THE ORIGINAL MAGAZINE FOR MODEL ENGINEERS

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IN THIS ISSUE

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John Clarke's one sixth scale model of an eighteenth century framework knitting machine (photograph: John Clarke).

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Doncaster Show

Now is the time to inscribe the date of the National Model Engineering and Modelling Exhibition into your diary. It takes place from the 10th to the 12th of May at Doncaster Racecourse. As one of the top shows of the year, it is one not to be missed. An added attraction this year, of course, is the reintroduction of the *Model Engineer* Competition, which is kindly being hosted by the show and organised by the Society of Model and Experimental Engineers. If you would like to enter your model into the competition you have until the 10th of April to return the entry form. A copy of the form and the rules are given on pages 427 and 428 and further details about the show may be found at www.thedoncastershow.co.uk

Do it now before you forget!

Wilton Show

If you cannot wait until May for your modelfest fix you could pop along to the 9th Wilton Model Engineering and Hobbies Exhibition being held at the Michael Herbert Hall, South Street, Wilton SP2 0JS on the 23rd and 24th of March. There will be a wide range of high standard model displays - traction engines, fun fairs, ships, trains and much more. Many of the exhibits will be working. Some outside exhibits will be in steam and there will be four full sized traction engines outside the hall. Light refreshments will be available. There is disabled access and free parking is available in the adjoining public car park. The cost of entry is £4, or £2 for children, and all profits will go to the Stars Appeal for Salisbury District Hospital – so a good cause and a good day out.

Gravesend Burglary

Sadly, Gravesend MMES was broken into about a month ago. A substantial amount of damage was done and four locomotives were stolen. These are: a 5 inch Metropolitan electric locomotive *John Milton*; a 5 inch Speedy (boiler no. N95 80 8); a 5" B1 (boiler no, N95 8 037); a 5" Simplex *Ashmore* (boiler no. N95 100 260).

If anyone spots any of these locomotives or knows of their whereabouts I should be pleased to pass the information on to the Gravesend club.

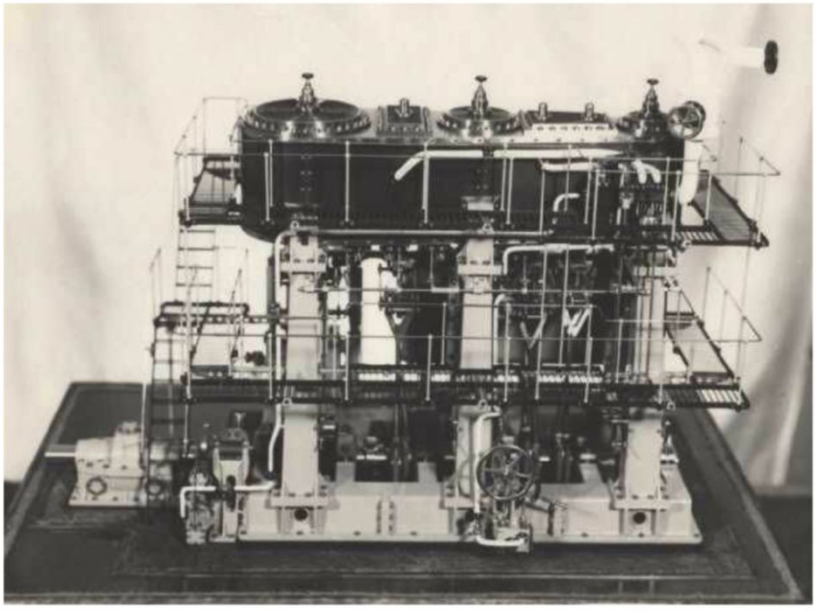
Cover Price

I have to tell you that the cover price for *Model Engineer* has been increased from £3.99 to £4.20, starting from this issue. Unfortunately, inflation dictates that most of the magazine's costs rise inexorably from year to year so occasional rises in cover price are an inevitability. Naturally enough, my own opinion is that this is still a modest price to pay for such a well written (and well edited!), entertaining, informative and up-to-the-minute publication.

Martin Evans can be contacted on the mobile number or email below and would be delighted to receive your contributions, in the form of items of correspondence, comment or articles.
07710-192953
mrevans@cantab.net

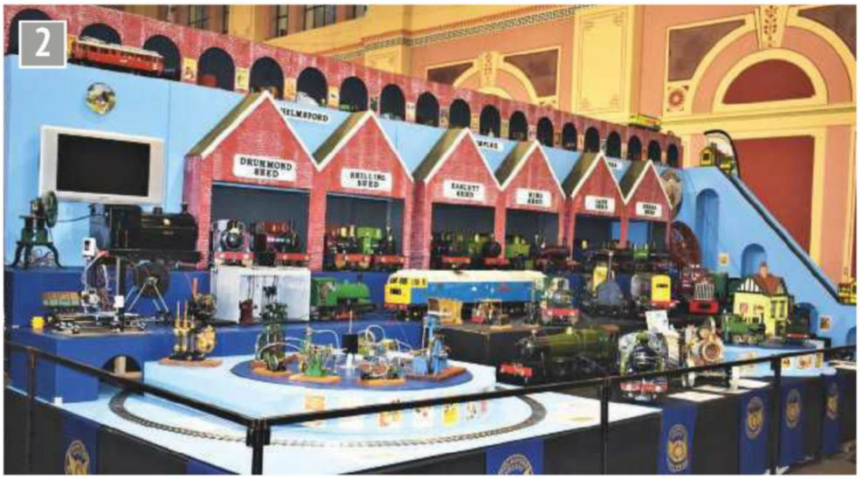
Mystery Model

Our photograph shows a triple expansion steam engine built by George Hartung, a notable model engineer, some of whose work is on display in the London Science Museum. A relative of Mr Hartung has contacted me, keen to know more about this model and, in particular, where it is now. If anyone has any information I should be pleased to pass it on.



Triple expansion steam engine built by Mr George Hartung.

The winning Club Stand Competition winners receive their shield from Chris Deith.



The winning stand was this large display by the Chelmsford SME.

London Model Engineering and Modelling Exhibition 2019 PART 1

John Arrowsmith recalls highlights of the recent exhibition held at Alexandra Palace.

This fine exhibition was once again held in the Great Hall of Alexandra Palace in London over the weekend of the 18th/20th January. There was a good mix of model engineering and model making with nearly 50 displays combining with over 50 traders, covering virtually everything model makers need to continue or start a new project. The Activity Zone was well supported with a range of activities designed to entertain and inform the serious and casual model engineer or visitor. There were a couple of new displays this year which added to the event by showing how the younger members of ME clubs are progressing and the efforts being made to encourage this combined with the contrasting styles of the Ministry of Steam Punk which combines the old with the new and which seems to be getting very popular these days.

A major feature of the show is the Club Shield competition which is keenly contested by all the participants and judged by them with no involvement from organisers or visitors. This year the 1st Prize went to the **Chelmsford Society** (**photo 1**) for an amazing presentation of model engineering in all its forms (**photo 2**). 2nd Prize was awarded to the popular **West London Meccano Society** for a display of some very involved and clever constructions culminating in a very large model of the Eiffel Tower. The 3rd Prize was gained by the **Maidstone SME** with a well filled stand of excellent model engineering.

The Ministry of Steam Punk display included Dr Who's Tardis.

It is always difficult to add a new dimension to exhibitions of this type but this year one of the new displays was by the **Ministry of Steam Punk** which I am reliably informed is a well supported group who try to mix old engineering ideas into a modern setting. This they do by reproducing models and full-size artefacts to represent the blending of the different ideas. There are elegant dresses and jewellery combined with TV icons like Dr Who's *Tardis*. I am still not sure how it all works but it was a colourful display which created a lot of interest for many visitors (**photo 3**).

The other new display this year was a presentation by four organisations showing off what their young engineers are capable of using and making. It was instigated by Pat Hendra from the Eastleigh Model Boat Club who asked the organisers if such a display could take place. They readily agreed and so the **Eastleigh MBC** combined with the **Blackheath MPBC**, the **Sussex MLS Branch Line group** and the **Hereford SME** to provide a colourful and interesting display of work

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Part of the display by a group of Young Engineers.

This superb example of a 5 inch gauge LMS Royal Scot *was on the Maidstone SME stand.*

Ancient and modern locomotives from the Northolt MRC.

The large 7¼ inch gauge chassis of an American Big Boy *is being built by Alan Antiss from the Northolt MRC.*

Harrow & Wembley SME included working and static models on their stand.

This superb N2 0-6-2 tank locomotive was displayed on the 7¼ inch Gauge Society stand.

and models built by young people (**photo 4**). It was an excellent presentation and the stand stewards had a constant stream of visitors asking very relevant and pertinent questions. I hope that this initial interest will result in other clubs getting involved and hopefully next year the display will include other clubs from the South East area or any area who have reasonable access to Alexandra Palace. You will be most welcome.

The **Imagineering Foundation** is another organisation trying to encourage younger people to appreciate the skills needed to build models or other electronic or mechanical devices and they would also appreciate more help from experienced model engineers in their work in local schools.

Let's look now at some of the exhibits on the prize-winning stands and all the other fine displays presented to entertain visitors. On the **Chelmsford SME** display the selection of stationary engines working on air was well presented on a turntable so that each one could be studied as it rotated round. The fiftieth anniversary of the *Simplex* design by Martin Evans was also acknowledged with 13 examples on show. A well made 3D printer added a modern detail and the 5 inch gauge LNER 2-6-2 V1 tank locomotive looked to be a good powerful engine. The well filled **Maidstone SME** display contained a wide selection of locomotives, all displaying excellent detail and finishes. The 5 inch gauge *Royal Scot* (**photo 5**) and the 5 inch gauge *Lord Nelson* class were noteworthy engines while the 3½ inch gauge *Princess Royal* Pacific built by Harry Powell from Crewe was an exhibit of superb model engineering.

A star attraction on the **Northolt MRC** stand (**photo 6**) was the 7¼ inch gauge *Big Boy* under construction by Alan Antiss. This huge piece of work was accompanied by a full length detail drawing of the original (**photo 7**). On the **Harrow & Wembley SME** stand a nice model of a Mississippi Stern Wheeler was the focal

point of the stand (**photo 8**) accompanied by a varied mix of both static and working models.

The **7¼ Inch Gauge Society** displayed a superb LNER 0-6-2 N2 locomotive which is still under construction. With fine workmanship and finish on all the components, it will result in an excellent example of these once numerous locomotives (**photo 9**). There was a comprehensive display by members of the **St Albans & District MES** with a wide range of models. A very nice Clayton steam wagon caught the eye (**photo 10**) as did a 1 inch scale Fowler traction engine. The R/C scratch built digger/loader of Godfrey Greaves was in constant action demonstrating its capabilities.

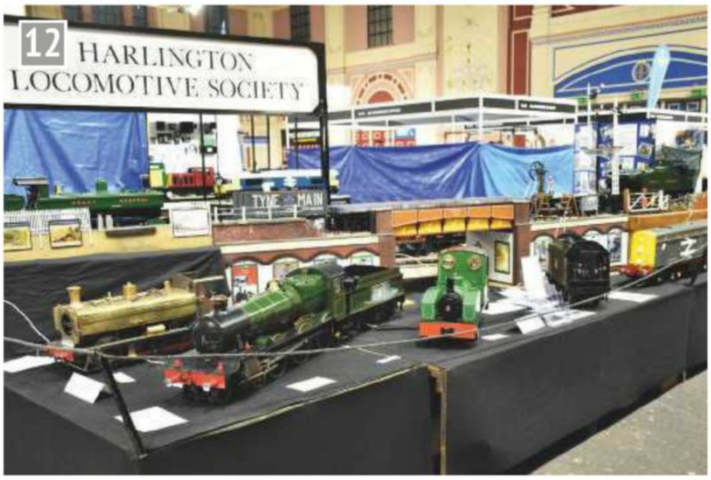
A couple of large locomotives and a wagon chassis were the basis of the **10¼ Inch Gauge Railway Society** display. Both locomotives, a Fowler dock tank 0-6-0 and Hymek outline engine looked in fine condition and no doubt are powerful machines (**photo 11**). There was an attractive scene on the **Harlington Locomotive Society** display with a long bridge structure displaying a short goods train and the usual railway furniture (**photo 12**). A varied selection of members' work including a 2 inch scale *Minnie* traction engine provided plenty of interest for spectators.

Some fine models on the **Sussex Miniature Locomotive Society** stand offered a good opportunity to inspect both completed models and those under construction. Andy Brocks 5 inch gauge tank wagons (**photo 13**) will be excellent models when complete and the 9F 2-10-0 being built by Adam Cro looks to be another fine engine in the making. The **Chingford & District MEC's** (**photo 14**) contribution to the exhibition included a very nice Adams 4-4-0 tank engine with a selection of working models including very simple hot air engine made from a well-known crisp supplier's carton. This attracted a lot of attention.

●To be continued.

A very well finished Clayton Steam lorry was part of the St. Albans presentation.

A sit in Hymek locomotive from the 10¼ Inch Gauge Society.

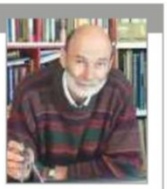


An interesting display by the Harlington Society.

Andy Brock's 5 inch gauge tank wagon is still under construction.

A comprehensive display by the Chingford MEC.

ME Vertical Boiler - Fittings PART 26



A project aimed at beginners wishing to develop their skills or those requiring a robust vertical boiler for the running or testing of small steam engines. **Martin Gearing** completes the boiler by adding the pressure gauge, water gauge and the other remaining parts.

Continued from p.360
M.E. 4607, 1 March 2019

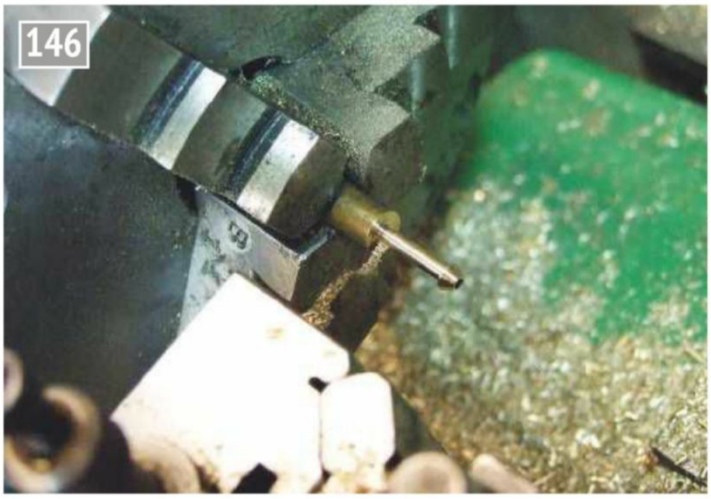
Pressure gauge cone – Item BF25

6mm diameter Brass

The size of pressure gauge specified is normally threaded 3/16 inch x 40 ME and, rather than make the nut, I would suggest that a union nut is purchased with the gauge. The cone that is normally fitted to this size of nut is, in my opinion, for a size of tube that is too small in diameter to be considered robust enough to support the pressure gauge on the end of the 'U' tube that connects the gauge to the steam space on the boiler. The cone drawn and described (BF25 – **fig 81**) fits **inside** the bore of the 4mm (5/32 inch) x 22swg copper tube used throughout the steam plant.

Hold the brass round in a self-centring chuck or collet with 17mm protruding. Face off and, ideally using a No. 1 centre drill having a pilot of less than 1.5mm diameter, drill a centre. (If you do not have a centre drill this small, produce a depression no larger than 1.3mm diameter in the end face using the smallest centre drill you have.) Drill 1.5mm diameter x 14mm deep using the highest speed available, withdrawing frequently to clear the swarf and applying lubricant before each re-entry.

Turn 4mm diameter x 14mm using a sharp tool. Rotate the top slide 30 degrees anticlockwise and turn the 60 degrees (included angle) cone using the top slide, leaving a **just** discernible trace of the end face about 0.1mm wide. With a sharp narrow parting tool 'back turn' 2.6mm diameter x 12mm, starting 2.2mm in from the end face, taking light cuts (0.15mm or 0.3mm on a diameter dial) feeding slowly. Part off 12mm overall, deburr and put to one side (**photo 146**).



Parting off the 'U' tube cone adaptor.

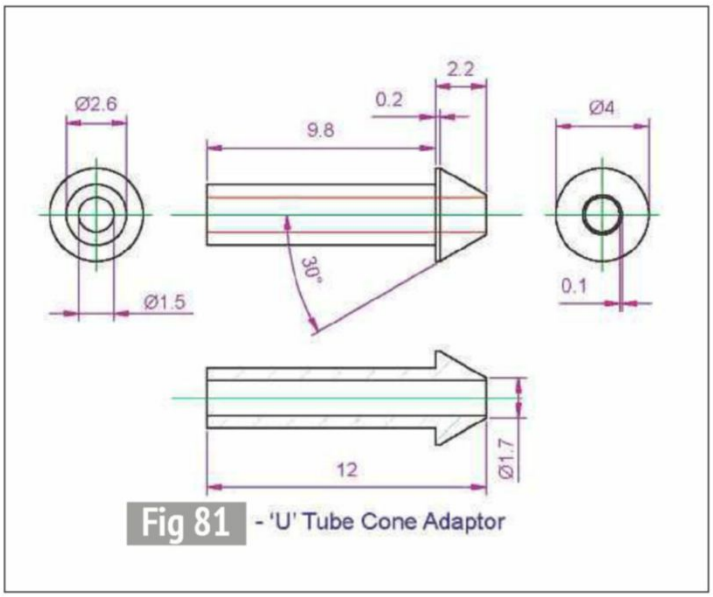


Fig 81 - 'U' Tube Cone Adaptor

Making up and fitting pressure gauge 'U' tube

I would recommend the pressure gauge purchased should be of 1 inch diameter and have an operating range of 0 – 120psi and, as stated earlier, should be purchased with a matching union nut. This operating range will allow for it to remain in place for the four yearly 1½ times working pressure hydraulic test. When the boiler is in steam the needle will conveniently be mid-way on the scale.

Take the remaining banjo/pipe assembly, the union nut purchased (to fit the pressure

Tolerances:
Non functional (i.e. parts not a fit or match) ±0.1mm
Functional (i.e. parts having to match) ±0.02mm

gauge) and the 'U' tube cone adaptor (BF25) made earlier. Check the free end of the pipe is square and free from burrs before putting in the pickle along with the cone for 10 - 15 minutes. Drain and wash in clean water.

Pass the cone through the union nut and whilst pushing the cone to the back of the nut put a turn of copper or soft iron wire (about 0.5mm diameter) around the projecting tail of the cone tight to the back of the nut, bringing the ends of the wire up and over inside the union nut to prevent it sliding back down the adaptor.

Alternatively you can run an 8mm length (12½ turns) of 3⁄16 inch x 40 ME thread onto the end of a piece of 4.76mm diameter (3⁄16 inch) brass about 15mm long and screw that into the nut to capture the cone. That demands a die which for this project would only be used once. Make your choice.

Insert the cone end into the free end of the tube (attached to the banjo) about 3mm and, with a pair of pliers, gently grip the copper tube about 3.5mm from its end and apply enough pressure to distort the tube. Distort the tube only just enough to prevent the cone end dropping further into the tube.

Remove the cone end and slip on the ring of 0.7mm silver solder (55%) on the 2.6mm cone end. Apply flux to the inside of the copper tube and insert the restrained nut/cone end with the silver solder ring in place, applying more flux around the ring and cone end (**photo 147**).

Stand the banjo on a fire-resistant block and support the tube so that it stands vertical with the cone/nut assembly uppermost.

Direct the flame of a small burner towards the upper section of copper tube passing occasionally over the nut but avoiding playing it directly on the silver solder ring. When you have confirmed that there is an even smooth fillet, remove the heat. Allow to cool. Remove the wire before placing in the pickle for 10 – 15 minutes, draining and placing in clean water, leaving to soak for 20 -30 minutes and removing all traces of flux with a stiff brush on removal (**photo 148**).

Nut held at end of cone and pipe crimped to locate assembly.

Cone silver soldered.

Pressure gauge 'U' tube fitted.

Chimney fitted to smokebox cap.

The copper tube will be annealed because of the two silver soldering operations and will be easy to bend to a 'U' shape so that the nut and cone is about 10 – 15mm higher than the centre of the banjo fitting.

Fit a copper washer to the pressure gauge 'U' tube banjo bolt (BF 19) before passing through the 'U' tube banjo (BF16). Fit a second copper washer over the protruding ¼ inch x 32 ME banjo bolt thread before installing the assembly into the remaining upper boiler barrel bush (**photo 149**).

Fitting the chimney to the smokebox cap

Attach the chimney to the smokebox cap using six brass, bronze or stainless M2 x 6mm (or 8BA) bolts with nuts on the underside (photo 150).

Totally out of character I made six M2 bolts with round heads that were not slotted to give the appearance of rivets but to achieve a consistent radius on the 'head' I had to make a 1.5mm radius tool.

Installing the cap exhaust fitting

Take the exhaust fitting (BF12) and bend the pipe at 90 degrees to direct the exhaust steam up the chimney (the 70mm length is to make the bending easier). Check for fit by trial fitting it into the hole drilled in the cap for the purpose. When a satisfactory fit has been achieved trim the excess length to leave between 15 – 20mm of tube actually up inside the chimney. Use a fine file to remove any burrs before securing with the nut (**photo 151**).

Fitting the smokebox cap

Take the smokebox cap assembly and fit it over the top of the boiler barrel orientating it so that the extensions fit through their correct holes before securing with three M3 x 6mm stainless, brass or bronze bolts.

Fitting the stop valve

Fit a copper washer to the ¼ inch x 32 ME threads of the stop valve body (BF9) and screw onto the extension of the superheater protruding through the smokebox cap. Adjust the washer thickness so that when tight the outlet stub is positioned facing either to the left or right when facing the 'front' of the boiler - which notionally is midway between the two pairs of bushes in the boiler barrel. The choice of left or right depends on which side you favour to have the engine located.

Screw into the valve body the stop valve spindle (BF21). Fit a BS006 silicone or viton 'O' ring into the recess of the spindle gland nut (BF6) and screw onto the top of the stop valve body passing the spindle through the 'O' ring. Tighten

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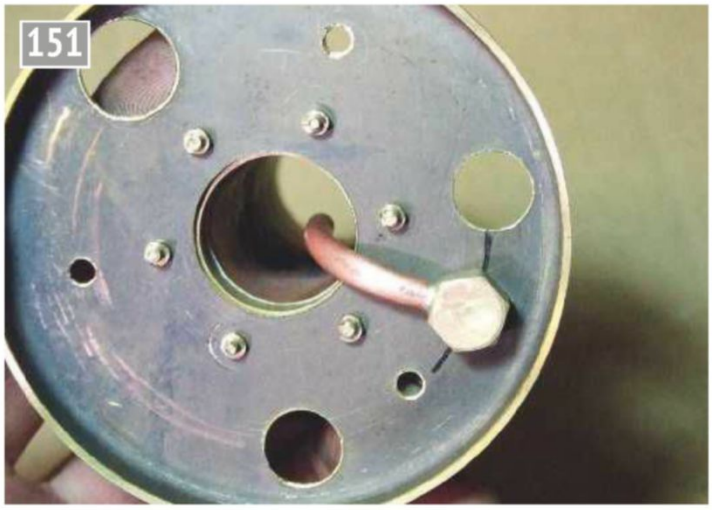
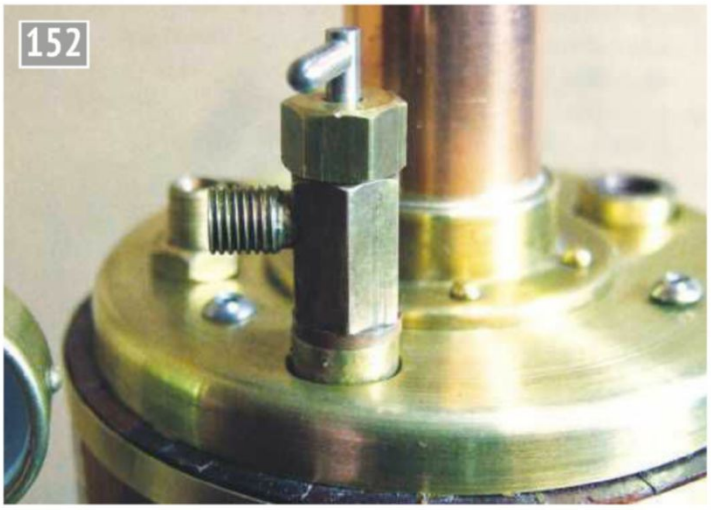


Exhaust fitting installed in smokebox cap.



Main stop valve installed.

the nut down. Screw on the operating lever (**photo 152**).

Assembling and fitting the safety valve

Make up a copper washer from a 16swg tubeplate offcut drilled 8mm diameter and with the outside turned to 12mm diameter. Remove all burrs and anneal.

Cutting spring to length

The safety valve spring (3⁄16 inch diameter x 24swg stainless) initially needs cutting at least seven turns long to allow for the ends to be ground flat. The safest method of doing this is to drill a hole that is a close fit to the outside diameter of the spring, in a piece of material 6 – 8mm thick (hard wood or good quality plywood will do). This is presented to the SIDE of a grind stone and the spring is pushed LIGHTLY through the hole at 90 degrees against the side of the wheel, making sure the direction of the cut end of the spring coil/wire faces in the same direction as the grinding wheel rotation.

Only allow the end of the spring to touch the wheel briefly before withdrawing the spring quickly and cooling the end in water. The spring rate will be compromised if you heat the end coil to above a light straw colour. Repeat until the end coil has been ground from having the wire cut at right angles, to the wire having an elliptical shape, flat and 90 degrees to the coiled length.

Turn around and repeat the process but this time continue the grinding process until you can count six complete turns (**photo 153**).

Seating the ball valve

Take the safety valve body (BF13) and drop a 7⁄32 inch stainless steel ball onto the seat and place the threaded end on a flat solid surface. Using a short length of 4mm (5⁄32 inch) copper tube resting on the ball, give the tube a light tap with a small hammer, in the same manner as you did with the clack valve. To see if the seat is sound, blow into the top of the body above the ball and no air should pass. Put your thumb over the top and shake the body and repeat. Again, no air should pass.

In the event of the seat leaking, remove the ball and check for any loose particles in the area of the seat. With an eyeglass (around x4 magnification) look at the seat area. You should be able to discern a minute continuous ring where the 4mm reamed hole meets the 15 degrees face, against which the ball has seated. Any breaks in the ring would give a faulty seal. If you're lucky you might rectify the problem by a repeat of the seating process.

Should that not cure the problem then the body will need to be set up to run true in the lathe and the 8.5mm 'D' bit just touched lightly against the seat face (removing the minimum of material) to restore the knife edge before repeating the seating process with a light tap as before.

Again, the previous comment about retaining/replacing the ball applies.

Assembling the safety valve components

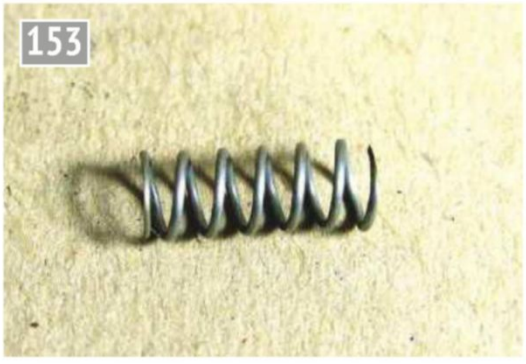
When a good seat has been achieved fit the 8mm copper washer to the thread and screw in the valve body to the extension finger tight. Drop in the 7⁄32 inch stainless steel ball. Fit the spring onto the safety valve spring guide (BF20) and pass through the recess side of the safety valve adjuster (BF14). Screw this assembly into the end of the safety valve body about five turns (**photo 154**). The pressure at which this relieves will be set later at the steam test. Before that however the safety valve will be removed and the boiler tester will fit an adaptor to the extension to carry out the 1½ times working pressure hydraulic test to confirm that all the fittings and their joints to the boiler are sound.

Filler plug

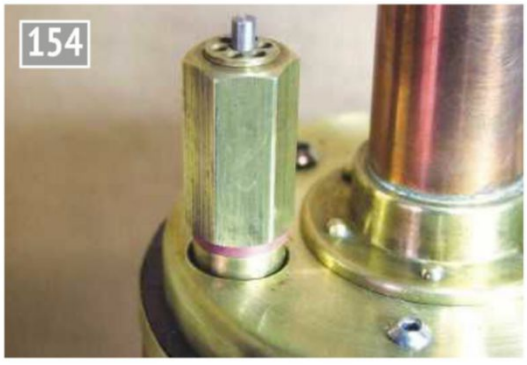
Fit a copper washer to the ¼ inch x 32 ME threads of the filler plug (BF1) and screw in finger tight to the filler plug extension. This will need to be removed to fill the boiler with water completely for the 1½ times working pressure hydraulic tests.

●To be continued.

NEXT TIME
We shall tackle something new – a burner for the boiler.



Ends ground on safety valve spring.



Safety valve assembled.

NEW DATE • NEW VENUE • NEW FORMAT

MODEL ENGINEER COMPETITION

Since 1907

10-12 May 2019

National Model Engineering and Modelling Exhibition (Doncaster Racecourse)

OFFICE USE ONLY

CLASS	ENTRY NO.

Please return completed form by Wednesday 10th April 2019 to:
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Email: post@michaellaw.co.uk

Entries may be returned by either post or email but in order to reduce costs, the organisers would prefer to correspond by email.

ENTRY FORM COMPETITION & LOAN MODELS

PERSONAL DETAILS (Please print)

Surname _____ Forename(s) _____ Age _____

Address _____

_____

_____ Post Code _____ Email _____

Home Tel No _____ Daytime Tel No _____

Model Club or Association _____

How many years have you been a modeller? _____ Camping Required? Yes ❑ Vehicle Registration _____

*Required for competition entries only

MODEL DETAILS – PLEASE TICK BOX IF MODEL IS FOR LOAN ❑

*Entry Class (see overleaf for competition rules and categories) _____

Model Title (to be used for catalogue and display card) _____

Model Description (to be used for catalogue and display card) _____

_____

_____

Model Scale _____ Length _____ Width _____ Height _____ Weight _____

*Type of construction _____

_____

*Parts not made by you and commercial items _____

_____

_____

Please supply a photograph of the finished model for insurance purposes. (Please note: It may not be possible to provide insurance for models entered later than 10th April 2019.)

*Are you supplying Judges Notes? Yes ❑ No ❑

Value of Model (the organisers will not insure the model unless a realistic value is entered) £ _____

I have read the rules and conditions of entry and confirm the information is correct to my knowledge and I accept the conditions of entry.

Signature _____

Information about entries included on or with this form may appear in MyTimeMedia publications and on the exhibition organiser's websites. Other than entrant's name, no personal information will be published.

Further details of the National Model Engineering Exhibition can be found at **www.thedoncastershow.co.uk**

PHOTOCOPIES OF THIS FORM ARE ACCEPTABLE

N.B. Please make a copy of this form and any photographs enclosed for your own reference.
Please note that the organisers will not accept liability for any loss of documents or photographs submitted with this form.

To help you get the best from The Model Engineer Competition

These notes are written purely for guidance. Full information is contained in the Competitors' Information booklet which is sent to every entrant as part of the information package. If you have an item and are unsure as to the Class into which it should be entered, leave that section blank and we will take care of it. The Judges have the right to move any competition exhibit into another class if they feel that by doing so its chances of gaining higher marks or a more appropriate award are improved.

If the item is offered as a Loan exhibit please indicate this by writing Loan on the form in the box identifying the Class. Loan models are not judged but carry all other privileges associated with competition entries.
Part built models are particularly welcome in the Loan Section: visitors like to see work in progress, and entry does not preclude the item being entered in competition when completed.

The classes listed below are those associated with mainstream model engineering.

Engineering Section

A1 Hot air engines.
A2 General engineering models (including stationary and marine engines),
A3 Internal combustion engines.
A4 Mechanical propelled road vehicles (including tractors).
A5 Tools and workshop appliances.
A6 Horological. scientific and optical apparatus.
A7 General engineering exhibits - not covered by the above

Railway Section

B1 Working steam locomotives 1in. scale and over.
B2 Working steam locomotives under 1in. scale.
B3 Locomotives of any scale, experimental, freelance or based on any published design and not necessarily replicas of full size prototypes, intended for track duties.
B4 Scratch built model locomotives of any scale, not covered by classes B1, B2, B3, including working models of non-steam, electric or clockwork powered steam prototypes.
B5 Scratch built model locomotives gauge 1 (10mm scale and under.
B6 Kit built model locomotives gauge 1 (10mm scale) and under.
B7 Scratch built rolling stock, gauge 1 (10mm scale) and under.
B8 Kit built rolling stock, gauge 1 (10mm scale) and under.
B9 Passenger or goods rolling stock, over 1in scale
B10 Passenger or goods rolling stock, under 1in scale.
B11 Railway buildings and lineside accessories to any recognised model railway scale.
B12 Tramway vehicles.
B-K1 Working steam locomotives built from a kit.
BK2 Working locomotives other than steam powered. (Any model locomotive in class B-K1 and 2, built from a commercial kit, entered into these classes will not be judged in the medal classes but can receive commended certificates and an award from a trade supplier).

Marine Models

Cl Working scale models of powered vessels (from any period). Scale 1:1 to 1:48
C2 Working scale models of powered vessels (from any period). Scale 1:49 to 1:384
C3 Non-working scale models (from any period). Scale 1:1 to 1:48
C4 Non-working scale models (from any period). Scale 1:49 to 1:384
C5 Sailing ships and oared vessels of any penod - working.
C6 Sailing ships and oared vessels of any period - nonworking.
C7 Non-scale powered functional models including hydroplanes.
C8 Miniatures. Length of hull not to exceed 15in for 1:32 scale, 12in for 1:25 scale. 10in for 1:16 scale: 9in for 1:8 scale. No limit for smaller scales.
C9 For any model boat built from a commercial kit. Before acceptance in this class the kit must have been readily available for at least 3 months prior to the opening date of the exhibition and at least 20 kits must have been sold either by mail order or through the retail trade.

Scale Aircraft Section

Dl Scale radio control flying models
D2 Scale flying control-line and free flight
D3 Scale non-flying models. including kit and scratch-built
D4 Scale flying radio controlled helicopters

Model Horse Drawn Vehicle Section

G1 Carriages & other sprung vehicles. (Omnibuses. trade vans etc.) Wagons, carts and farm implements. Caravans.

Junior Section

J1 For any type of model, mechanical or engineering work, by an under 14 year old.
J2 For any type of model, mechanical or engineering work, by a 14-16 year old.
J3 For any type of model, mechanical or engineering work. by a 16- 18 year old.

All entries will be judged for standard of craftsmanship, regardless of the modelling discipline. i.e. a boat will not be competing against a military figure. Providing a model attains sufficient marks q will be awarded a gold, silver or bronze medal.

Model Vehicle Section

K1 Non-working cars, including small commercial vehicles (e.g. Ford Transit) all scales down to 1:42.
K2 Non-working trucks, articulated tractor and trailer units, plus other large commercial vehicles based on truck-type chassis, all scales down to 1:42.
K3 Non-working motor bikes, including push bikes, all scales down to 1:42.
K4 Non-working emergency vehicles, fire, police and ambulance, all scales down to 1:42.
K5 Non-working vehicles including small commercial vehicles (e.g. Ford Transit.) scale from 1:43 or smaller.
K6 Any available body shells in any scale or material, to be judged on appearance only.
K7 Functional model cars/vehicles which must be able to move under their own power of any type. Can be either free-running, tethered, radio controlled or slot car, but must represent a reasonable full size replica.

DUKE OF EDINBURGH CHALLENGE TROPHY

Rules and Particulars

The Duke of Edinburgh Challenge Trophy is awarded to the winner of the Championship Award at the Model Engineer Competition.
The trophy remains at all times the property of MyTimeMedia Ltd.
Any piece of model engineering work will be eligible for this Championship Award after it has been awarded a Gold or Silver medal at The Model Engineer Competition.

A model may be entered more than once but if the model wins it will be permanently retired.

Competitors must state on the entry form:
(a) That exhibits are their own bona-fide work.
(b) Any parts or kits which were purchased or were not the outcome of their own work,
(c) That the model has not been structurally altered since winning the qualifying award.

COMPETITION RULES

1. Each entry shall be made separately on the official form and every question must be answered.
2. Competition Application Forms must be received by the stated closing date. LATE ENTRIES WILL ONLY BE ACCEPTED AT THE DISCRETION OF THE ORGANISERS.
3. Competitors must state on their form the following:
   (a) Insured value of their model.
   (b) The exhibit is their own work and property.
   (c) Parts or kits purchased.
   (d) Parts not the outcome of their own work.
   (e) The origin of the design, in the case of a model that has been made by more than one person.

NOTE: Entry in the competition can only be made by one of the parties and only their work will be eligible for judging.

4. A junior shall mean a person under 18 years of age on December 31st in the year of entry.
5. Past Gold and Silver award winners at any previous Model Engineer competitions are eligible to re-enter their model for 'The Duke of Edinburgh Challenge Trophy'.
6. Past Winners of an award at any previous exhibition promoted by the Model Engineering Magazine will not be eligible for re-entry unless substantially altered.
7. Previous entrants in 'The Duke of Edinburgh Challenge Trophy' may re-enter as long as they have not been previously awarded the Trophy.
8. The Competition organisers reserve the right to: (a) Transfer an entry to a more appropriate class, (b) Describe and photograph any models entered for competition or display and to make use of any such photographs and descriptions in any way they may think fit (c) Refuse any entry or model on arrival at the exhibition and not furnish a reason for doing so
9. Entry into the competition sections is not permitted by:
   (a) Professional model makers,
   (b) Anyone who has a financial interest in the direct supply of materials and designs to the public.

NOTE: If unsure, please contact the Competition organisers prior to the show.

10. The Judges' decision is final. All awards are at the discretion of the judges and no correspondence regarding the awards will be entered into.
11. Exhibitors must present their model receipt for all models collected at the end of the exhibition and sign as retrieved.
12. The signed release for each model must be presented to security staff when leaving the exhibition complex with display model(s) after the close of the exhibition.

IMPORTANT NOTE: PLEASE MAKE COPIES, INCLUDING PHOTOGRAPHS, OF ALL INFORMATION RELATING TO YOUR MODEL, AS THE ORGANISERS WILL NOT ACCEPT LIABILITY FOR ANY LOSS.

CLOSING DATE: 10 APRIL 2019

A Framework Knitting Machine PART 2

John Clarke describes how he set about the making of a one sixth model of an eighteenth century knitting machine.

Continued from p.317
M.E. 4606, 15 February 2019

The frame of the machine.

The three treadles.

Making my one sixth size Knitting Machine

From the measurements of the c. 1760 machine I was able to construct a very strong oak frame. This had to include an adjustable seat and a section on which to mount the mechanisms. It is said the machine required a lot of strength to operate, so a man knitted while his wife prepared the yarn and kept an eye on her children who were sewing the stockings. The frame was assembled in the house close to a large window. As the family were poor the machine was always on hire and they had to pay to keep it in order.

For example, needles were often replaced. As mentioned, I started my model by making the oak frame (**photo 15**). This is a view from the corner of the frame. Note the large square fittings, the seat adjustment and the fittings to hold a spring loaded roller.

Next I produced three wooden treadles and fitted them under the seat (**photo 16**). The two outer treadles, left and right, slacken the sinker retaining springs using the following method. There is a large wooden pulley and a small metal one. Both are screwed together and mounted on an axle and brackets.

The two treadles are made to rotate a metal pulley left and right. The large attached wooden pulley also moves but its rope is held at the bottom to ensure that it doesn't slip (**photo 17**).

The two pulleys mounted at each end of the metal bar take the rope to a slurcock. The slurcock during its movement is able to release the sinker retaining springs.

The roller on top of the slurcock will pass under the end of a jack releasing its retaining spring (**photo 18**). The jack sinker will then fall. The skill of the knitter should cause the jacks to fall one

The slurcock and its operating pulley.

The slurcock roller is about to release the springs.

The locker bar is about to force the jacks back under the springs.

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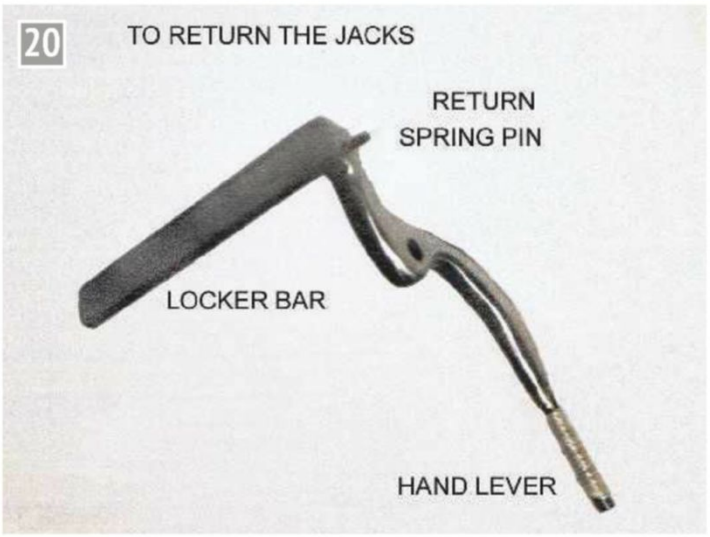
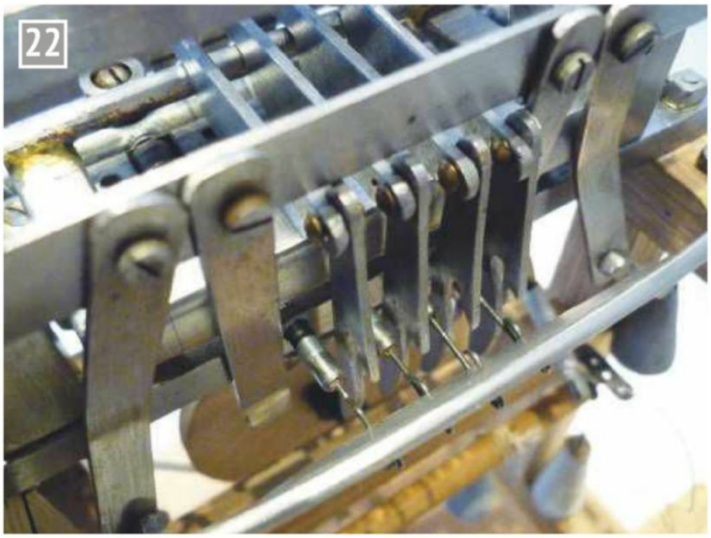


The locker bar.

The locker bar, jacks and slurcock assembly.



A pressure bar (front) closes the beards of the needles.

The pressure bar mounting.

after the other; otherwise, if they all crash down too fast the yarn will break.

The hand operated locker bar on top of the four jacks will force them back under the retaining springs ready for the slurcock to return (**photo 19**). The return spring attached to the locker bar (**photo 20**) will lift the bar off the jacks after locking.

Photograph 21 shows the locker bar assembled with jacks returned. Note the whipping used for a hand grip.

Closing the beard of a needle is the work of the pressure bar (**photo 22**). The bar can be seen mounted on the frame supported hinge in **photo 23.** A loop of metal takes its movement to the rear of the machine. A bow metal shaped part and a return spring take the movement directly from a rod connected to the centre treadle. Photograph 23 shows the parts connected with this mechanism.

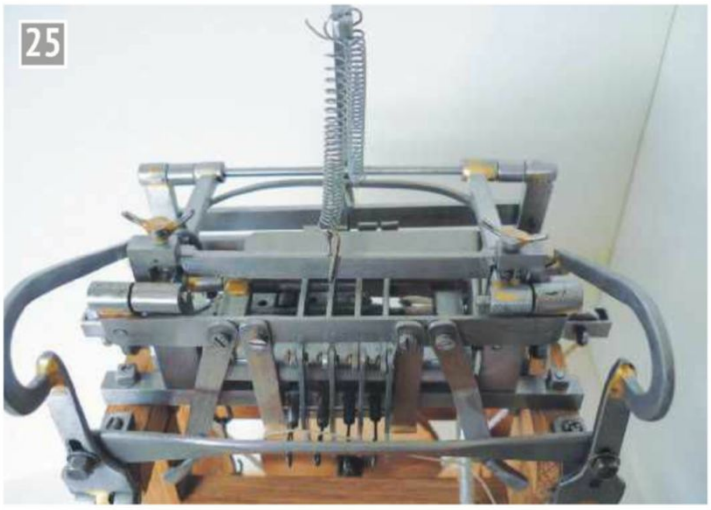
The needle shape was produced as seen in the diagrammatic photos in Part 1 (p.317, *M.E.*4606, 15 February). I found the tempering was quite critical, as did the inventor. Setting the distance to meet the pressure bar also gave me problems. I solved this by fitting a sleeve to the end of the needle. When fitted in place a small grub screw gave me a fine adjustment.

The loop from the hinge required a number of attempts to get the clearance correct in combination with the other mechanisms. On some occasions when I was experimenting knitting with tweezers (no small fingers available) I had to completely rebuild some of the parts I made earlier to achieve the present working model.

The left and right handles, if pulled, will move a plate on hinges that will in turn move the sinkers forward (**photo 24**). A foot pedal operates the large hinges at the back of the machine. These have fine adjustment screws to the front, allowing the sinkers to be brought forward from a lower position (**photo 25**). Notice the yarn across the needles. Below the needles there is a weighted, spring loaded roller, to roll up the finished knitting and keep it tensioned (**photo 26**).

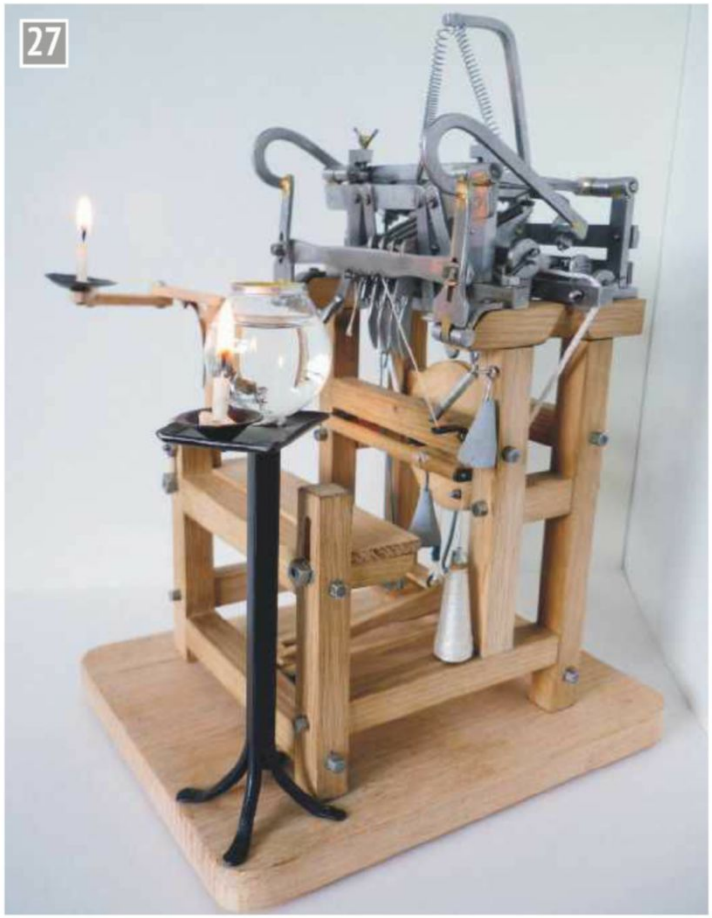
To finish the model I made a cone of yarn which sits on the wooden base frame (**photo 27**). The basic source of light came from an early form of

The two handles for controlling the sinkers.



This shows the two fine adjustment screws for the sinker position.

The weight tensions the rolled up knitting.



A general view of the machine.

The source of the globe lenses.

'Anglepoise' lamp using a candle on a wooden post. A curved spring can be seen pressing on the post as the jointed parts are moved to a desired position for the candle. Improved lighting is provided by placing a candle behind a globe filled with water. This intensifies the light from the candle. I made the globe from a golf ball-type electric bulb. I carefully separated the glass bowl with a fine saw (**photo 28**).

I hope I have covered the important points of interest about my model machine. I did not make detailed drawings of the working parts as even on the original old machines there were no exact parts. The machines seem to have been modified to the requirements of the time. Therefore, as time passed, no two machines were the same - they changed and were adapted during their working lives. ME

City of Stoke on Trent in 2½ Inch Gauge PART6

Robert Hobbs creates a longed for Pacific from an historic set of castings

Continued from p.321
M.E.4606 15 February 2019

In the first part of this series the tender chassis was completed, but somehow or other I neglected to mention the tender platework. The construction was a relatively simple mark out, cut and fold exercise from mild and galvanised steel. The water tank filler and pump access door was a nice little fabrication project in its own right and is shown in **photo 105** .The body sections were bolted together and are shown

The fabricated water tank filler.

in **photos 106**, **107** and **108**, the dummy coal being made from stone chips bonded to a shaped piece of light ply and painted matt black. The completed body was bolted to the chassis (**photo 109**), the brake operating stand and the hand rails were fitted and this assembly was put to one side to await the transfers and lining.

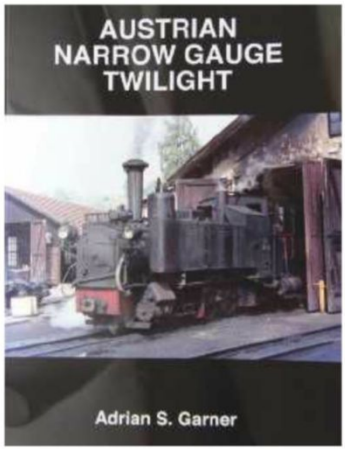
The linings were added with old gold pinstripe tape and the water slide transfers fitted to the cab and tender; the number chosen being my apprentice numbers which I have taken to applying to all my locomotives. Asking around for a decent display track, the National Two and a Half Inch Gauge Association suggested a Gauge Three track supplied by Cliff Barker from Essex. After an extensive telephone conversation the specially cut to length track arrived. It was really well made with scale rails and sleepers and suited the locomotive and tender a treat as can be seen in **photo 110**.

Nearing completion, the back plate details were added to the boiler together with the handrails and the smoke

deflectors. The dummy sand boxes and the reversing rod with its support were fixed in place. Following a visit to the Midlands Model Engineering Show at Warwick the nameplates for the locomotive were ordered from Peter Wood of Model Engineers Nameplates from Doncaster, who was kind enough to deliver them in less than a week enabling me to take the final photos for this series. **Photographs 111** to **117** show the completed build of my LMS *City of Stoke on Trent*, which was built for display only. I am aware that this is not everyone's idea of model engineering, however it satisfies my need and gives an enormous amount of pleasure whilst working on and completing the project. Furthermore, writing these notes and planning the photos adds to the enjoyment and ensures a fine record for my files. The Pacific sits well in my study and is nowhere near as dominating as the three and a half inch gauge *Hielan Lassie* that was shown at the start of this series.

I am very grateful to Diane and Martin for allowing this indulgence which I hope informs, entertains and will encourage others to build models for their own satisfaction.

Finally to paraphrase Frank Sinatra; *'I did it my way'*. ME



Book Review

Austrian Narrow Gauge Twilight: Tours in the 1960s and 1970s

By Adrian S Garner

Austria was blessed with an unusually varied narrow-gauge railway scene, little visited by British enthusiasts in the 1960's. Luckily the author was fortunate enough to holiday there and take excellent photographs detailing many railways. The book features additional photos by Stuart Baker and Mike Christensen. They were just in time for many closed in the 1970's and 1980's making this a valuable record.

Austrian narrow gauge was richly varied. Mostly 760mm gauge, steam still operated on many lines though others had been dieselized or electrified like the Mariazellerbahn. Although some appeared more like main line railways, with track lengths of up to 90km, others retained the quaint charm of rural backwaters. There were substantial engineering works like the concrete Grub viaduct on the Feistritzalbahn shown in the book though generally these photographs are of station yard or shed scenes rather than trains in the landscape.

Some operated rack systems and the short but delightful Achenseebahn illustrated still operates steam locomotives. At Donawitz a narrow-gauge line served the large steelworks. Iron ore came down on the Erzbergbahn, a standard gauge steam rack line, also depicted in the book.

Pictures are almost all black and white and of high quality. They'd be useful for railway modellers and for model engineers though detail modelling an Austrian steam locomotive would be challenging. Most were side tank engines, some including elaborate engineering to allow for side movement of axles without resort to full articulation. Others had an extra coal bunker placed on top of the side tanks, plus tanks for air brakes. There are no bogies pictured though some had trailing pony trucks. Doubtless designers wanted maximum weight for adhesion.

Austrian coach on the Welshpool and Llanfair Light Railway.

The Schafbergbahn rack line has since adopted modern oil-fired steam engines like those on the Swiss Brienz-Rothornbahn designed by Roger Waller. They can be operated by one man.

Lines still carried considerable freight traffic, even including cement wagons, but do not seem to have used transporter wagons to carry standard gauge trucks to any great extent.

Carriages were mostly wooden bodied four wheelers with balconies. The Welshpool and Llanfair Railway has three classic Austrian coaches brought over from the Zillertalbahn plus a steel bodied example from the Salzkammergut Lokalbahn. All have been rebuilt by the W&L.

That railway also has an 0-8-0 Feldbahn locomotive built in 1944 that worked on the Styrian Government railways. It was rather inappropriately named *Sir Drefaldwyn.* The engine is a fine example of relatively modern continental narrow gauge practice showing that narrow gauge lines there were not the quaint railway byways of England and Wales.

This is a thoroughly enjoyable book though it does not claim to be a definitive account giving technical detail. Unfortunately, spellcheckers are no substitute for good proofreading - for instance, the Abt rack system is described as the Apt system throughout. Why are so many railway books thus marred?

Overall this book is a fascinating glimpse of Austria's smaller railways as they were. Many have now gone or been truncated but we can be thankful the author and his colleagues recorded something of their charm.

Roger Backhouse

Lightmoor Press, 2017. £15.
136pp. ISBN 9781911038306.

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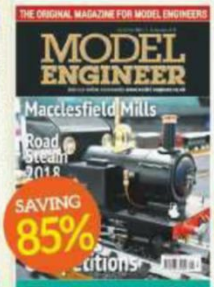

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PART 35

Lathes and more for Beginners

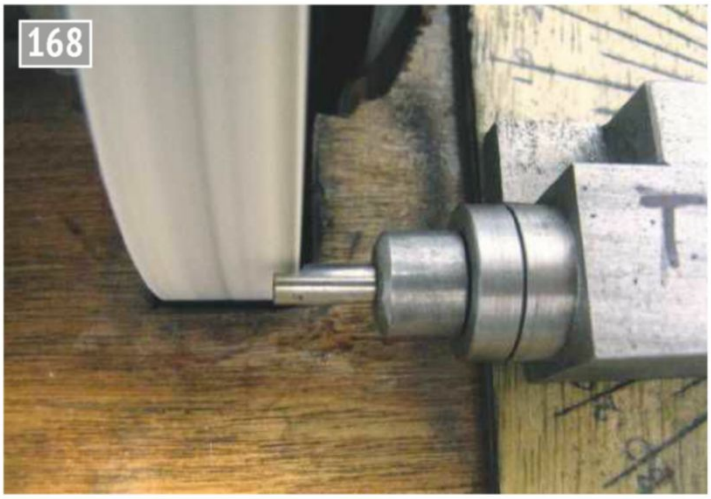
Graham Sadler grinds some tool bits.

Continued from p.365
M.E. 4607, 1 March 2019

Grinding the tool bits

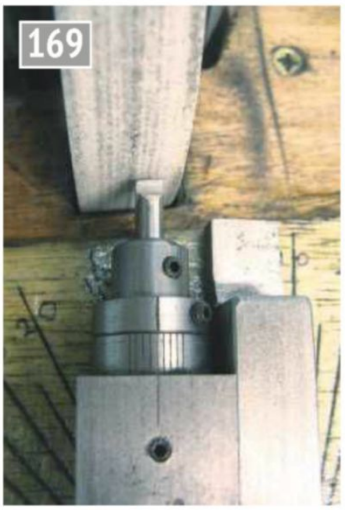
With the grinding rest as already covered, we had the angle set to 8 degrees to give the tool clearance. If this holder is used directly onto the sliding platform, the resulting angle onto the grinding wheel is 6 degrees. It is highly probable that your first try at grinding a bit will be a failure, but it will be a learning experience! Start with the tool-bit for the square 10mm bar (non-angled) used on through holes. It is bigger than the others so easier to comprehend. Procedure may seem complex at first, but it will become clear.

Use a 5mm HSS bit. Put a full length into the holder. **Fig 37** (item 1) shows views of what we want to end up with. To avoid confusion, again use a marker to mark top, front tailstock etc onto the holder block (I still do this). Don't forget that all boring tools are left hand cutting compared to a standard lathe tool and each holder boss division is 6 degrees and that, as with any tool grinding, when the sparks go onto the top of the bit, you have a full facet. Here is the procedure:

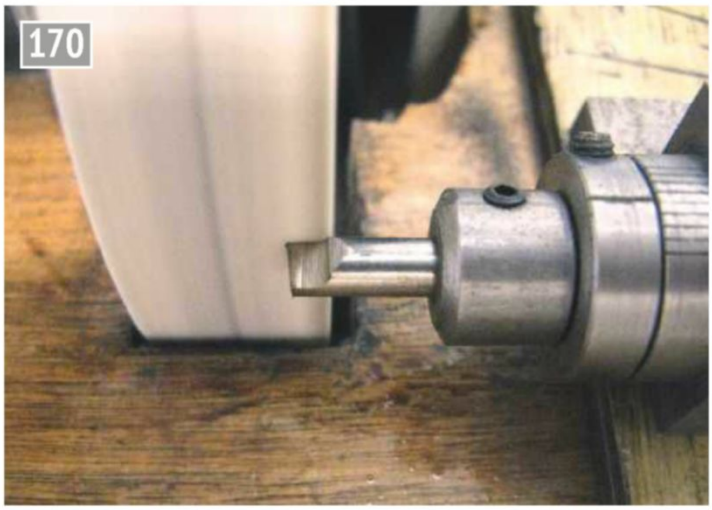


Grinding the top of the tool-bit with tailstock block face up.

1. ***Top of the tool*** - set the holder scale at clockwise 12 or 18 degree side rake when seen from the back (6 degrees needed to remove the curve of the wheel).
2. Set the slider on the end of the grinding rest, rest at zero degrees and tailstock face of holder up.
3. Grind the top to half the diameter of the tool bit plus 0.4mm – 15 thou (see note below - **photo 168**).
4. ***Primary cutting clearance on end of tool*** - rotate carrier to zero.
5. Set slider to 8 degrees clockwise, top of holder up.
6. Grind the facet (**photo 169**).
7. ***Front (chuck face) clearance*** - holder set to zero.
8. Slider square on to the end of grinding rest (**photo 170**).
9. ***Secondary clearance*** - set carrier at 6 degrees clockwise (to match side rake).
10. Slider 25-30 degrees anticlockwise, chuck face up (**photo 171**).



Grinding bore side clearance to 5 degrees in both directions.



Grinding front chuck face clearance to 5 degrees. This can be angled up to 20 degrees as in fig 37 (item 1), chain line in enlarged view.

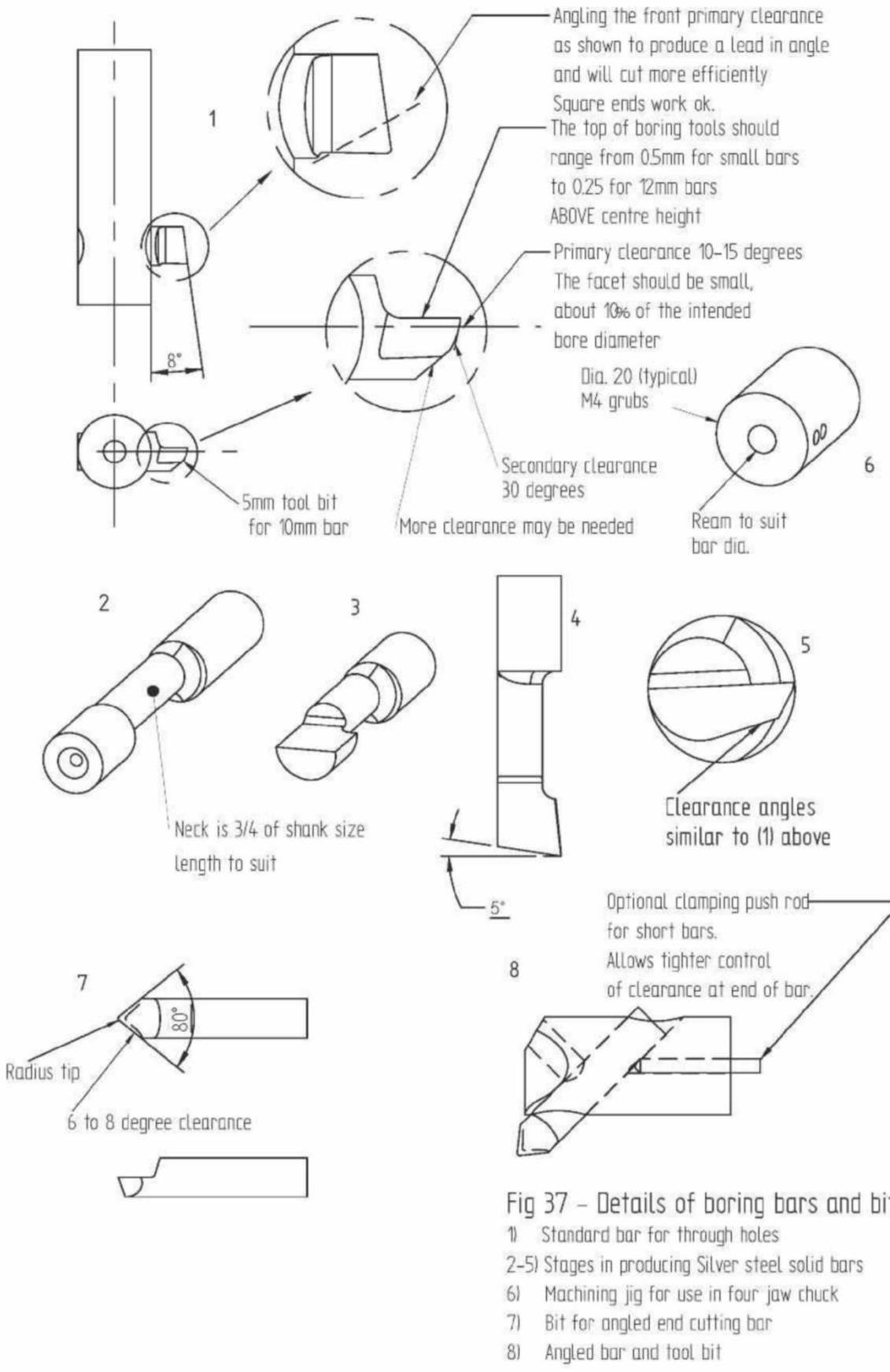


Fig 37 – Details of boring bars and bits

1) Standard bar for through holes
2-5) Stages in producing Silver steel solid bars
6) Machining jig for use in four jaw chuck
7) Bit for angled end cutting bar
8) Angled bar and tool bit

Fig 37

Grinding secondary clearance. Angle as required.

Angled bit for large bars. Set at 50 degrees to give clearance on front and side. See fig 37 (item 8). Note the extension to the highly angled slider fence.

Rotate carrier 12 to 15 degrees (6 to remove the angle created by the curve of the wheel) invert the block and grind the trailing face.

Note: the top of the tool bit should finish up from 0.4mm above lathe centre height for efficient cutting. As the holes in the bars themselves are made when on centre, it is during the grinding at stage 3 where the adjustments need to be made.

Tool bit for the angled bar

See **fig 37** (items 7 and 8). Start with the front cutting face. Set the graduation line on the sleeve at the zero position, locking the sleeve and tool bit. Set the slider at 50 degrees in order to give a front clearance of 5 degrees. The front of the tool can then be used to face the bottom of a pocket so it is square. Here you will find that it is advisable to use an extension to the slider fence as it is at an unusually steep angle. Grind a flat to as close to the centre of the bit (on the end flat face) as you can (**photo 172**).

For the back edge we will invert the holder but this will produce not a clearance but an interference so to stop this we now need to rotate the sleeve towards the right, i.e. clockwise when viewed from the back of the holder. One division is 6 degrees which will remove the angle from the curvature of the grinding wheel. Two divisions will give a 6 degree clearance but here I like to be generous and give it at least a minimum of another 3 degrees to increase the clearance. This is why we need graduations on the block boss. Grind the trailing edge to the centre of the bit (**photo 173**).

Finished angled cutter, making the clearance stand out on the background. Not rounded on the end yet. The cutter must be as close to the bar in order to use in a small diameter hole. Here it is extended for clarity.

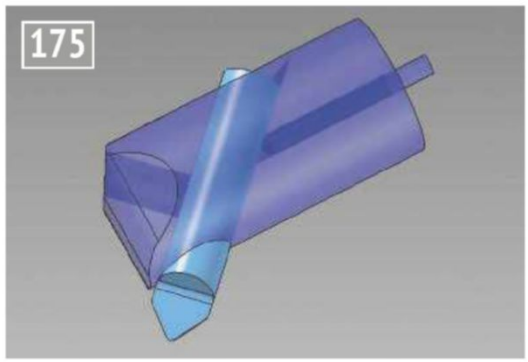
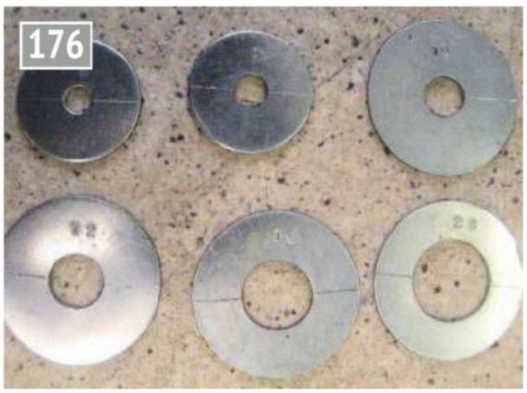


Image of finished end of angled bar. The 3mm push rod is the best way to clamp the bit, but only in short bars.

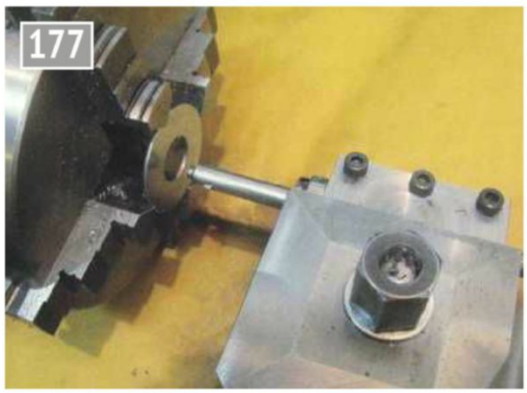
Return the graduation to the zero degree position and turn the block so the chuck marking is uppermost. Set the slider to zero degrees and use on the end of the grinder. Grind the top of the tool which at the same time will give a 6 degree back rake in a compound direction, similar to photo 170. Again, the depth of grinding here should be enough to leave the bit a little more than half of its diameter. Examine before removing from the holder. When satisfied, remove and insert into the boring bar and visually test again. **Photograph 174** gives a view of the assembled bit while **photo 175** gives the CAD view. Note here, if the bar is short, a push rod can be used to secure the bit - more secure than a grub screw directly onto the tool-bit. It will remove minimal stiffness of the bar itself.

Hone the tool, putting a small rounding on the point, then grind a groove to break it off. Grind the broken end smooth and fit into the boring bar and put this in the boring tool mounting block in the lathe. Use the edge of the pillar of the centre height as a guide to enable you to rotate the bit in the bar so that there is clearance at the front. Lock the bit into the bar, then use the eccentric sleeve with the centre height gauge to lift the bar so the tool is on centre or a trace above. The bar is now ready for action!

So, grip a bit of bar, drill it 13mm then try the system. If all goes according to plan, you will be pleasantly surprised with the quality of the resulting bore! But don't despair if it



Washer set to check clearances of bits. Stamp the diameter and add a central line with the centre height scriber.



Boring the washer with an 8mm bar.

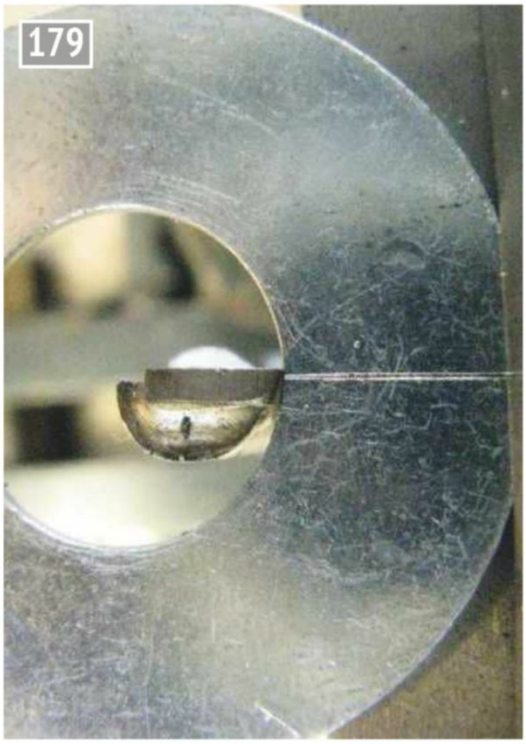
does not quite work - try a number of adjustments until you get the feel of how to set the tool but of course only do ONE adjustment at a time!

Checking if a bar will foul in the hole

With our first very crude boring bar made a long while back, I suggested a washer could be used to check for clearance. Now it's time to make a decent set. I used a number of penny washers bored out bigger. Before removing from the chuck they had a solid line either scribed with the height gauge or cut with the graduation tool all the way across the face. Measure the approximate diameter of the hole then stamp the size on the washer. The use of these will be obvious from **photos 176** to **179**.

To be continued.

This 10mm short bar with bar locking does not have clearance.



A carbide tipped 10mm bar with clearance (difficult to photograph!).

- **Aero Engine**
  Mick Knights makes a set of valves and valve springs for his quarter scale Bentley BR2 rotary aero engine.
- **Vertical Boiler**
  The boiler itself is now finished, so Martin Gearing starts work on the burner.
- ***Tadpole***
  Tony Bird completes the twin cylinder oscillating engine for *Tadpole* and goes on to make the gearbox and propeller.
- **ME Beam Engine**
  David Haythornthwaite machines the crankshaft for his 1 inch scale beam engine.
- **Rainhill Reborn**
  Norman Barber remembers his first workshop and rebuilds *Rainhill*, his first locomotive.

Content may be subject to change.

A New GWR Pannier PART 3

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

Continued from p.307
M.E. 4606, 15 February 2019

Just one little thing which I meant to say is that the 67XX Panniers (that is the ones which had no vacuum brakes and just the three link couplings) all had a little reinforcing plate around both draw hooks. It would be very nice if you were to add this little detail. I have not seen this detail on any of the other Panniers.

The horn blocks are of course iron castings and are cast in pairs, toe to toe, so it might be a good idea for you to cut them into two pieces across the toes. You will need to mill the backs of these, possibly using a ¼ or 5/16 inch end mill so that they exactly fit the slots in the frame plates. You can then turn one block over and use it to drill the others (**photo 12**). All the rivet holes need facing with a ¼ or 9/32 inch counterbore (or pin drill) - if you can find one, that is. Even mine are quite old and have the odd tooth missing now!

As far as I have seen, all horn blocks are fixed on to the frames with what I presume are fitted bolts so as you will see with my Y4 this I exactly what I have done. Well, let's just say I reamed all the holes 3/32 inch! If you look at the photographs of the Pannier Tank that it is the same. I used a 5/16 inch long series end mill to machine my horns, mainly so that could see what I was doing! They can be machined to ⅛ inch so that the flanges horns are flush with the outsides of the frame plates. They can then be faced to ¾ inch thickness overall.

For the horn block bolts, I always use a tailstock die holder, as you can pretty well guarantee that the die will go straight on, but first of all you need to make a little collet to hold the bolts in the chuck. I just used a small offcut of 5/16 inch bar and cut down one side of it just over half way across. I use ¾ x 3/32 inch soft iron rivets, which I am sure are not iron but steel, for the horn bolts and thread them for about ½ inch or thereabouts (**photo 13**). When tight they should have the usual one and a half threads showing. The bolts are fixed with the usual 7BA nuts apart from the four at each side of the rear axlebox on the leading edge which will need to be countersunk rivets to clear the boiler.

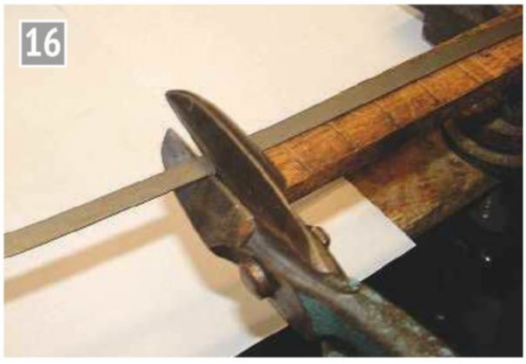
I then machined the openings for the horns by first of all bolting the frame plates back to back with several spacers between them. For the first one I machined it to size using a digital calliper and then for the next slot I used the dials on the lathe to get the wheelbase right. I did this by measuring from the rear of the machined horn slot and took the required amount off

Spotting through the horn blocks back to back.

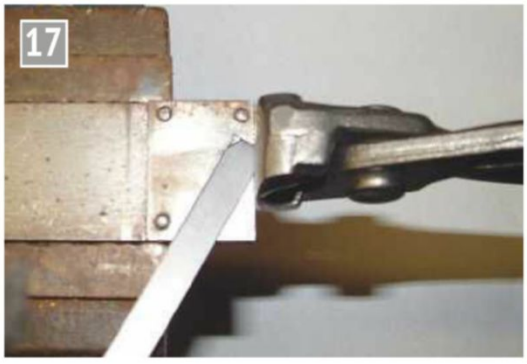
Threaded horn block bolts.

Accurately spacing the horn block openings on the mill.

Neat horn blocks on 7754 at Llangollen.



Cutting spring leaves accurately to length.



Jig for cropping the corners off spring leaves.

there and then machined it to the correct size (**photo 14**). **Photograph 15** shows the full-size Pannier of course to show what a nice job they made on 7754 at Llangollen.

You now need eight ⅜ inch x 18swg coil springs ¾ inch long (which are identical to the Y4 axlebox springs as it so happens). Now, I have provided you with the lost wax castings for all the springing but you will need to provide your own pieces of 3/16 inch rod 2 3/32 inches long to screw into the tops of the rear two axleboxes to act as the spring pins.

I think that the next best thing to do is to make the leaf springs for the two front axles. These are chopped from annealed spring steel 7/16 inch x 20swg strip. The springs need curving which is best done in a set of rolls before they are cropped to length. They will need over bending by about ¼ inch as they need to take the dead weight of the engine and then be in the working position. A bit of guesswork is required here (sorry, calculated estimation!).

The next job is to make some jigs. All you need is two pieces of timber about 1 x ¼ inch and mark out the lengths on one piece of wood and lay the one piece over the other with your marks on the bottom one face upwards. This can then just be pushed along one leaf at a time for cutting them off six leaves at a time (**photo 16**). Once you have done that, the upper eight leaves then require the corners cropping and I also made a simple jig for doing those (**photo 17**). The photographs explain all this much better. You may have to run a fine file over the threads to take the edges off them.

Jig for centring the hole in spring leaves.

Hardening spring leaves.

Photograph 18 shows another very useful little tool I made for drilling the springs in the middle. It has a left and right-hand thread on the lead screw which draws a couple of die blocks into the centre for drilling the plates. When you have made as many leaf springs as I have it is a question of 'needs must'.

Now, there is no easy way out here, but you then need to make the leaf spring buckles and I find the easiest way to tackle these is to make them in two parts. This is done by making them with an open bottom and then silver soldering a piece in the bottom. You will need to start with a piece of steel ⅜ x ⅝ inch and mill the 5/16 inch slot across the top to fit the gimbal. This needs to be 5/16 inch deep. You can then pass the cutter across each side to reduce them to ½ inch across. They need a 3/16 inch hole reaming across the top and rounding off.

The next job then is to mill the bottom out to 7/16 inch wide and then you can get square corners in the channel. Finally, you can make a filling in piece for the bottom and if you make that a good fit you can hopefully silver solder it in without it moving. The last job is to fit a 3mm x ⅛ inch grub screw in the top to hold all the leaves together.

I now harden and temper the springs all in one piece, first using a full flame to get them fairly red hot and then quenching them in water (**photo 19**). Now, using a limp flame, you can waft it over them until they turn blue or, better still, float them on a little bath of molten lead, which is just the correct temperature, and then quench them in cooking oil. I always use rape seed oil for these jobs.

In fact, I was doing a large batch of wagon springs (120 I think!) one day when it started raining. Some drops of rain

Fig 3

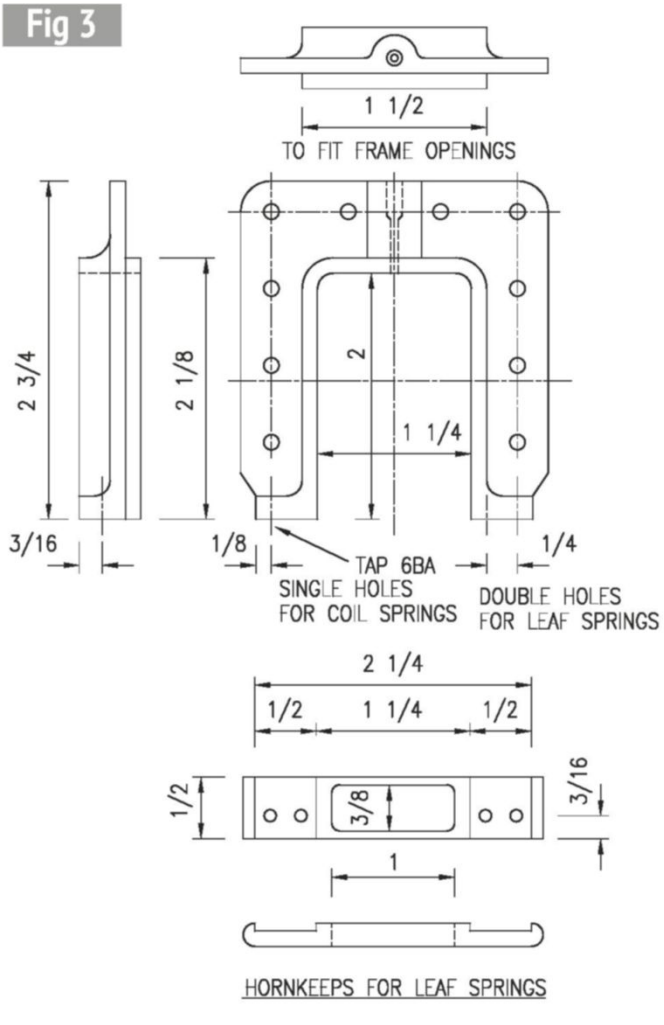


Fig 4

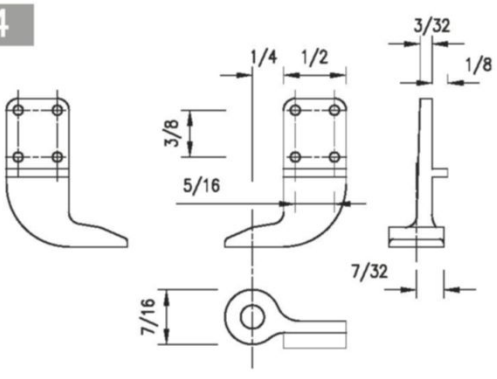
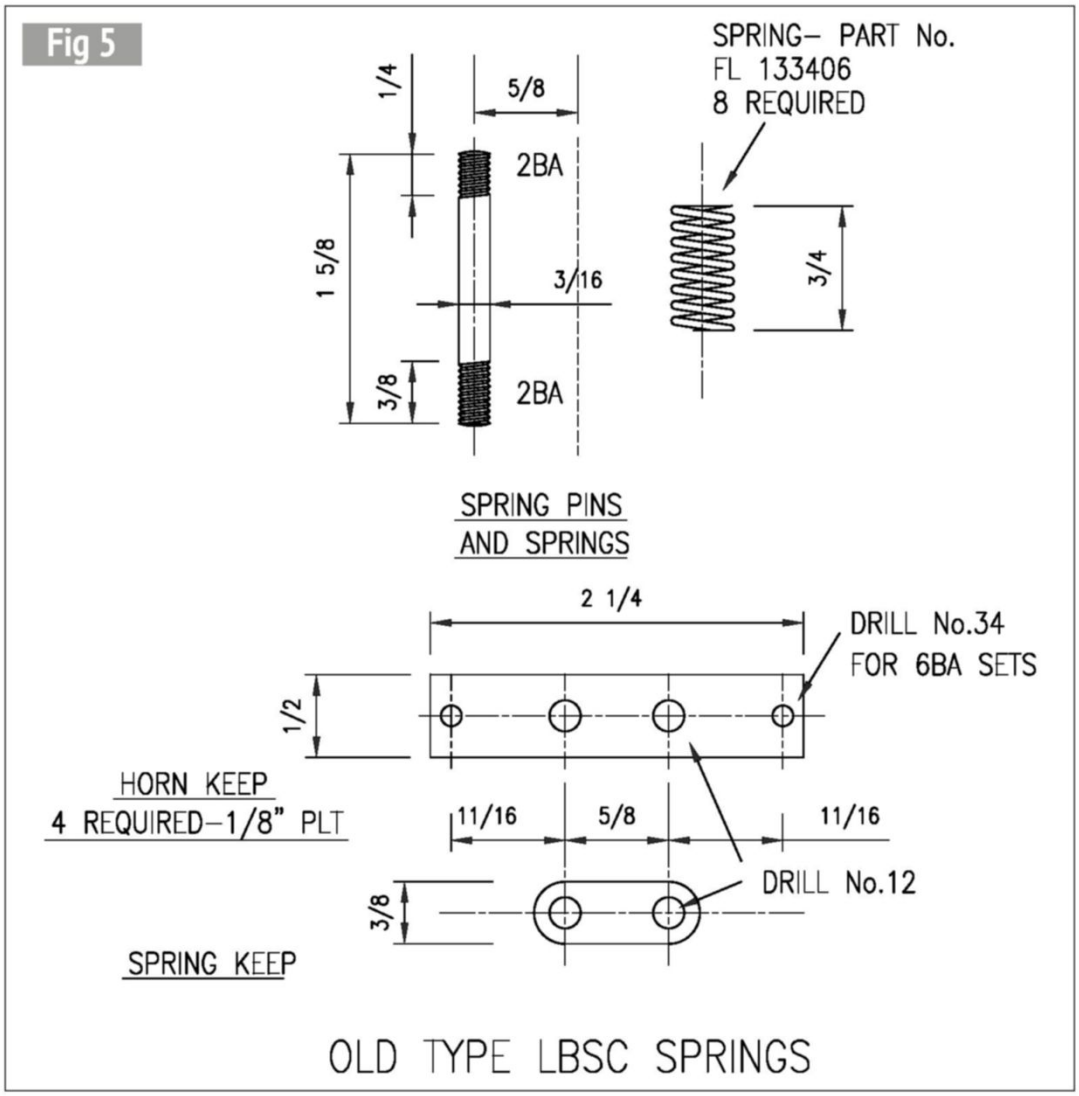


Fig 5



Coil springs within the cab.

Leaf spring on 7754.

Half assembled spring within the cab.

Two leaf spring hangers, back to back.

got in the tin of oil and the oil boiled over as I hadn't realised that the tin had got so hot and the whole lot caught fire!

One thing I have provided is the leaf spring hangers which are cast in silicone brass. They should be available from either Steam Workshop or G & S Supplies. The reason for the silicone is that it makes them much easier to cast but it has the side effect of making them tougher and a bit more difficult to machine. You need very sharp tools, although there should not be any machining to do on these.

There will be some cleaning up to do on the lost wax castings but it can all be done with a fine file. You will find it much easier if you use a new one and make sure you keep on one side and use it only for brass! Once you use it on steel you will find it fairy useless for brass.

You will find that the spring hanger brackets are cast in pairs, so they will first need separating and then a little bit of filing to ensure that they sit properly on the frame plates. There are also the leaf spring pads which will just require a fine file rubbing over them. There are also the horn keeps to fettle.

Now I will not burden you with making the axleboxes at this stage as it will take too long but what you can do is to make the gimbals for the axleboxes - that is, if you do not buy the lost wax cast ones. These are simply pieces of 5/16 inch BMS bar 15/16 inch long with another piece of 5/16 inch square let in half way down and silver soldered together. They need to be 21/32 inch long with a 3/16 inch hole through 1/2 inch from the cross hole and with both ends rounded off.

Photograph 20 shows the coil springs which will appear inside the cab eventually and it also shows the rod which comes down to the axlebox and the little block above it which the engine sits on at the rear end. **Photograph 21** shows the main leaf spring and the buckle and the spring hangers etc. **Photograph 22**

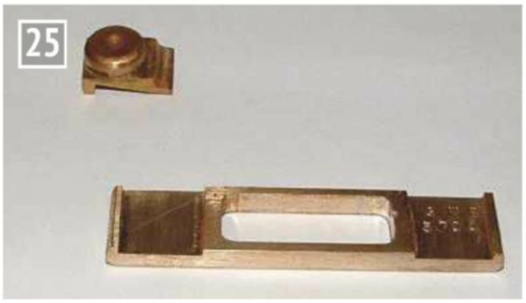
shows the upper part of the rear springs being fitted on 7754 (they are all the same) and in the foreground are the separators for the coil springs. **Photographs 23**, **24** and **25** show the patterns which I made for the leaf spring hangers, axle box gimbals, leaf spring separators and caps and the horn keeps and the leaf spring shoes.

Finally, there is a very nice photo of Peter Robinson's Pannier tank which he brought to Gilling a couple of times (**photo 26**). I have included this one particularly, as it has been built with the correct fish bellied coupling rods.

●To be continued.

NEXT TIME
We will look at the buffers and odd bits of bracketry.

Axle box gimbal and leaf spring separators.



Horn keep and leaf spring shoe.

Peter Robinson's Pannier at Gilling.

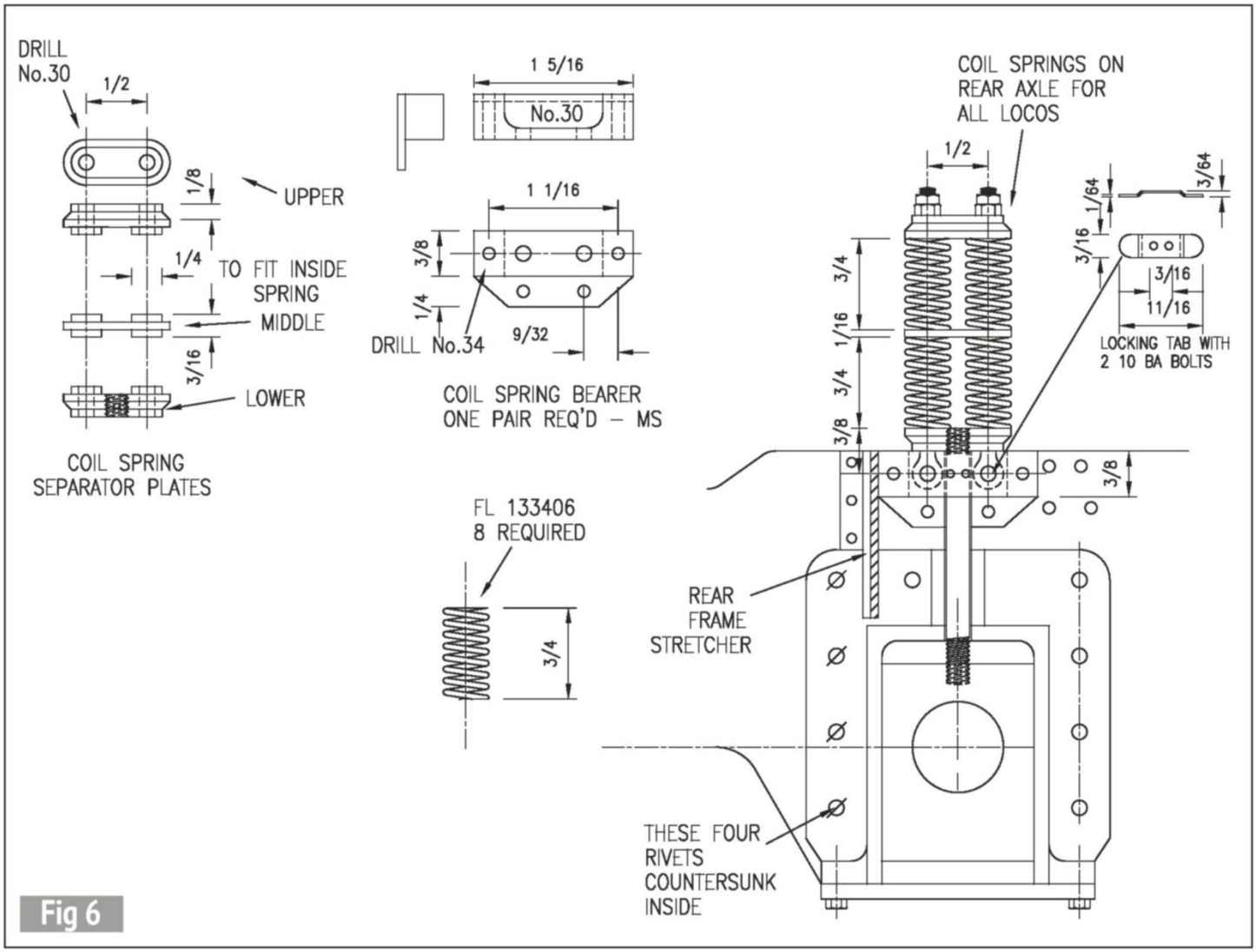


Fig 6

Young Engineers

Dear Martin,

A few weeks ago, I attended the Southern Manufacturing and Electronics Show at Farnborough. This is a well-attended trade show, is very large and seems to get larger and more popular by the year. I noted several old 'friends' from the London show on the stands.

My impressions were worrying - the attendees were almost entirely male and, although they were of a range of ages, youngsters seemed to be thin on the ground. I asked why the ladies were not among us - a shrug was the normal response.

I spoke to several stand people and heard again and again that they can't find apprentices - I thought the problem was lack of apprenticeships!

I spoke to several engineers—young and old (but 100% male!) about the shortage of youngsters entering the engineering trades. Everyone agreed that the problem lies squarely in the schools - there is nothing for the 13 and 14 year olds who want to go on and join a trade - potential plumbers, electricians, sheet metal workers, welders, bricklayers or chippies... They get almost no stimulus in the majority of schools in their early teens. Metal work is rarely, if ever, on offer. Could we - the model engineers - help?

If half the clubs that have workshops took on, say, eight youngsters and taught them how to make things then we would be taking a small but significant step towards helping the future of British engineering. Many club members have taught apprentices in their careers. We have the knowledge and the kit and most of us have time on our hands.

This proposal is not simply pie in the sky; Hereford SME are doing the job and exhibited at Alexandra Palace in January so why don't we all do our bit?

Patrick Hendra (Eastleigh Young Engineers – www.eyeclub.co.uk)

Content of Model Engineer

Dear Martin,

The letter from James Wells on the subject of the content of *Model Engineer* states that 'Neville Maskelyne… founded the magazine'.

As I'm sure you know, the magazine was founded, edited and published by Percival Marshall from 1898 until his death half a century later. Nevil (not Neville!) Maskelyne was a magician and father of J. N. Maskelyne, who contributed many articles to ME, was at one time editor of *Model Railway News* and produced superb outline drawings of railway locomotives in 'Locomotives I Have Known'.

Also, in the same issue, page 292 ('A Swiss Railway in Snowdonia'), the word *Brienz* (pronounced 'Bree-entz') is misspelt throughout as 'Breinz!' (Oh dear – just *two* varieties and we get the wrong one! – *Ed*.)

Having had a good old whinge, may I say that for me *Model Engineer* is now better that it has ever been in so many ways, not least the variety of subjects and styles of writing. The amount of work that must go into producing a fortnightly publication of this standard hardly bears thinking about, so it is not surprising that the occasional error creeps through - it is just a pity that some people burst into print without checking their facts first!

May I wish you and Diane the best of luck with the *Model Engineer*.

Yours sincerely, Ron Isted

Dear Martin,

I am replying to the letter by Jeremy Buck in Postbag 15 February 2019. There was a reason for the reprinted articles from the LBSC era. At no time were the readers of *Model Engineer* being shortchanged.

Yes, the material had been published before but not in *Model Engineer*. I believe I sourced it from *English Mechanics*. As to being unedited, I carefully edited the series as I did to all *Model Engineer* and *Model Engineers' Workshop* articles.

During the yearly budget process for the two magazines I discovered it was cheaper to print a 68-page magazine than it was to print a 60-page magazine due to the type of press a 60-page magazine had to be printed on.

The reason why I chose to reprint the LBSC articles was to do with contributors' budget restraints. I could not afford to pay contributors for the extra eight pages I included when I increased the page count from 60 to 68 pages so giving readers an extra 8 pages in every issue, which I believe continues to this day.

I also put articles into the magazine in a particular way. For example, if I got a steam engine construction article of say eight parts from Anthony Mount, I would publish it every fortnight and after four parts were printed I would take another series of articles about tramways by Ashley Best which would overlap the Anthony Mount series and continue for about four more fortnights. In the meantime, I would run another eight part series, four parts of which would overlap the last four parts of the Ashley Best series and so on.

This was done for a couple of reasons. Firstly, readers got an article every fortnight

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Responses to published letters are forwarded as appropriate.

so they did not have to skip a fortnight waiting for the next article to continue building and secondly there was always another series to follow on. This encouraged people to buy every issue and often to subscribe because they knew they were going to get something interesting to read every fortnight.

I believe *Model Engineer* has insufficient modeling content compared with the large amount of theory it now contains.

And finally - should we really be poking fun at the Germans at the end of the Club News feature?

David Clark,
Ex-editor *Model Engineer*

Dear Martin,
I have been following the comments in 'Postbag' about the content of *Model Engineer*.

Surely one cannot be dogmatic on what should or should not be in the magazine. There will always be some articles that are not of great interest to one's particular speciality, but even these may contain something that will be of help towards your present or future project.

If you go back to the early days of the magazine there was often something appertaining to full size engineering as well as models. The launch of a new ship, the opening of a new bridge for example.

The editor has to pick a difficult path between something for the beginner and something to stretch the expert. Personally, I found the series 'Technology Sans Frontieres' by Dr Ron Fitzgerald fascinating even if it was not actual model making. It might even encourage someone to build a De Glenn compound for the IMLEC competition. I also hope he could be persuaded to write a sequel on the work of André Chapelon.

The ultra-simple article also has a place, particularly as the last two generations have had little or no practical experience in school of actually making things. With a 40-minute lesson on 'Craft Design and Technology', or whatever they call it now, it's impractical in that time to actually accomplish making anything worthwhile.

I have found talking to beginners at exhibitions that they are very aware of their lack of knowledge and experience and want to be led by the hand in how to proceed with a project. They are quite fearful to jump in at the deep end and get stuck in on something that might be taxing for them.

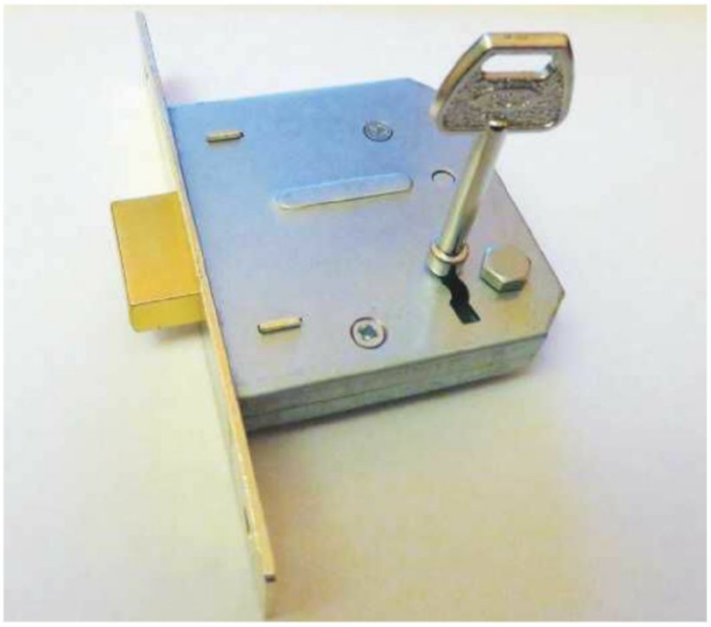
This brings to mind a comment from an old model engineering friend: 'Actually there is nothing very difficult in ordinary model engineering and, taken separately, each component is quite simple.' It just needs a bit of encouragement to take the first steps and get going in model engineering. Building a simple easily made engine, which works, is a great step forward and, once this has been accomplished, something more advanced will be tried.

Anthony Mount

Facing-point Ground Lock

Dear Martin,
I thought your readers might be interested in a method I used to lock the facing point leading to the loading spur on the Rode Woodland Railway at the Tropical Bird Gardens near Bath. (Sadly, the Bird Gardens closed down in October 2000.)

A right-hand turnout led to the loading spur, with the main line continuing to the left. We fitted an extra-long stretcher bar which extended to the left of the point. The sleepers each side of the stretcher bar were also extended to the left. A deadlock was mounted across the two extended sleepers with the bolt facing downwards and resting firmly against the end of the stretcher bar so that the right-hand switch rail was held fully closed. The deadlock



The point interlock in the locked position.

should, of course, be far enough from the track so as not to foul any part of a rail vehicle, e.g. drivers' footrests, etc.

However, there's a safety problem. If the key were able to be turned fully 360° when unlocking the point, the key could be removed and returned to the shed where it was normally hanging on a hook. We needed the key to be captive in the deadlock while the point was unlocked. In this way, if the key was in the shed, it was safe to run on the main line.

Therefore, I drilled a hole through the body of the lock assembly, to take a 2BA bolt, in a position that prevented the key from turning more than about 300°. I cannot remember the precise details and, unfortunately, I never thought to take a photograph of this arrangement. However, I recently obtained a similar deadlock. The photograph shows it locked with the key turned to the 90° position, ready to unlock. Turning the key clockwise by 180° unlocks the point but the key cannot be withdrawn as the 2BA bolt prevents it being turned far enough.

This is suitable for any facing point that is used very occasionally and therefore not worth being controlled electrically or from a lever frame.

The next stage would have been to interlock this ground lock with protecting signal(s). We could have had a second deadlock in the shed. This would have been operated by a second key which would be fixed permanently to the first key. The normal position of this second deadlock would have been with its bolt withdrawn, detected by a microswitch. Removing the key would have extended the bolt, thus pressing the microswitch in. Its break contact would cut the feed to signals leading to the loading spur point. This second deadlock would also need a bolt fitted, to prevent the key being removed while the deadlock was in the normal position.

We never fitted a second deadlock because the semaphore signals leading to the loading spur point were never electrically operated.

Mike Hanscomb

Oil Pumps

Dear Martin,
James Wells asks about a small oil pump. Has he thought of one out of a motorcycle? He might find one of use.

Yours faithfully,
John Yeoman (York)

PART 2

Faszination Modellbau Friedrichshafen 2018

John Arrowsmith takes a trip to Friedrichshafen to take a look at a vast display of model engineering.

Continued from p.357
M.E. 4607, 1 March 2019

The model boat enthusiasts would have been delighted at the vast array of craft of all types on show, from four masted sailing ships (**photo 16**) to large steam powered launches and ships. There was some excellent model engineering in lots of these vessels with the detailed engines and control systems and, of course, this is all available to be seen up close while they were on static display - but then, on the boating pond, they could be seen in action! On a pool which was a metre plus deep and about 80 metres square there was plenty of space for boats of all sizes to show off their capabilities and they did that with great enthusiasm. One full size canoe did catch my attention, simply because it had been fitted with a steam powered engine and outside paddle wheels (**photo 17**). Gas fired, it was just puffing away gently for the duration of the show. There were some superb examples of fully rigged sailing ships on display with one stand, Freunde des historishen Schiffbaus Bodensee, showing nothing else (**photo 18**). The high speed hydroplanes and similar boats were able to demonstrate their power and manoeuvrability on the outside boating lake to great effect, while on the inside boating pool a more gentle pace and atmosphere was generated by a wide selection of marine craft from small fishing boats to large freighters and paddle steamers (**photo 19**). In addition to all the activity on the water there were some superb models on static display as well. For example, a model of the *Bismarck* which was superbly made included little cameos of the working gun turrets and control gear (**photo 20**). I met up again with Charles West-Thomas, an Englishman who lives in Germany, as he had his excellent stern wheel river paddle steamer on show. This model has a lovely steam plant engine room and looked superb (**photo 21**).

A superb model of HMS Victory *built by Manfred Burhart.*

The steam powered Canoe, Fultons Folly *which attracted a lot of attention.*

Probably the biggest contribution came from the radio controlled road vehicle clubs in all their various guises. I was told that 90 tons of soil had been used for one of the displays and this had been watered and planted with cress seeds to produce the green ground cover on the hills together with lots of small shrubs and trees to create a very realistic landscape (**photos 22** and **23**). There were large crowds watching all the different displays, one of which included a snow clearing operation on a hillside (**photo 24**). I am not familiar with the

A fine selection of fully rigged sailing ships from the Bodensee club.

Going well on the boating pond was this well detailed patrol boat.

The powerful looking model of the Bismarck *complete with the detailed working gun turrets alongside.*

A superbly built stern wheel paddle steamer by Charles West-Thomas.

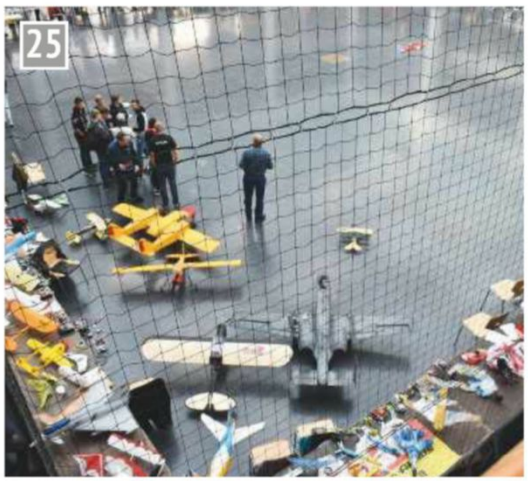
types of models and r/c units employed in these displays but it was fascinating to watch these large soil movers in action. There was also an area just for young people to try their hand at controlling their models and many were involved in all the displays.

The other large contributor at this exhibition was the model flying clubs and they produced an excellent selection of both flying and static models. When you consider that the indoor flying arena was about 50 metres square and three stories high you get some idea of how much space was available. Here, demonstrations of many different types, from twin engine A10s to flying wing parachutes entertained the crowds, who could sit in the first floor restaurant and watch everything that was going on. I hope my photos give you a flavour of the activities (**photos 25** and **26**). Outside, of course, it was totally different with a full size airfield available for full flying demonstrations in

Large crowds watched the operations on the I/C road vehicle demonstrations.

A busy roundabout scene on one of the r/c road demonstration sites.

Snow clearing in model form with r/c vehicles.



A view of the indoor flying area from the first floor restaurant.

This r/c parachute display was a novel way to entertain the visitors.

To add to the atmosphere the Zeppelin Airship attended on a regular basis.

Patterns in the sky as the formation gliders entertain the crowds.

Not a crash landing, just a delay in turning off the wing tip smoke canisters.

A delicate example of excellent aero modelling, the Fokker 'Spinne' was in 1 : 2.5 scale.

The twin track O gauge model of an 80cm Kanone, Dora.

between commercial traffic landing and taking off and, if that wasn't enough, there was even a Zeppelin flying around to add to the atmosphere (**photo 27**)! Obviously, the outside flying was more ambitious than indoors and here spectators were given jet formation flying, high level gliders and low level fly pasts. The program started at 11.00am in the morning and ran until 4.15pm in the afternoon with the Zeppelin putting in an appearance once every hour, so there was lots going on. Catching high speed planes with an ordinary camera is difficult so I'll include some of the glider demonstrations which were very good. Two tow planes took two large gliders up to 1000 metres before release and the gliders, which were fitted with smoke tanks on the wings, proceeded to perform a tremendous aerobatic display (**photo 28**). When they landed, however, the smoke tanks were still operational so it looked like one almighty air crash on the ground which caused some amusement (**photo 29**). The other glider display I caught was one where the aircraft with a 30ft wingspan was towed up before release: it looked so graceful performing series of aerobatics.The static displays had a wide range of prototypes on display from a spindly looking Fokker Spinne in 1:2.5 scale and weighing just 24 kg (**photo 30**) to the mighty *Concorde* under construction by Otto Wildroither but weighing in at 149.5 kg.

Another feature of this exhibition is the provision of work stations within the display space to cover the introduction and building of models for the particular aspect of the show. In other words, in the five halls of actual models and activities there was about eight different locations where youngsters and adults could try their hand at building a model related to the displays in the

One of the complex OO scale railway layouts.

hall. I thought this was a very innovative way of introducing model making to a much wider audience.

Model railways had lots of quality layouts in a range of gauges from OO to the garden scales and these provided lots on entertainment for the visitors. Unusual models like the huge twin track rail mounted field gun nicknamed *Dora* was well made and a very large model for the scale (**photo 31**). There was a number of different themes on the layouts from American, Dutch and German, both ancient and modern, all of which had large areas of display to work with (**photo 32**).

One hall was devoted entirely to a motor racing circuit where high speed cars were put through a series of races that provided an additional fast moving spectacle if that was your interest. Another area outside was provided to demonstrate r/c motor cycle racing with the operators performing different skills to show off their ability like high speed 'wheelies' (**photo 33**). Fun to watch for a short time, but not model engineering. Adjacent to this arena was the jalopy racing circuit and these vehicles were certainly put through their high speed paces in some order, the speed and noise created had to be seen/ heard to be believed.

Radio controlled motorcycles performing on the outside track.

To conclude my notes on this large exhibition I would like to thank the organisers Messe Sinsheim GmbH and the Project Manager in particular, Sascha Bürkel for his help and assistance during the show. I hope you find these notes interesting as I am reliably informed that in 2019 there will be a much larger model engineering content which should provide an even more attractive exhibition for UK visitors. Finally I would like to thank all twelve of the members from the Hereford SME including two of our young engineers for their contribution to the visit. It was most enjoyable.

ME

PART 54

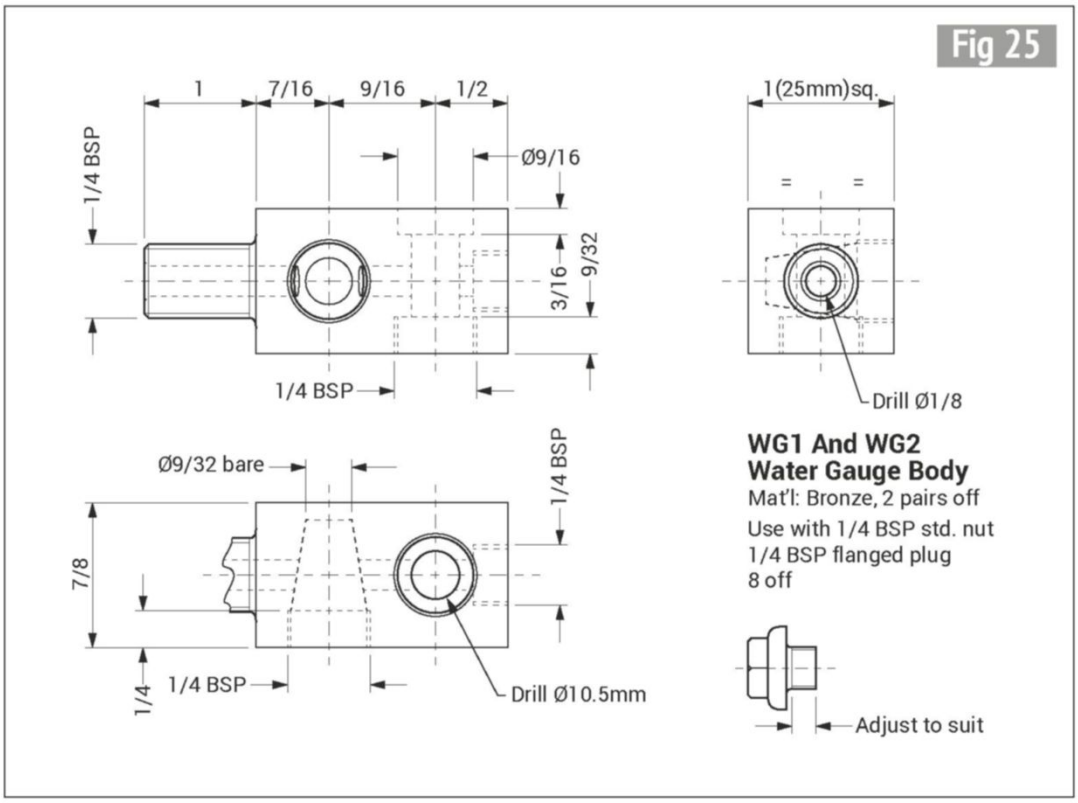
Garrett 4CD Tractor in 6 inch scale

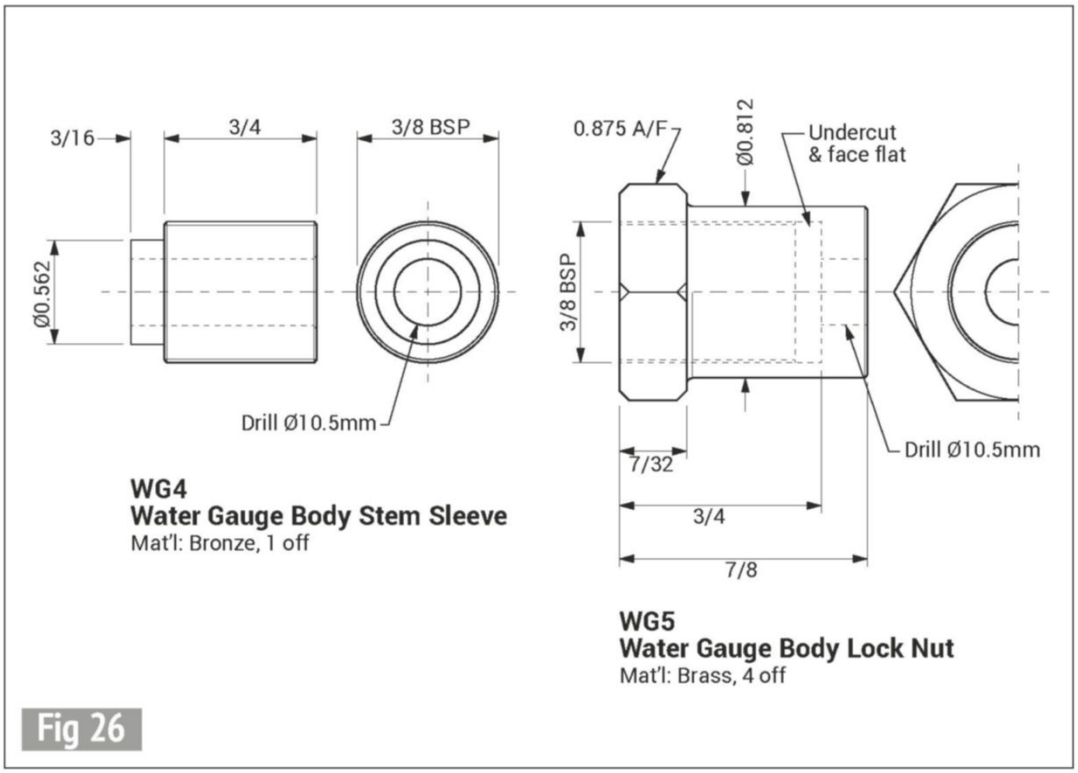
Chris Gunn considers the design of the water gauges.

Continued from p.298
M.E. 4606, 15 February 2019

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.

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



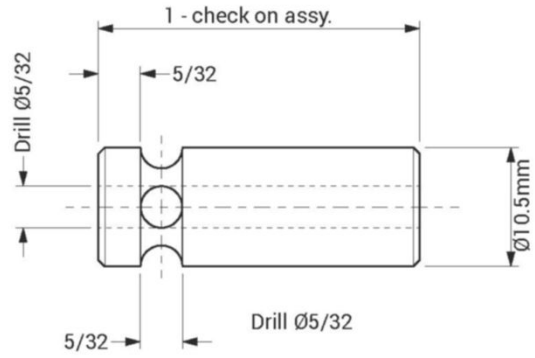


I dithered for some time before ordering the two water gauges for the 4CD, as they were not in stock anywhere and the prices for a pair with gauge glass protectors was well into four figures excluding any pennies. One of my fellow club members suggested I should make them as he had made some for his 4 inch Garret and he told me it was a nice turning job for a rainy day. Having almost been persuaded, I priced up the material from a few suppliers, and I was surprised at the cost of 1 inch square bronze. My local non-ferrous supplier did not have any offcuts either. I left it for a while, as I had plenty to do, but it makes sense to plan a bit in front so materials can be organised.

Then at one of the rallies I attend, I was wandering around the junk stalls and I saw what looked like some bronze hexagon sticking out from under a load of jumble which, when I pulled it out, was almost 3ft long and 1 5/16 inches across the flats, which meant I could get a 1 inch square out of it. When I enquired about the price, I was informed a tenner would take it and I could not get one out of my wallet fast enough. I took my prize back to the van and locked it away.

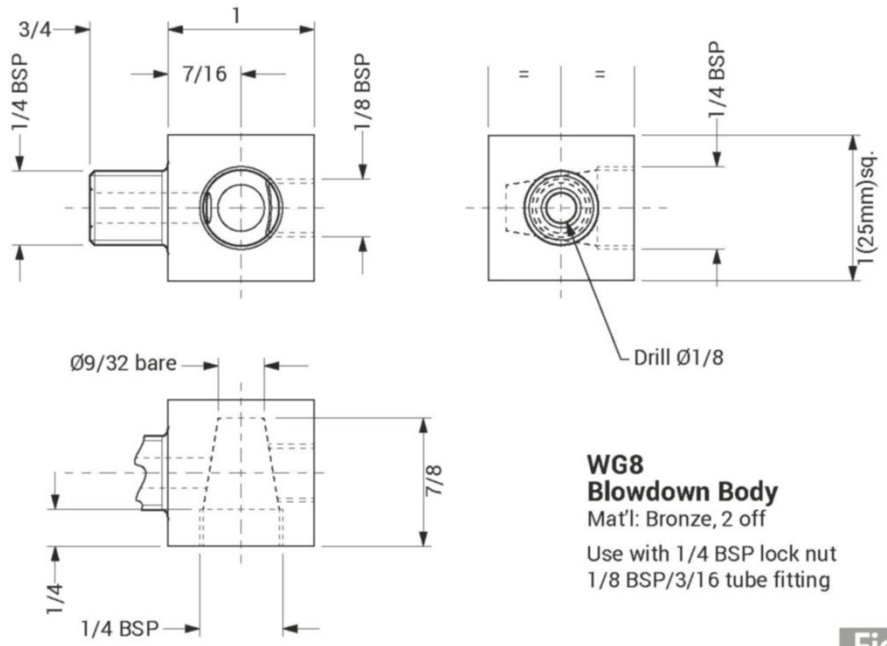
This had made the decision to proceed with making the gauges myself an easy one. During the rest of the weekend I was able to chat to my colleague and get some tips on making the gauges and also got some input when we were sitting round the fire after a hard day's steaming. In due course I started sketching the water gauges, based around the 1 inch square that I knew I could get out of the bronze hexagon. I had also decided to make the water gauge cock holes tapered, and the holes to receive them, but I would not be using PTFE seats like the ones fitted to my 4 inch Garrett, as I had problems with these turning round in service, and sealing the holes. I remembered this well, as I also failed a steam test because of another occurrence when the sleeves moved to partially block the holes through the gauge, as the inspector decided the water level was not recovering quickly enough after the gauges were blown down.

I could not deal with the problem until the engine was cold, so I had to return another day for a re-test. In my earlier discussions, there was not a consensus as to the benefit of the PTFE sleeves, so I went for the easy option and a metal to metal seal. Since I made the gauges and have talked more about this, I have had a suggestion as to how PTFE



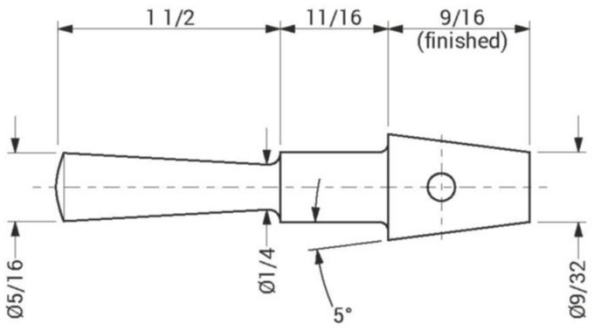
WG7
Water Gauge Glass Support
Mat'l: Brass/stainless steel, 2 off
Note: check dimensions on assy.

Fig 27

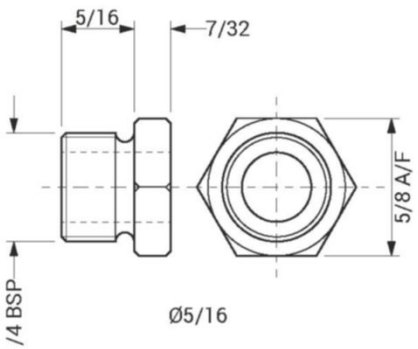


WG8
Blowdown Body
Mat'l: Bronze, 2 off
Use with 1/4 BSP lock nut
1/8 BSP/3/16 tube fitting

Fig 28



WG9
Taper Cock - Before Bending
Mat'l: Free cutting stainless steel, 6 off



WG10
Taper Cock Gland Nut
Mat'l: Brass/bronze, 6 off

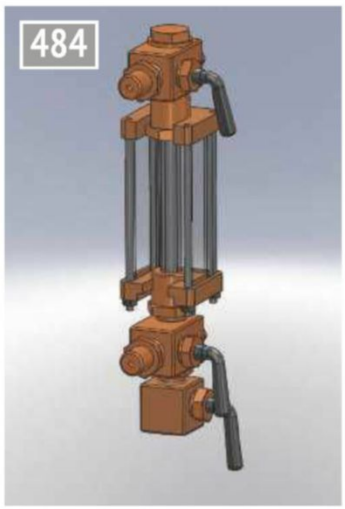
Fig 29

seals could be better retained and it would be possible to modify my gauges should I have a problem in this area. I do have scale on my side this time, as there is more room in the half size body to incorporate the sleeves. I intend to describe the manufacture of the gauges as I made them and also explain how a PTFE sleeve could be substituted.

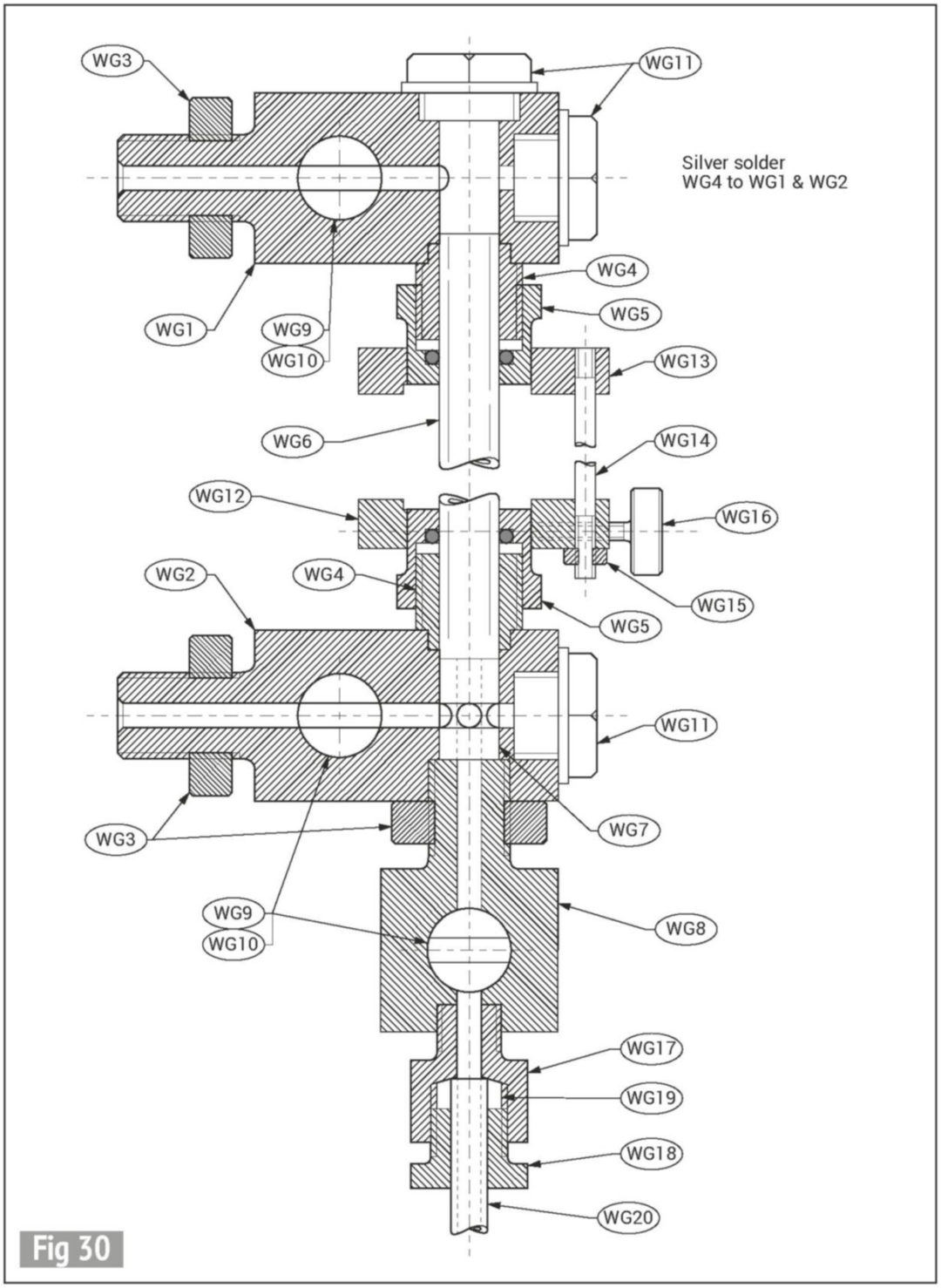
It should be noted that since this instalment has been written, the engine has been steamed eleven times, with the last of these being the official steam test, it has been rallied for nine days in total, and once the various glands had been nipped up I have had no problems at all with any leaks. **Figures 25** to **29** show the components for the water gauges. **Figure 30** is my rough sketch of the complete water gauge and **photos 483** and **484** are much better 3D drawings of the assembled water gauge and the gauge glass protector Mk 2.

●To be continued.

Gauge glass protector.



Gauge glass assembly.



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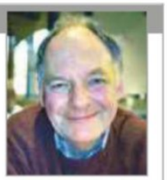
Steam Turbines Large and Miniature

PART 11

What causes poor efficiency?



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

Continued from p.303
M.E. 4606, 15 February 2019

Does size matter?

As explained in Part 6, halving the rotor diameter while doubling the rpm gives the same blade speed without increasing the centrifugal stress. This is important since it means that miniature turbines can, in principle, attain blade velocities similar to full-size turbines. As described in Part 3, matching blade velocity to steam velocity is important for attaining good efficiency. In an impulse turbine, maximum efficiency is attained if blade velocity is half steam velocity since this ensures the steam leaves the rotor with a low speed (relative to the casing) and hence with minimal kinetic energy. Of course, if steam is to be exhausted at all, it must leave the turbine at a certain speed but, if that speed is excessive, then it constitutes a waste of energy, known as leaving loss.

If leaving loss was the only wasted energy in a turbine then it should be easy to build an efficient model. But, alas, many other factors act to reduce efficiency. As size of a turbine is reduced, some of these losses become more significant. It is, however, fortunate that some other losses become less significant.

Losses in model turbines

Perhaps the most obvious losses are associated with friction in bearings and gearing. These undoubtedly increase with increasing rpm but I don't know how size affects them. In a model turbine the peripheral velocities of bearings and gears will be comparable to full-size turbines but bearing surfaces and gear teeth will be smaller. Other types of loss are leakage through seals on shafts and past blade tips. The latter tends to become more significant in smaller turbines and, as described in Part 8, this makes reaction turbines an unattractive choice for a working model. However, the present article concerns yet more types of loss, namely those which are associated with the actual flow of steam through the turbine.

Losses in flowing steam

Losses due to fluid flow are relevant to all heat engines since, for example, in reciprocating steam and I/C engines, steam or air has to move rapidly through pipes, passageways and valve ports. However, in turbines, since they are based solely upon manipulation of high velocity fluids, flow losses are of much greater significance.

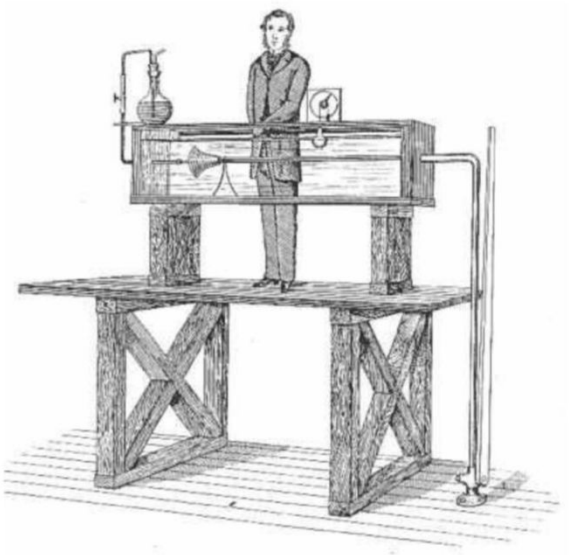
In earlier articles, explanations were often qualified with the phrase, 'assuming there is no friction'. Well, now we must face up to the fact that in the real world, friction and other phenomena always act to spoil our fun. As steam flows past a surface such as the wall of a pipe or the face of a turbine blade, there will be friction and this will cause slowing down of the steam and hence a loss of pressure and/or loss of kinetic energy. This results in less energy being available for conversion to shaft power in both turbines and reciprocators.

Fluid flow

Fluid dynamics is relevant to almost every aspect of our existence since it explains subjects as diverse as the weather, rivers, piped distribution of water and gas, flight, pumps, engines and flow of blood around our bodies. When studied at a very general level I find it a fascinating subject that is quite easy to understand. However, if one delves deeper into the theory then the maths gets very complicated, but that will not concern us.

Successful steam turbines and reciprocating engines were both initially developed while fluid dynamics was in its infancy. About 1840, the German engineer, Gotthilf Hagen and the French scientist, Jean Poiseuille independently discovered that as water flows through pipes, friction is directly proportional to flow rate. In other words if you double the flow rate through a length of pipe then you double the frictional loss. However, other people found that friction increased in proportion to velocity squared. i.e. if you doubled the flow rate then friction increased four fold. It was not until 1883, just before Parsons and De Laval patented their turbine designs, that Professor Osborne Reynolds published

Fig 38



Apparatus described by Osborne Reynolds in 1883 and used to analyse flow of fluids through tubes. (From ref 7.)

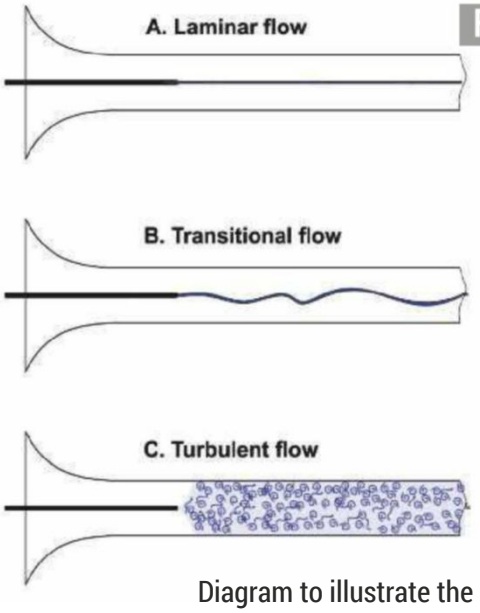


Fig 39

Diagram to illustrate the different flow patterns observed inside the glass tube of the apparatus in fig 38.

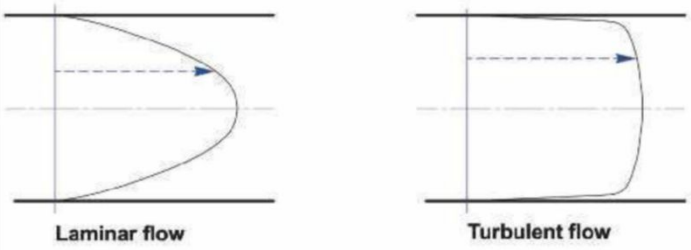


Fig 40

Variation in velocity of fluid across circular ducts when flow is laminar or turbulent. The distance of any point on the curves from the vertical lines indicates the velocity at that point.

results from a large amount of research and described a new way to analyse the data. That publication (**ref 7**) resolved the previous inconsistencies and is widely considered to be the foundation of the whole modern subject of fluid dynamics. Osborne Reynolds was mentioned in Part 4 of these articles in relation to his explanation of critical pressure in the flow of steam through nozzles, but it is for his research on resistance to flow in pipes that he is most widely known.

Reynolds knew that friction in fluid flow is affected by pipe diameter and by the velocity, viscosity and density of the fluid. His research showed that multiplying and dividing together the values for these four properties gave a number that predicted the nature of the flow and helped predict the resulting friction. The result of this calculation in now known as the Reynolds number and some aspects of its importance will be mentioned below.

Equation 1

$$\text{Reynolds number} = \frac{\text{fluid velocity x pipe width x fluid density}}{\text{dynamic viscosity}}$$

Figure 38 shows the apparatus designed and used by Reynolds in 1883 (ref 7). By today's standards it is hard to imagine that ground-breaking scientific research could be done using such simple equipment.

Flow patterns

A major problem in studying fluid flow is that it is difficult to see what is going on inside a stream of liquid or gas. Reynold's apparatus (**fig 38**) allowed him to accurately measure the flow rate while also visualising the flow pattern. He did this by introducing a thin stream of dye solution into water flowing through an horizontal glass tube. In his apparatus this tube was immersed in a tank of water at the desired temperature. The water was allowed to drain out of the tank by flowing through the tube at a rate controlled by the long-lever attached to a valve on the outlet. When flow rates were low the dye remained as a straight, narrow stream all along the tube (**fig 39 - A**). This pattern is now called *laminar flow.* It is a very uniform and predictable pattern in which all particles of water move in smooth lines parallel with the wall of the tube. Under these conditions frictional resistance is directly proportional to flow rate, as described by Hagen and Poiseuille. As the flow rate in Reynolds' apparatus was increased, the line of dye became increasingly wavy (**fig 39 - B**) and eventually became totally mixed with the bulk of the water (**fig 39 - C**). This last pattern is called *turbulent flow.* Under this condition the relationship between velocity and friction is more complicated and, with a doubling in velocity, friction increases by more than two fold. For a video of the flow patterns in a replication of Reynold's experiment see **ref 8**.

When fluid flows past an object such as the wall of a pipe, fluid immediately next to the solid object is stationary relative to the object. In other words, there is no slippage of fluid past the solid surface (see the video in **ref 9**). This means that all the friction arises between different parts of the fluid rather than between the fluid and the solid surface. In laminar flow, fluid in the centre of a pipe flows fastest with a gradation in velocity down to zero at the pipe wall (**fig 40**). Friction in laminar flow is proportional to ≫

flow rate and can be calculated using an equation worked out by Hagen and Poiseulle, based on a theory first described by Sir Isaac Newton over 100 years earlier. For an impressive demonstration of the absence of random motion in laminar flow see the video in **ref 10**.

In contrast, turbulent flow consists of continual small, random swirls and vortices in many different directions. This randomness makes it very difficult to predict the frictional losses and people have had to rely on experimental measurements. These show that, in turbulent flow, friction increases approximately with the square of the velocity and velocity of the fluid is fairly uniform across most of the bore, decreasing rapidly only across a narrow region very close to the wall (fig 40).

Reynolds and others have shown that the velocity that a fluid must attain before its flow changes from laminar to turbulent depends on all of the values used to calculate the Reynold's number (equation 1). For example, the change from laminar to turbulent flow occurs more readily (i.e. at a lower velocity) as tube width and/or fluid density are increased. On the other hand, if the viscosity of the fluid is increased, then a higher velocity is needed for the transition to occur. This changing pattern is simply due to the balance between two types of force that act on the fluid. These are:

1: the tendency for the fluid to continue swirling around as a result of its momentum versus:
2: friction or drag on the fluid as a result of its viscosity.

For example, water in a bucket will continue swirling around for longer than water in a thimble while a bucket of water will continue swirling around for longer than a bucket of syrup. At low velocities fluids have less momentum and so the movement of any small part of it is more easily influenced by neighbouring parts via viscous drag. However, at high velocities each small part of the fluid has high momentum which is more likely to overwhelm the influence from neighbouring parts of the fluid. In that situation movement is more turbulent.

Friction in flowing steam

You may be wondering what relevance all this information about the flow of water has for the flow of steam. The answer is, it has been established that the flow patterns revealed in water also occur in other fluids regardless of whether they are liquids, gases or vapours. In steam, the transition from laminar to turbulent flow occurs at different velocities to water because of the differences in density and viscosity. However, the flow pattern can be predicted by calculating the Reynolds number (equation 1). If this number is less than about 1,800 then flow can be laminar whatever the fluid. Also, if the Reynolds number is higher than about 2,500, then under most circumstances flow will be turbulent. In a turbine, the fluid is constantly moving between stationary nozzles and moving blades so, even if the Reynolds number was small, the fluid would never have a chance to conform to a regular laminar flow pattern. Nevertheless the Reynolds number still gives an indication of the relative importance of friction on the flow.

Whether flow is laminar or turbulent not only determines how friction varies with fluid velocity, but it also affects how friction is influenced by the degree of surface roughness of the pipe or blade. Surprisingly, the degree of surface roughness does not influence frictional loss in laminar flow. It does, however, have a significant effect in turbulent flow.

Friction and surface finish in small ducts

It seems quite logical that frictional loss per pound of steam should increase as duct diameter is made smaller since, for example, if duct diameter were halved, the cross-sectional area would be reduced four-fold and this means that, for a fixed velocity, the quantity of fluid carried per second would decrease four-fold. However, for a given length of duct, the area of the surface past which the fluid must flow would only decrease two-fold. Another way to think of things is that as duct diameter decreases, a greater proportion of the fluid is close to the duct wall. This is an example of the principle that you cannot scale nature although the change in surface area relative to cross-sectional area is taken into account in calculation of the Reynolds number.

It is fairly easy to calculate rough estimates of Reynolds numbers for various situations. In modern so-called microfluidic devices, duct sizes and fluid properties often result in very low Reynolds numbers such that flow is always laminar. The values in the table show that even in small nozzles typical of a model turbine, values for Reynolds number are greater than 2,500 and so steam flow will be turbulent even at relatively low pressures (when the steam density is also low) and low velocities. This means that, in a model turbine, it is expected that surface finish will affect friction and friction will increase with roughly the square of steam velocity.

The table also shows that values of the Reynolds number for a model are much lower than for duct sizes typical of full-sized turbines. This demonstrates clearly that frictional forces have a much larger impact on steam flow in miniature ducts compared to large ducts and this is one of the reasons why large turbines are generally more efficient than small ones.

Blades from a high pressure stage of a large Parsons turbine. (Blade, courtesy of Fred Graham. Photograph by Izel Photography/ Duncan Andison.)

Surface finish on turbine blades

By an amazing coincidence, a member of our local model boat club, Fred Graham, used to be in charge of production engineering at Parsons turbine works. He has told me much about the methods and tools used to manufacture turbine blades and one fact that particularly impressed me is the surface finish that is attained on full size blades. Large blades several inches wide and up to a few feet long are individually polished by hand using fine abrasive. Smaller blades are prepared in the same way but are then highly polished in a process called barrelling whereby they are tumbled around for many hours with abrasive particles so as to attain a high finish. A segment of blading that has been polished by barrelling is shown in **photo 40**. The gap between each of these blades is about 1 inch and this is relevant because roughness is generally measured relative to the width of the duct

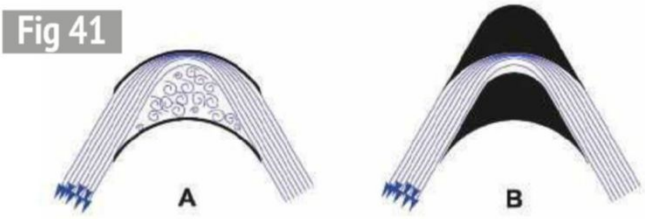


Diagram to illustrate patterns of steam flow around impulse blades. A: simple plate blades; B: profile blades.

$$\text{Relative roughness} = \frac{\text{average height of surface irregularity}}{\text{pipe diameter}}$$

So, if it is worth the cost and effort to polish full-size turbine blades - and bearing in mind what was discussed above about frictional losses in small ducts - it must be even more important to attain a good surface finish in miniature turbines.

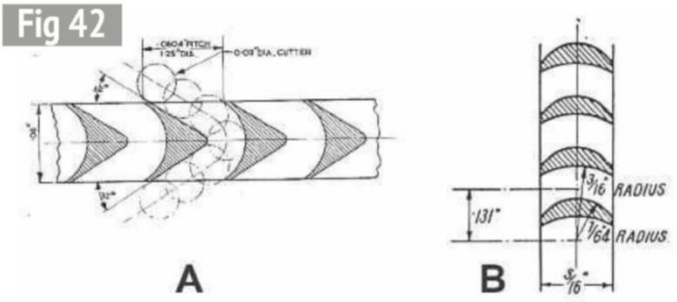
Flow separation

As steam flows at high velocity around a curved surface such as a turbine blade, the tendency of the steam to continue flowing on its initial course (i.e. its momentum) causes the pressure adjacent to the concave surface of the blade to increase while pressure on the other side of the channel is decreased (**fig 41**). In early Rateau turbines as well as some model turbines, the blades were made of curved sheet metal (**fig 41 - A**). With this form of blade, the passage width increases towards the centreline and this accentuates the effects of the pressure gradient. The result of these factors can be that the flow of steam separates from the convex face of the next blade. Such separation is associated with eddies in the steam and these increase the frictional losses. This situation can be avoided by using a properly shaped profile blade (**fig 41 - B**) and as shown in **fig 42**; blades of similar shape have been made by model engineers such as Professor Chaddock (**ref 11**), Jim Bamford (**ref 12**) and Werner Jeggli (**ref 13**).

As was described in Part 4, convergent-divergent De Laval-type nozzles are used in order to achieve steam velocities higher than the speed of sound. However, at supersonic velocities many aspects of the flow of compressible fluids (i.e. steam) are very different to when the same fluids are flowing at subsonic velocities. A consequence of this is that, in steam leaving De Laval nozzles, there is yet another way by which velocity, and hence kinetic energy, is wasted. The next article will describe this and then move away from theory to discuss what is actually known about the performance of miniature nozzles.

●To be continued.

Fig 42



Blades in turbines built by Prof Chaddock (A) and Mr. Bamford (B). (Refs 11 and 12.)

Table 5. Significance of friction compared to momentum, as indicated by Reynolds number, for steam flowing through passages with widths typical of full-size and model turbines.

Values are approximate Reynolds numbers for dry saturated steam at 20, 60 and 180 psig.

		Reynolds number (approximate)		
Width of steam passage	**Steam pressure (psig)**	**Steam velocity 200 ft/sec**	**Steam velocity 500 ft/sec**	**Steam velocity 1400 ft/sec**
1" (e.g. Gap between large h.p. turbine blades)	**20**	158,000	395,000	1,107,000
	60	302,000	756,000	2,117,000
	180	683,000	1,708,000	4,783,000
0.25" (e.g. Throat of a full-size De Laval nozzle)	**20**	39,000	98,000	276,000
	60	75,000	189,000	529,000
	180	170,000	427,000	1,195,000
0.02" (e.g. Throat of a model De Laval nozzle)	**20**	3,000	7,000	22,000
	60	6,000	15,000	42,000
	180	13,000	34,000	95,000

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7. Reynolds, O. (1883) *An experimental investigation of the circumstances which determine whether the motion of water shall be direct or sinuous, and of the law of resistance in parallel channels.* Philosophical Transactions of the Royal Society, London. 174: 935 – 982.

8. Patterns in water flowing through a glass tube - reproduction of the experiment described in ref 1. https://www.youtube.com/watch?v=Kq9UKD0iZ2Q

9. Demonstration that fluid adjacent to a solid surface is stationary. https://www.youtube.com/watch?v=cUTkqZeiMow

10. Demonstration of the absence of random movement during laminar flow. https://www.youtube.com/watch?v=jrAoRdL3MVQ

11. Chaddock, D. H. (1950). *An experimental steam turbine plant - Part 1.* *Model Engineer* **Vol 103** (Issue 2588): pp. 966 -969.

12. Bamford, J. A. (1951). *An experimental steam turbine - part 1.* *Model Engineer* **Vol 105** (Issue 2629): pp. 474 – 477.

13. Jeggli, W. (2008). *A steam-powered turbo electric intercity train part 2.* *Model Engineer* **Vol 200** (Issue 4320): pp. 274-277.

The Barclay Well Tanks of the Great War

PART 46

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

Continued from p.291
M.E. 4606, 18 February 2019

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.

Whistle valve and whistle

Photograph 220 shows the Barclay whistle fitted to *Airservice Constructional Corps No.2* - one of Douglas's sister engines. It is interesting to note that the cab windows seen in this shot are the ones that were donated to the Talyllyn Railway when the locomotive was scrapped at Abelson's in the early '50s. These were used in the construction of the rear cab for *Douglas*. The pipe running across the top of the Belpaire firebox (lolloping you might say – but there was a war on!) is the external steam supply to the blower, which connects to a bulkhead fitting in the smokebox.

A whistle this small (**fig 144**) will be a bit of a 'pip squeak' – a term I normally reserve for 'Holly' my Jack Russell! But there's no reason why a larger whistle could not be fitted – under the running boards if necessary.

Whistle on Barclay Class E engine (author's collection).

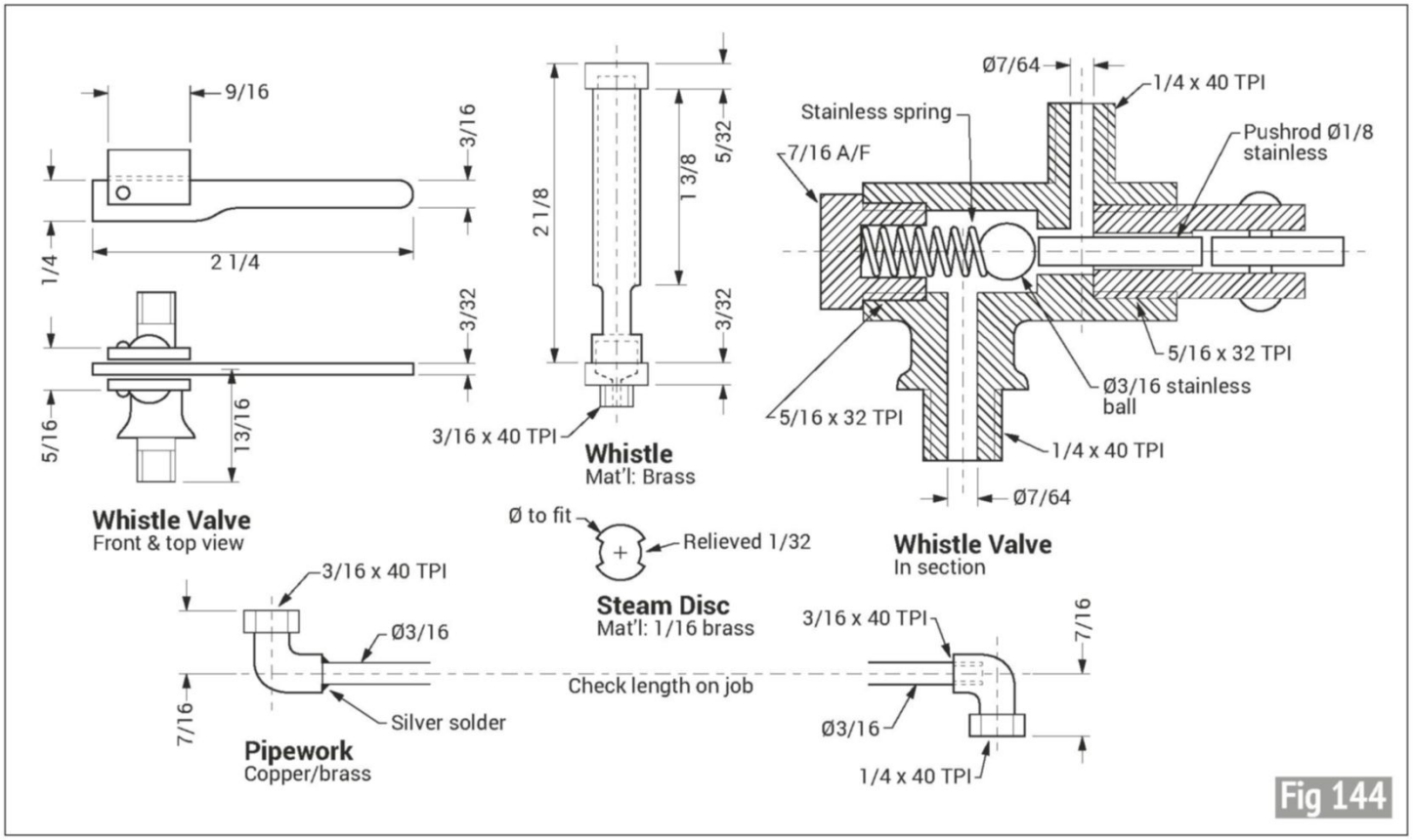


Fig 144

Some years ago a short series was published in this magazine addressing the design of whistles. In that article I included instructions on how to produce an American-type chime whistle and specific, tuned whistles, which may be of some use here if a more realistic sound is preferred (**ref 46**). I don't think, however, that the locomotive would benefit from the addition of a wind chime or, for that matter, a full-blown calliope!

Firedoor – *Douglas* and *ACC No.1*

I have grouped these doors together in **figs 145** and **146** but the Talyllyn sliding door for *Douglas* is the one requiring the four bushes shown in fig 99 (part 32, M.E.4584, 13 April 2018).

Bend up the tab on the left-hand side to make a door-stop for when the doors are open. Likewise, bend the four mounting tabs as necessary to clear the boiler bushes, so that the door fits flush with the face of the backhead over the firehole ring. To prevent clogging of the bottom runner with coal dust etc. a slot should be provided in the bottom runner as shown in fig 145.

The original Barclay door, shown in fig 146, does not require the four 2BA bushes as the fixings can be screwed directly into the copper backhead with 6BA screws. However, if your boiler happens to have the four bushes and you change your mind and wish to fit the original, conventional door I have added a drawing of an optional backplate to fig 146 (fitted with 6BA studs), which will avoid the need to drill and tap the backhead.

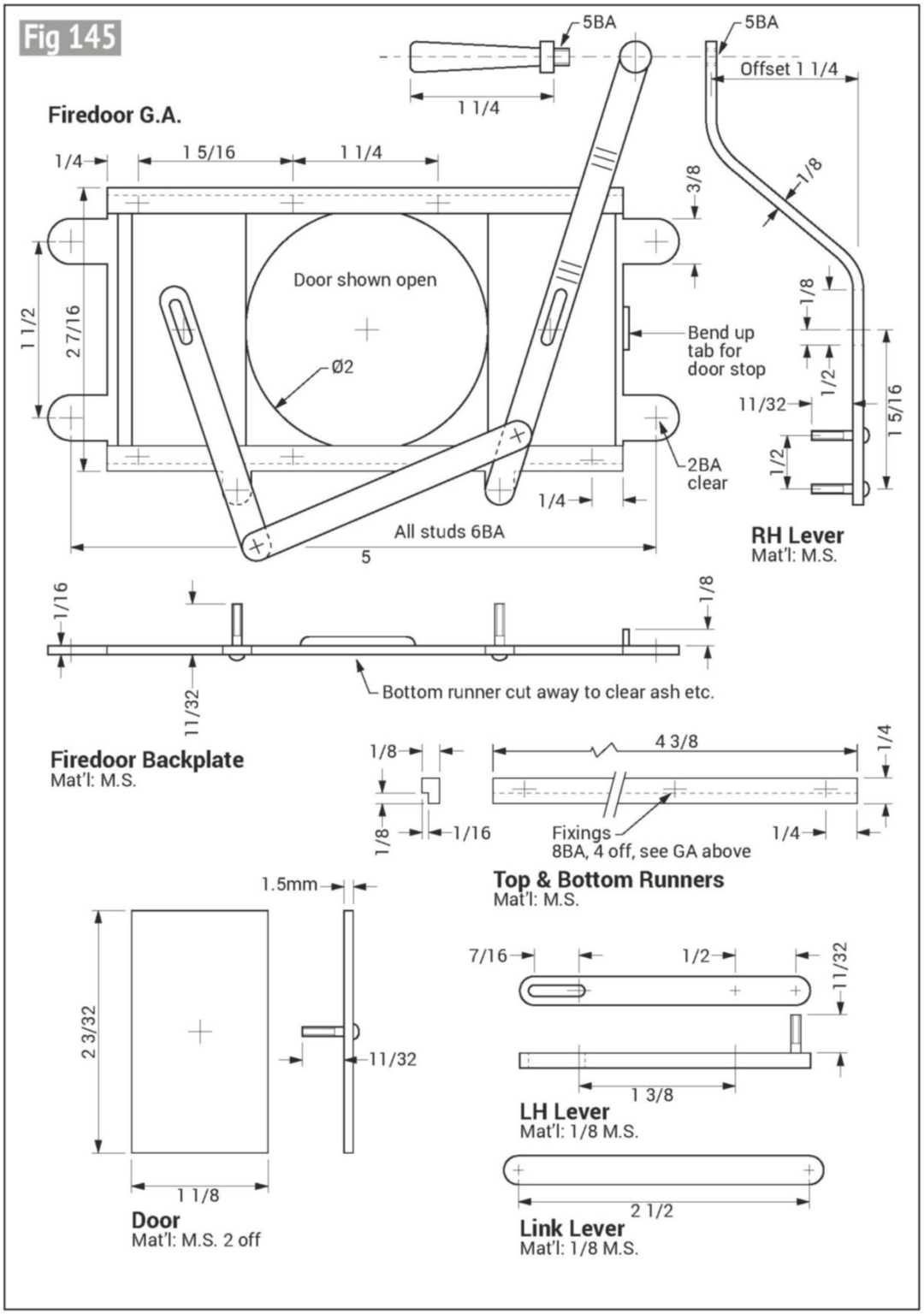
If this backplate is painted with smokebox black paint, along with the backhead itself, it will hardly notice. The backplate should touch the firehole where the firehole ring is peened over (see the sketch in fig 146) – if there is a slight gap the backplate ends will need bending slightly to fit, in similar fashion to the fixing of the sliding-type firedoor.

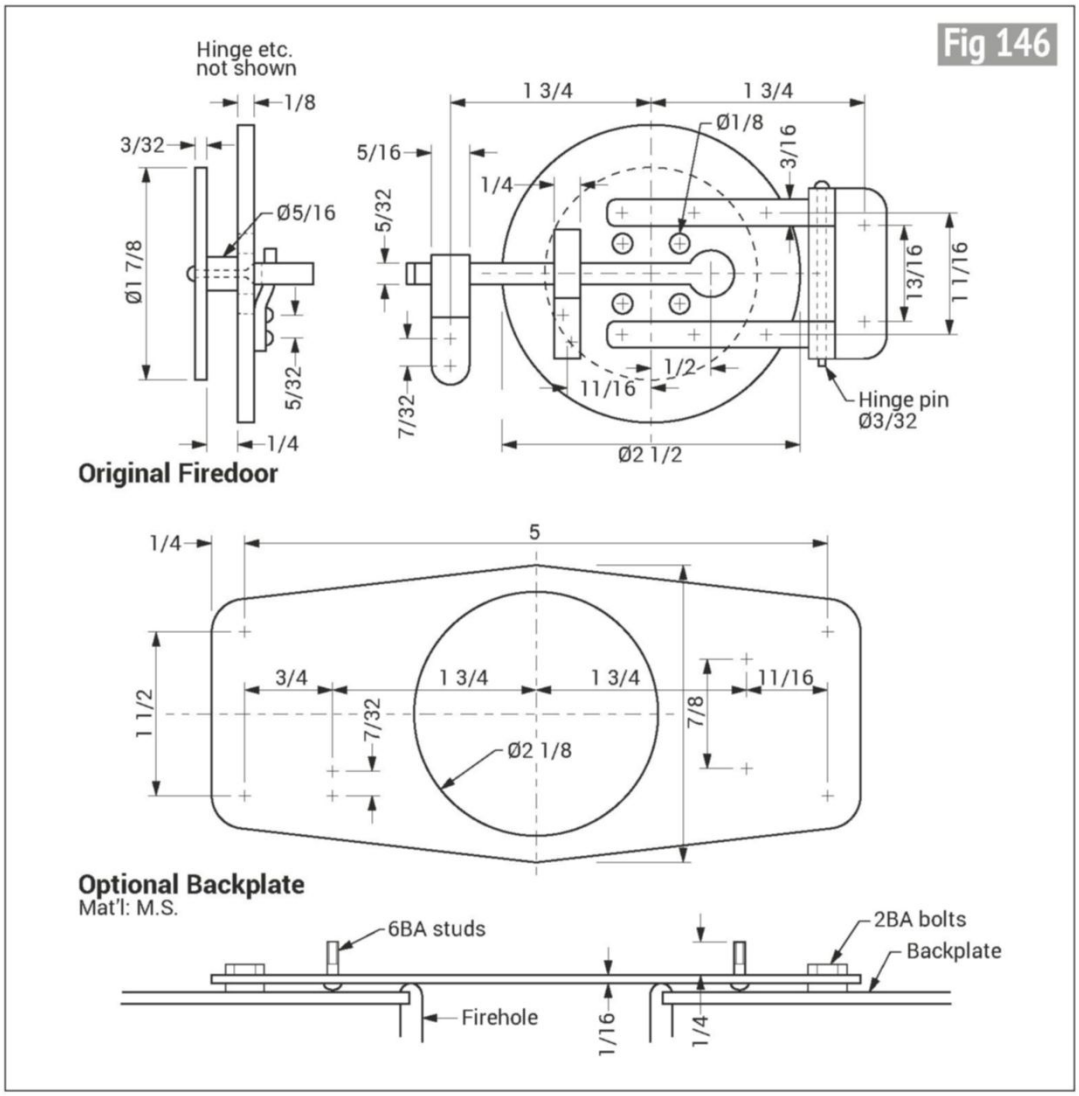
Drain cock lever

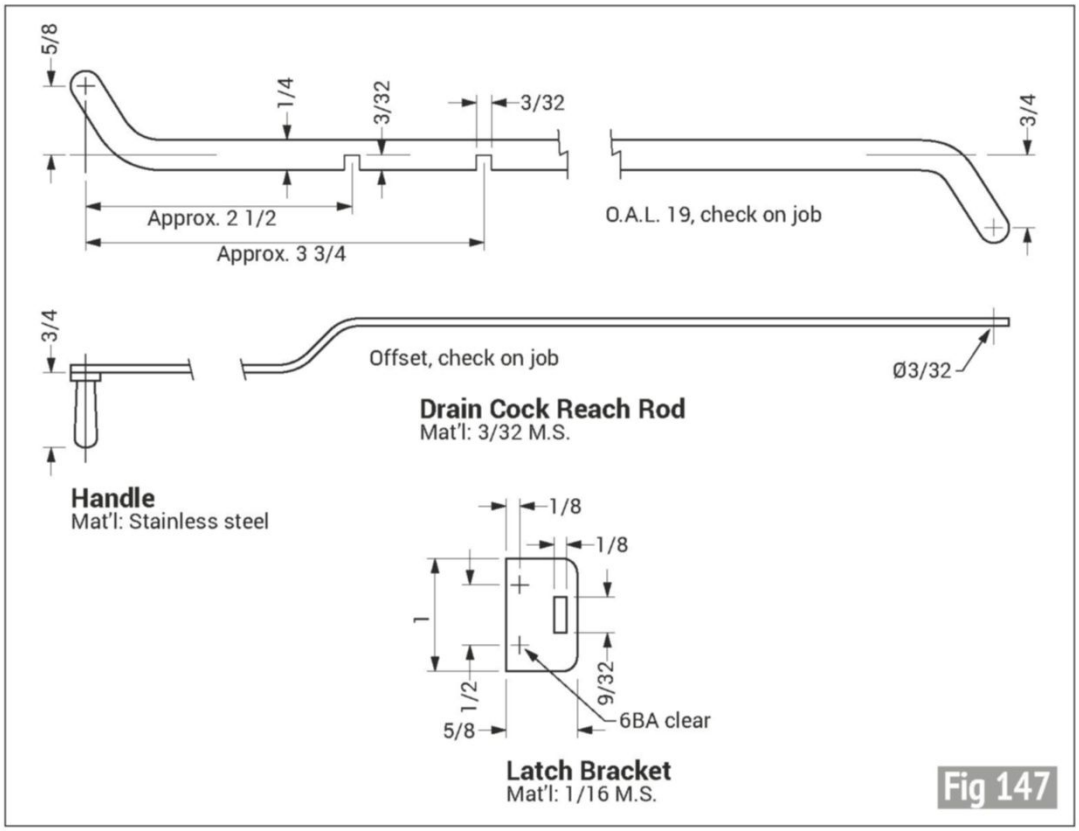
A fairly simple item this; the rod is made from ¼ x 3⁄32 inch mild steel strip but it will need to be dimensioned 'on the job' (**fig 147**). The latch bracket is screwed into the corner of the lagging box. The handle is turned up from a piece of stainless rod with a 5BA stub and screwed into the rod. The other end is drilled 3⁄32 inch to accept the 7BA stud on the drain cock lever. Mark out the notches when all is assembled.

Bulkhead fittings

Not a lot to do with the cab but part of the plumbing required when fitting the bunkers, so they may as well be addressed here. Typical bulkhead fittings are shown in **fig 148**. The two shown are required for the crosshead feed pump pipework. One is the outlet from the bypass valve - this has a short stub of 3⁄16 inch copper tube on the inside which delivers the overflow to just below the bunker lid, where it can be seen by the driver. The other fits in the bottom of the bunker and allows excess water to drain from the tank as waste to the trackbed. If the frame is drilled and tapped at the top







of the rear well tank, another fitting can be screwed in and connected to the overflow with a short length of plastic tube. This arrangement of pipework will maintain a full head in the bunker, feeding the driver's injector and the overflow returns to the well tank.

The same design of fitting can be used (without the tube on the inlet etc.) for other connections to the injectors.

Bunker coal door

I think it goes without saying that this is on the left-hand, fireman's side – I can't imagine what firing would have been like at Tywyn if it had been on the driver's side! See **fig 149** and **photo 221**. It won't be needed until the left-hand bunker is constructed but I'll deal with it here as part of the cab fittings. Note that the door is a Talyllyn modification – the original engine simply had an opening in the rear of the bunker.

There's not a lot of space to fit the door in but it was done on *Douglas* so it shouldn't be a problem here. The tricky bit is to make it as big as possible to be compatible with the firing shovel and the 2 inch diameter firehole. This means keeping the door runners as narrow as possible. Note, however, that the easiest way to fire is from a container fitted into the front of the driving tender. So, in practice, the bunker coal is just for show and the bunker door could be fitted in the closed position without the runners.

The bunker door is a bit difficult to photograph so photo 221 shows the footplate with the engine in steam, with the bunker door just visible on the left.

Steam brake plumbing

The steam pipe from the cab valve to the brake cylinder runs through the right-hand bunker, but as this acts as a head tank for an injector it creates a minor problem, i.e. the pipework will be water cooled and the injector feedwater in the tank heated up! The solution was to insulate it in some way, so I wound the

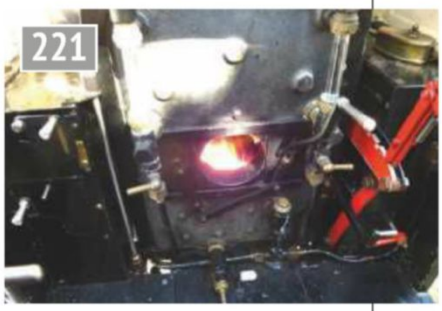
underwater section with PTFE tape; about half a dozen layers provided quite a thickness and it didn't use too much tape, which is fairly cheap in any case. I note here that the working steam brake is a bit of a novelty and unlikely to be in use during normal operation.

Pipe lagging

Again, not part of the cab fittings but important for the plumbing. Applied to the steam pipes in the cab and painted gloss white, it looks the part. As far as I can remember, lagging on the Talyllyn is painted black but I'm probably wrong! I have lagged the injector steam pipes and, in the confines of a 5 inch gauge cab, it helps to avoid burning one's fingers when operating. I didn't bother to lag the pipes from the whistle and blower valve, as these are tucked out of the way behind the steam fountain. I painted my lagging with white gloss paint, which tidies things up no end.

In the past I have used asbestos string (wash his mouth out with soap and water!) but I now use ordinary string, wound on the pipe and then filled with cellulose filler before gloss painting. This is quite adequate, looks good and stands up to the temperature with no problems – it's a good example of alternative materials being just as effective but much safer to use.

●To be continued.

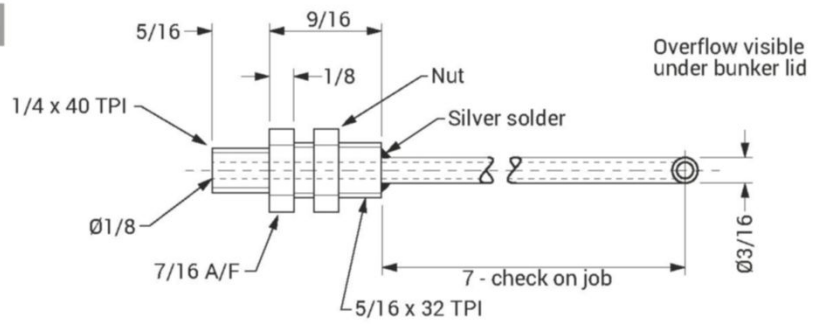


Bunker coal door.

REFERENCE

46. Terence Holland, *Steam calliopes, whistles and wind chimes*, Model Engineer 4361, September 2009.

Fig 148



Bulkhead - Pump Overflow

Bulkhead - Bunker Overflow

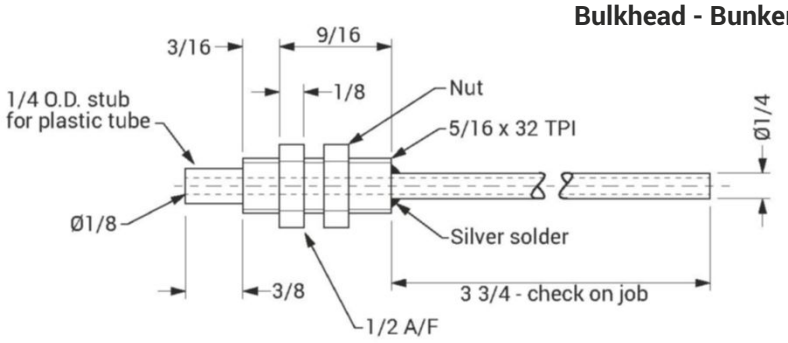
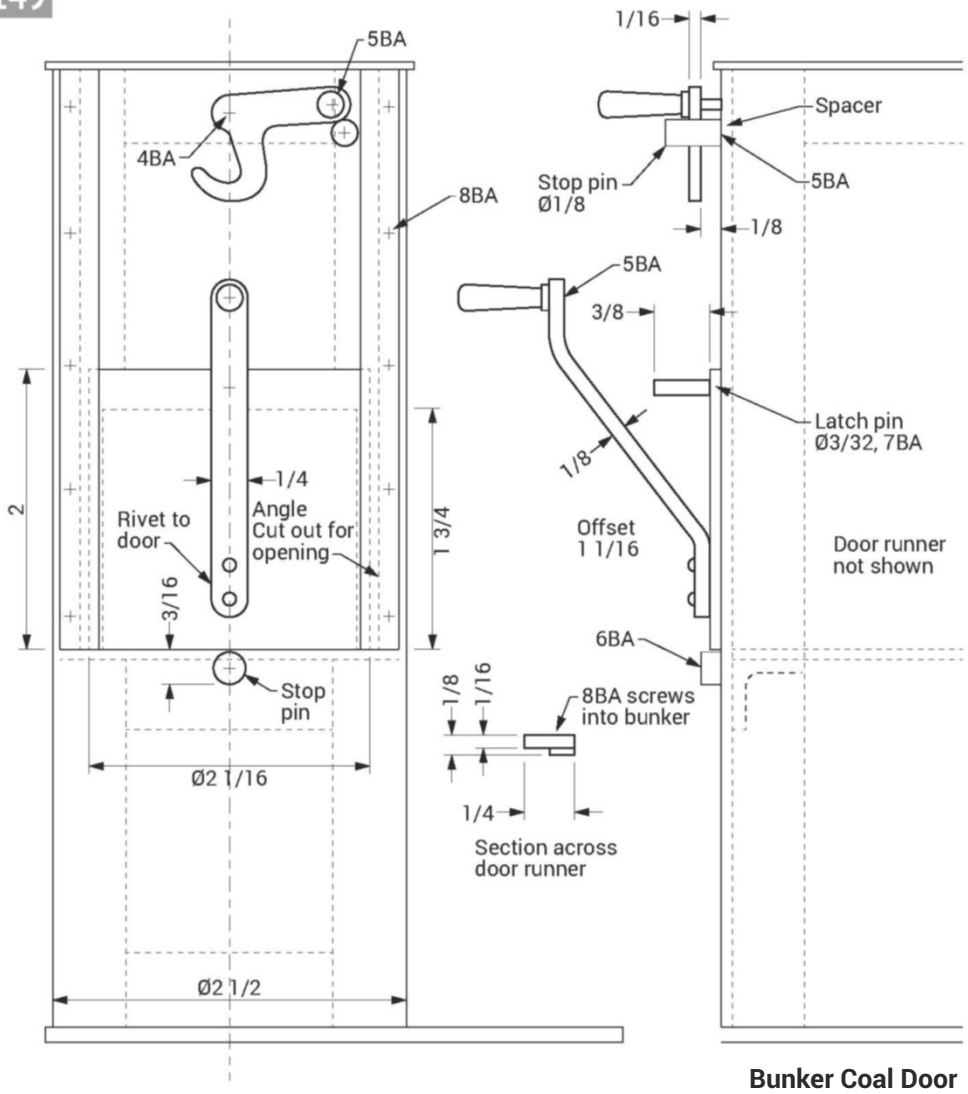


Fig 149



Bunker Coal Door

CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.

A member of a society has raised a point about not being consulted when a photograph of his was requested by me for inclusion in this column. This depends on club policy, i.e. is there a blanket understanding that all images in a club newsletter are available to reviewers like me upon request, or does the newsletter editor have to ask the individuals concerned on each occasion? As far as *M.E.* is concerned, copyright remains with the photographer. There is no budget to pay for photographs, they are published in order to promote the society and illustrate its activities.

On a lighter note, my engineering knowledge donned my electronics hat to solve a little problem. I was building a filter circuit which called for a dual potentiometer and I only had single examples in stock. Two different parts of the circuit had to act together, hence controlled by the one knob. Sorting through my stock, I found no matching-sized sprockets, nor had I such pulleys, which could have been used to join together two single 'pots'. I *did* however have two matching knobs with a ribbed surface. Add two rubber bands in a fetching lilac shade and Robert's your aged relative! I also encountered a little mechanical hysteresis as the rubber bands reacted to the reluctance of the pots to move (**photo 1**).

A news item which appealed to me concerns a variation of the 'Men in Sheds' idea, bearing in mind that pubs are shutting everywhere. Pubs in Sheds! If you don't fancy gardening, making things or radio amateury (I just coined a new word!) then install a bar, some comfortable seating and a stereo or a TV and invite your friends round.

I've been inundated by another fan letter, about my photography, which ends; 'keep up the good work and the cr*p jokes'. How dare you Sirrah! I demand satisfaction! Cameras at dawn, a photo-shoot-out, in fact. I would remind readers that my humble attempts at wordplay are dew-picked at dawn on South-facing Pennine slopes, by naiads of this parish and served on a bed of warmed-up, wilted verbiage to your complete degustation (…and then *I* have to wade through this stuff – *Ed.*).

In the matter of decluttering, a recurring favourite of the distaff side, a colour supplement item covered the 'art' of *feng shui*, of which decluttering is a major part. It also concerns auspicious directions and 'flow'. Having been almost forcibly deprived of some of my precious books and voluntarily disposed of every item of disfunctional electronics some time ago, we now consider Flow. The best arrangement is to have the mains input discreetly placed in a Northern corner and travel constantly clockwise tending constantly, with increased processing, towards the South East, where is located your aerial tuner and the feeder to the aerial. Minimalism being the watchword and energy saving, we should all adopt a low power output station, using 'below the noise' communications methods. Favourite elements for good 'vibes' are copper and germanium. Sparks from the apparatus create ozone, cleaning the air and the environment and favourite numbers are 7.090 and 1:1. Now, assume the position, in front of an item of Marconi test equipment and chant, "CQ, CQ, CQ, CQ Forty Meters"

After I had been for a flu-jab and routine blood test, my doctor said, "See you next year". I replied, "I don't see why not, you seem reasonably healthy to me..."

In this issue: Araldite, Sutherland, Coronia, Meccano, a unique ship, bolt cutters and piston rings.

Here, held over from the previous issue, is Britannia, 70004, *William Shakespeare,* owned Chris Williams, from **Maidstone Model Engineering Society** newsletter (**photo 2**).

In **Northern Districts Model Engineering Society (Perth)'s** *Newsletter,* Jan-Feb, Richard Turner writes on the 30th Australian Miniature Traction Engine Rally at Cobdogla in South Australia, who also have full size Fowler B6 crane- and Z7-ploughing engines. 20 visiting models included a Case and a Buffalo Pitts examples. The Sandgropers weekend was not well attended, by modellers or models, although the weather was great. Others have reported similar results. What is happening? Bill Walker writes on the Beeching report

Fabricated dual potentiometer from Geoff.

and its impact; he was on a diesel course at Derby at the time. The Buxton to Manchester line was due for closure despite its popularity (24,000 passengers a week) but the town successfully objected and it is still open today. Dr. Phill Gibbons lost a fingernail to his linisher and shortly afterwards got a spark in the wound. After much 'railway esperanto' he dabbed a blob of Araldite onto it, which was painless and effected a lasting cure. N.B. this should not be taken as an approved medical treatment! A visit to Esperance Miniature Railway *(do they speak Esperanto? Ed.)* Public Run day was enjoyed; the track is 1.2Km long and was in use but not 'busy' all day. Similarly, a visit to the Katanning club was much enjoyed.
W. www.ndmes.org.au

Albert Haywood writes: 'I am a member of the **Aston Manor Road Transport Museum** in Aldridge in the West Midlands. We are holding a Models in the Museum day on Sunday 24 March 2019. From 10.30 to 16.00 hrs. There will be an exhibition of model railways and model engineering items from various clubs and should be of interest to children of all ages. We would be very pleased if you are able to include this event in your list of 'what's on', in your magazine. There will be a free vintage bus service from Walsall and a free park and ride facility. Our location is Shenstone Drive, Aldridge, WS9 8TP and our web page is at
W. www.amrtm.org'

Grimsby & Cleethorpes Model Engineering Society's *The Blower,* January, saw many well-wrapped-up passengers enjoying a ride at Christmas, whilst work went on in the previous weeks installing two signal gantries and new track to the steaming bays. Geoff Hoad's electric Q1 dropped a coupling rod on Boxing Day but we won't mention that.
W. www.gcmes.com

York City & District Society of Model Engineers, *Newsletter,* January, says new Secretary,

Chris Williams' Britannia at Maidstone MES. (Photo courtesy of Sue Parham.)

Tony Simons worked at the NRM from 2006 until he retired (he was previously at York College). His retirement lasted one day, before returning to the college at their request until 2015. Richard Gibbon made a 5 inch gauge model of Isle of Man 2-4-0 *Sutherland*; it is on YouTube and can be found by searching for 'Sutherland 2-4-0 trial run'. An elegant Victorian design, says new Editor, Roger Backhouse, who also introduces himself but needs no introduction here. Mike Pinder made a MacLellan truck (the water and oil tankers? - Geoff). Christopher Ashcroft has died. Notably, apart from his railway knowledge, he had an interest in shipping and got to know the Scarborough day excursion boat, *Coronia*'s, skipper, helping repair the engines at times. In return, he was allowed to take the helm at sea. Roger introduces Dr. Yorick (… The Beatles? Oh no, that was Dr. Robert) who embodies the collective knowledge and experience of York members as Agony Aunt for those in peril on the lathe. The Society's best attended event is the sale, in February. Roger acquired a set of Whitworth taps and dies last year, complete with woodworm (in the box, silly!), now cremated. The proceeds last year topped £2k. Surprisingly, whilst everyone is invited to contribute to the Doncaster show, Manchester in February appears to be neglected and by Grimsby too.
W. www.yorkmodel engineers.co.uk

Steam Whistle, January, from **Sheffield & District Society of Model & Experimental Engineers** says that the Santa Specials, especially the tunnel, were enjoyed by all passengers. As there isn't normally a tunnel at Abbeydale, one was prepared earlier. Danish pastries were preferred to mince pies - so much for 'seasonal fare'! Alan Thorpe and his colleagues' Christmas-themed models were a great attraction and raised funds for Guide Dogs for the Blind. Alan Cooper has made a fully functional vacuum brake valve – one inch in diameter! Perfect in its internal workings too. An item by Murray on transmitting power 'wirelessly', was paralleled by one on the *M.E.* Forum, about running clandestine radios from 'stolen power', using a wire loop laid below a power transmission line. Nowadays, clandestine items are more likely to be using solar PV panels. Wireless, or inductive loop systems are inefficient and very lossy but are used in cordless toothbrushes and proposed for electric car chargers. The latest is a drone with no batteries at all, which could theoretically fly for ever. So far it has reached an altitude of five inches...
W. www.sheffieldmodel engineers.com

Conrod, January, from **Otago Model Engineering Society,** publicises their Festival of Modelling in early February, which will include the large, fully operational 'Meccano' container crane as at Port Otago. A photograph from earlier days shows almost everyone in shirt and tie, with most in dust coats or boiler suits. A sea story from Chris K. relates the *S.S. Warrimoo* being everywhere at once, on the IDL and the Equator simultaneously, on 31 December 1899, whilst on a voyage from Vancouver to Australia. The ship was stationary at the point

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where the lines crossed, so, the ship was astride two different centuries, two different days, two different months, two different years and two different seasons! A notice seen on a Wellington construction site said, *'If you are one of those accident-prone b------s, please bxxxer off now and save us a lot of paperwork'*.
W. www.omes.org.nz

Canterbury & District Model Engineering Society joins we happy few, we band of brothers... and sends their *Stour Valley Express* for January. Editor, Barry Loraine, relates that the biggest misfortune to befall the Society is the return of himself as editor. (That's what I like to see, confidence, trust and an unshakeable belief in one's own inadequacies – Geoff.) The 'Trains and Traction' event produced a good example of a 1935 Humber saloon car. This event brought more visitors than expected, with 1700 rides sold. The usual locomotives, traction engines and r/c trucks were present, plus a good display of Mamod live steam models, watched by the occupant of a zebra-striped folding chair. Clive Mowatt writes on buying a Maxitrak 4F. It is good and worked right out of the box. However, finescale it is not, with crosshead screws being used but that is a minor quibble. Terry Gilkerson makes his first clock, as a show clock for an event and with a five foot diameter dial. This was powered by a small electric motor and a 12:1 gearbox. He produced the gears from plywood, following software called *Gear Generation,* £16, which can print out the profiles on paper which are then stuck to the ply and cut around. The assembled clock weighs about 1 cwt and is mounted on a gantry nine feet high.
W. www.cdmes.org

Another pic from Hack Green, is of a GKN Tactica, a multipurpose military or law enforcement vehicle, widely exported (**photo 3**) and then, *Dixie*, from the Sheffield Auctions (**photo 4**).

GKN Tactica at Hack Green nuclear bunker.

Dixie *at Sheffield Auctions.*

Model & Experimental Engineers Auckland, *Newsletter,* January, has Graham Quayle describing progress on his Fowler Showman's engine, now needing only the canopy. During the build, he replaced some screws with more appropriate versions, meaning some were left over. As everything was bolted on correctly, he was not dismayed. Graham Bell restored a set of Record bolt cutters, the largest being about four feet long. After setting the jaws straight he built them up with hard weld dressed with an angle grinder. Bill Parker was given the boiler from a 1960s coffee maker, which will probably be a good test boiler in time.

B&DSME News, January, from **Bournemouth & District Society of Model Engineers**, says Chairman, Peter Burton thanks everyone for their hard work over the past year and basks in the lovely facilities at Littledown Park. Editor, Dick Ganderton adds his thanks, including the way that the old engine shed has been transformed into a warm and comfortable lounge. Project Ellie (tram engine) continues with a boiler session at the Editor's house. Gordon Miles explains the three parts of the new Boiler Test Code 2018. Finally, the Lathe Assessment Course is a requirement for anyone wishing to use the club's workshop lathe. It consists of two parts, a general workshop safety section and a practical assessment, making something of your own, or as requested by the Tester. Page 3 concludes by claiming to be part of the August 2018 edition...
W. www.littledown railway.co.uk

The Link, February, from **Ottawa Valley Live Steamers & Model Engineers**, following on from last time regarding Editor, Graham Copley's *Royal Scot*: the blow-by in the middle cylinder appears to have been because three of the four cast iron piston rings appear not to have bedded in. Plus, running the rolling chassis on air at 100 psi seems to eject all the lubrication when first applied, so this is not recommended. New rings made a good improvement but he now detects a blow in each of the other cylinders...
W. http://ovlsme.x10host.com/index.html

And finally ... to the swine who stole my antidepressants - are you happy now?

Contact:
geofftheasby@gmail.com

MARCH

14 **Cardiff MES.** Talk: 'Illustrated Guide to the Barry Railway' – Lin Bryant. Contact Rob Matthews: 02920 255000.

14 **Worthing & District SME.** Club meeting, 7.30pm. Contact Geoff Bashall: 01903 722973.

17 **Cardiff MES.** Open Day. Contact Rob Matthews: 02920 255000.

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

17 **Newton Abbot & District MES.** Running day at Lindridge Hill. Contact Ted Head: 07941 504498.

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

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

19 **Romney Marsh MES.** Talk: 'RMMES – The Beginning' – John Wimble and Tony Crowhurst, 7.30pm. Contact Adrian Parker: 01303 894187.

20 **Bristol SMEE.** Spring auction. Contact Dave Gray: 01275 857746.

20 **Leeds SMEE.** Meeting night – 'Restoring a Full Sized Andrew Barclay Saddle Tank Locomotive' – John Dunn. Contact Geoff Shackleton: 01977 798138.

21 **Cardiff MES.** Bring & Buy. Contact Rob Matthews: 02920 255000.

23 **Worthing & District SME.** Cobweb run. Contact Geoff Bashall: 01903 722973.

24 **Aston Manor Road Transport Museum.** Models in the Museum Day. See amrtm.org.

24 **Newton Abbot & District MES.** Running day at Lindridge Hill. Contact Ted Head: 07941 504498.

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

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

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

26 **Wigan DMES.** Presentation by Mr T Heaviside on 'Lancashire Steam'. Contact Brian Clark: brianclark2@sky.com.

28 **Cardiff MES.** Talk: 'Old Cardiff' – David Green. Contact Rob Matthews: 02920 255000.

28 **Newton Abbot & District MES.** Presentation by Peter Jennings from GWR Didcot on the Railmotor. Contact Ted Head: 07941 504498.

28 **Sutton MEC.** Bring and Show. Contact Paul Harding 0208 2544749.

28 **Worthing & District SME.** Club meeting – 'Secrets of Cowfold Monastery', Keith West, 7.30pm. Contact Geoff Bashall: 01903 722973.

28-31 **GL5MLA.** Shildon GL5 event. Contact Peter Layfield: 01406 365472.

30 **Westland & Yeovil DMES.** Track running day 11am – 4.30pm. Contact Bob Perkins: 07984 931993.

31 **Bedford MES.** Public running, from 10.30am at Summerfields Miniature Railways. Contact Brian Walton: 07498 869902.

31 **Cardiff MES.** Steam Up & Family Day. Contact Rob Matthews: 02920 255000.

31 **Newton Abbot & District MES.** Running day at Lindridge Hill. Contact Ted Head: 07941 504498.

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

APRIL

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

3 **Bradford MES.** Spring auction, 7:30pm, Saltaire Methodist Church. Contact: Russ Coppin, 07815 048999.

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

3 **Bristol SMEE.** Talk: 'Turbine Modelling' – John Beddis. Contact Dave Gray: 01275 857746.

3 **Leeds SMEE.** Meeting night – Trophy night. Contact Geoff Shackleton: 01977 798138.

4 **Sutton MEC.** Bits and Pieces. Contact Paul Harding 0208 2544749.

5 **North London SME.** Talk: 'Isambard Kingdom Brunel and the GWR' – Colin Gent. Contact Ian Johnston: 0208 4490693.

5 **Portsmouth MES.** Club night – 'A Piece of Time', 7.30pm, Tesco Fratton Community Centre. Contact Roger Doyle: doyle.roger@sky.com.

5 **Rochdale SMEE.** 'Boiler Testing' – FAJ and Bob Hayter, at Castleton Community Centre, 7.30pm. Contact Rod Hartley 07801 705193.

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

7 **Cardiff MES.** Open Day. Contact Rob Matthews: 02920 255000.

7 **Guildford MES.** SMSEG open meeting, 2-5pm. Contact Mike Sleigh: pr@gmes.org.uk

7 **Newton Abbot & District MES.** Running day at Lindridge Hill. Contact Ted Head: 07941 504498.

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

7 **Oxford (City of) SME.** Running Day, 1.30pm-5pm. Contact: secretary@cosme.org.uk

7 **Portsmouth MES.** Public running, 2-5pm, Bransbury Park. Contact Roger Doyle:

7 **Welling DMES.** Public running at Falconwood 2-5pm. Contact Martin Thompson: 01689 851413.

8 **Bedford MES.** Talk: 'Model Steam Tales' – John Shawe, 7.30pm Summerfields Miniature Railway MK45 3BH. Contact: meetings@bedfordmes.co.uk

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

10 **Bedford MES.** Public running, from 10.30am at Summerfields Miniature Railways. Contact Brian Walton: 07498 869902.

Introducing the latest riveting title from SLEDGEHAMMER Engineering Press 'Rivet Lad - More Battles With Old Steam Boilers'

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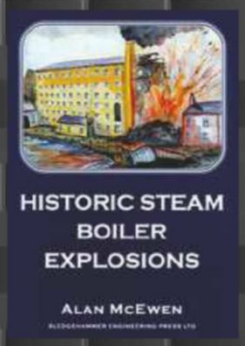

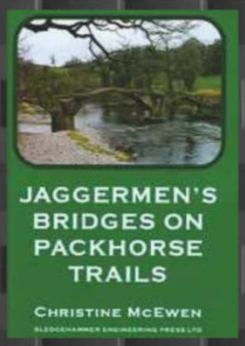

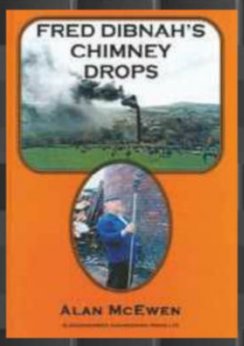

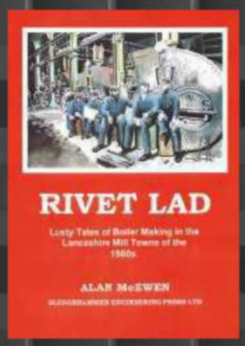

Alan's earlier book: **RIVET LAD – Lusty Tales of Boiler Making in the Lancashire Mill Towns of the 1960s** was published in September 2017 and is now reduced to £30 including postage and packing to UK addresses.
Our other three books are £16.00 EACH including postage to UK addresses

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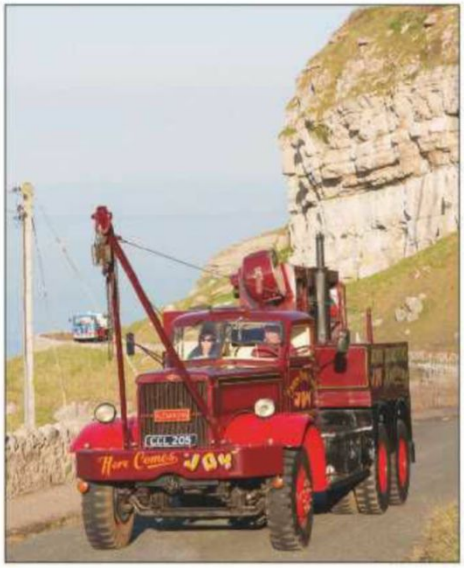



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