

THE ORIGINAL MAGAZINE FOR MODEL ENGINEERS

Vol. 229 No. 4703 • 4 - 17 November 2022

MODEL ENGINEER

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COVER FEATURE

Echills Wood
7¼ inch gauge
steam-up

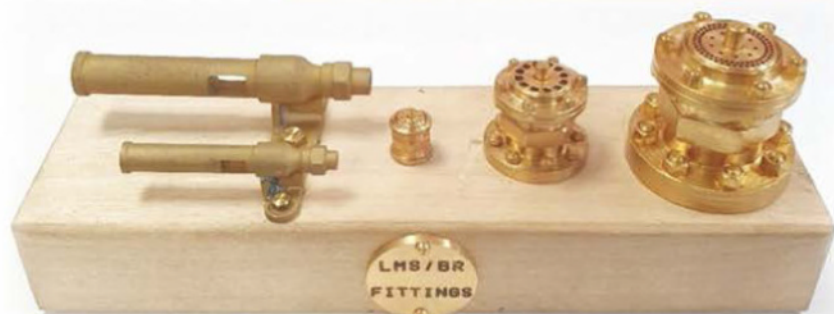
Midlands Show
First impressions



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and Autumn Rally at Little Hay

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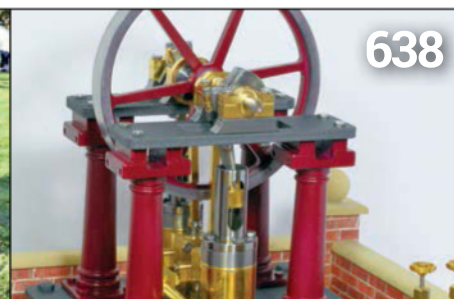
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A Mercer 35J Raceabout car by Brian Swann, seen at the Midlands Model Engineering Exhibition (photo by John Arrowsmith).

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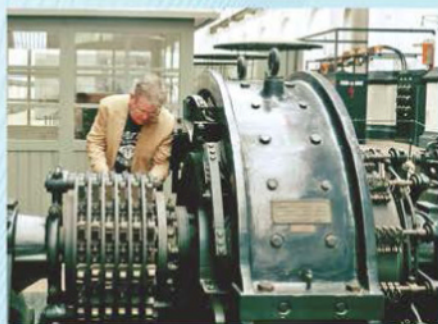
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Spitfire Competition

How do you fancy a spin in a Spitfire? All you need to do is spend a happy hour or two splashing a little glue over a plastic kit and you're in with a chance.

Airfix, one of the world's oldest and most well-known manufacturers of model kits, is giving the chance for one lucky person to experience an incredible once-in-a-lifetime flight in Britain's iconic Spitfire aircraft. Anyone who purchases an Airfix Gift Set or Starter Set through the Airfix website, will automatically have the opportunity to win the flight, which will take place in an authentic Spitfire in summer 2023.

'The Spitfire is a British icon and, as such, is one of our most popular to build', explains Dale Luckhurst, head of brand at Airfix, 'It makes

perfect sense for us to offer our customers the chance to bring one of their favourite models to life and win this incredible once-in-a-lifetime experience flight in an actual Spitfire aircraft. The winner of the Airfix prize draw will be able to fly a Spitfire TR9 over the English Channel. They will also have the opportunity to touch the controls and fly the aircraft themselves, so it really is an incredible prize.'

Dale concluded: 'While the flight must be taken by those over 18 years old, and health conditions apply, we hope that customers of all ages will purchase a starter kit. Whether it's a gift for an eight-year-old or a new hobby for those aged over 75, like our Spitfire, the joy of model building is that everyone can get involved. It's a passion that can be shared and passed down from generation to generation. We hope that this competition will

ignite the inner model builder in everyone.'

Entries to the prize draw will be applicable for Airfix Starter Set or Gift Set purchases (from £11.99) made on the Airfix website up until 31st January 2023. Terms and conditions apply - visit uk.airfix.com/community/win-flight-spitfire for details.

Kingston College

I wonder how the evening class scene is doing post-pandemic. Sadly, the class I used to attend, which closed when the first lockdown was imposed, has not restarted, despite the efforts of a couple of the members of the class to persuade the school involved to allow it to do so. A change of staff in the meantime has meant that we were no longer 'recognised' so they saw no reason to allow us to continue. I suspect that this pattern has been repeated across the country but I hope that most classes will have survived covid and be back up and running.

One class that has survived is the Kingston College Model Engineering Group in south-west London. They meet ten times per college term on Thursday evenings. Superb workshop facilities are available as well as professional instruction from Bryan Ruby, a member of the college staff and a time-served fitter. New members are very welcome. Fees are £15 per night or £130 for the full term.

For further details please contact Bryan Ruby at the college on 0208-268-2987.

Midlands Show

It was a pleasure to be able to attend the Midlands Model Engineering Exhibition at The Fosse in the middle of October, after a gap of three years. This was the first major show after the pandemic and, as such (I felt), 'set the tone' for the reappearance of other major shows. In my opinion, it was a great success and will, I hope, set the trend for other shows during the coming year.

John Arrowsmith will be writing a full report of the show in future issues but, for the moment, offers us his first impressions on page 614. I was at the show myself and it was a pleasure to see many familiar faces there and to meet several old friends again. I was also able to admire a beautiful model of *Waverley*, our last sea-going paddle steamer, which reminded me that Roger Backhouse reports on an Engineer's Day Out in the full-sized version on page 642.



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.
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Part of the attractive 300 ft SM32 layout.

Federation of Model Engineering Societies Rally

Mike Chrisp reports from Sutton Coldfield on this year's Federation rally.



Hosted by members of Sutton Coldfield MES Ltd on their attractive Balleney Green site at Little Hay, Saturday's records of this year's FMES Autumn Rally, held 3rd - 4th September reveal a total of 23 visitors and 13 locomotives. More would have been welcome but those of us there enjoyed an excellent day and felt sorry for absentees. We are very grateful for the efforts of SCMES members and friends who worked hard beforehand to ensure everything was ready and spent time during the event looking after their visitors.

The Little Hay site boasts a ground level track approximately ½ mile long for 7¼ and 5 inch gauge locomotives and rolling stock, a 480 ft 5, 3½ and 2½ inch gauge raised track and a very attractively landscaped 300 ft SM32 layout.

Saturday's proceedings included the annual competition for the Australian Association of Live Steamers Trophy awarded to the best working steam locomotive at the event modelled on a Commonwealth prototype in any gauge from 2½ - 7¼ inches inclusive. The winner is chosen by a team of three judges

consisting of last year's winner and representatives of the host society and the Federation. This year's judges were Martin Parham, Phil Davies and Ivan Hurst respectively.

A similar annual competition for the Federation of Model Engineering Societies Trophy is held in Australia at the AALS Easter Convention. These trophies commemorate the affiliation of the two organisations and were first contested in 1966.

This year's AALS Trophy winner was David Mayall with his five-inch gauge BR Standard Class 2 locomotive. Very finely detailed and

extremely well finished, it ran sweetly and attracted many admiring comments. Mike Chrisp, an FMES vice president, awarded David with the AALS Trophy during the presentation which was introduced by Bob Polley, the FMES chairman. He asked Paul Naylor, FMES vice chairman, to say a few words about a matter that affects us all. Paul made a brief appeal to all present, and to all reading the rally reports, concerning the need for active and enthusiastic volunteers to support the representative organisations including, of course, FMES.

There are some fairly obvious co-ordinated activities that are essential for the *existence* of much of the hobby (such as boiler testing) let alone other support that is or could be provided to enhance the hobby's prospects for growth and modern relevance. Without new volunteers (in whatever capacity, as board members or to manage an activity) with energy and ability to sustain and enable these, the representative organisations



Busy steaming bays for the 480 ft raised track.

will cease to be. Paul ended this sombre comment with an appeal to all to consider volunteering to support and enhance their hobby.

Martyn Cozens - SCMES secretary and Ivan Hurst - the

other FMES vice president then brought formalities to a close. Martin Parham received the SCMES award for having travelled the furthest to attend the event.

The day concluded with a barbecue, much enjoyed by all present, accompanied by a choice of hot and cold drinks which had also been available throughout the day. Bacon baps were served first thing and hot samosas and a selection of cakes at

lunchtime. Thanks are due to Ray and Anna Gilbert for all their work with the catering.

FMES is pleased to announce that next year's rally and competition will be held at Frimley and Ascot Locomotive Club's extensive mixed gauge ground level and raised track in Surrey on the weekend of 16-17 September 2023. Please see www.fmes.org.uk for more details as they are published, as well as other news and events.

ME



David Mayall enjoys a run with his fine five-inch gauge BR Class 2 locomotive.



Mike Chrisp presents David Mayall with the Australian Association of Live Steamers Trophy. (Photo by Bob Whitaker.)

Rewinding a Two Speed Motor

PART 9

Graham Astbury learns a lot about single-phase induction motors and describes 'The long and winding road that leads to a 2-speed single-phase motor'.

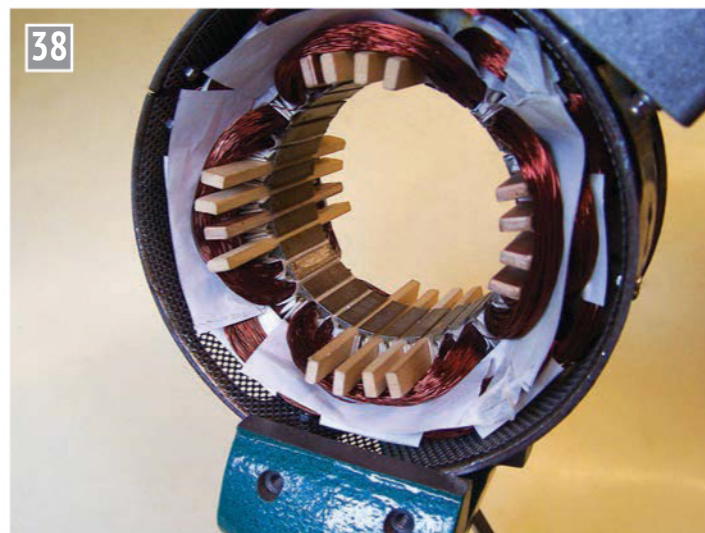


Continued from p.575
M.E. 4702, 21 October 2022

Winding the stator – four-poles

Prior to winding the first four-pole coil, I inserted lengths of 0.14 mm aramid insulation around the inside of the eight-pole winding to act as inter-winding insulation held in place with low-tack paper masking tape. Then the first phase of the four-pole winding was wound in a similar fashion to the low-speed winding using spacers carefully inserted into the slots so as not to damage the slot insulation. For this winding, I decided to use fractional pitch coils again as it spaces the wire out more evenly around the circumference of the stator.

In order to make adjacent poles of opposite polarity, I wound the first pole of the four-pole winding clockwise and the second pole anti-clockwise followed by the same for poles three and four. This winding of the coils in alternate directions is exactly the same as the eight-pole



The first phase of the four-pole winding in place.

winding as both windings are fractional pitch. Exactly the same procedure was used of winding the coils of one phase first (**photo 38**), followed by the inter-phase insulation and slot closers prior to winding the second phase. Note that for the four-pole winding, each pole is wound using four slots instead of two as in the

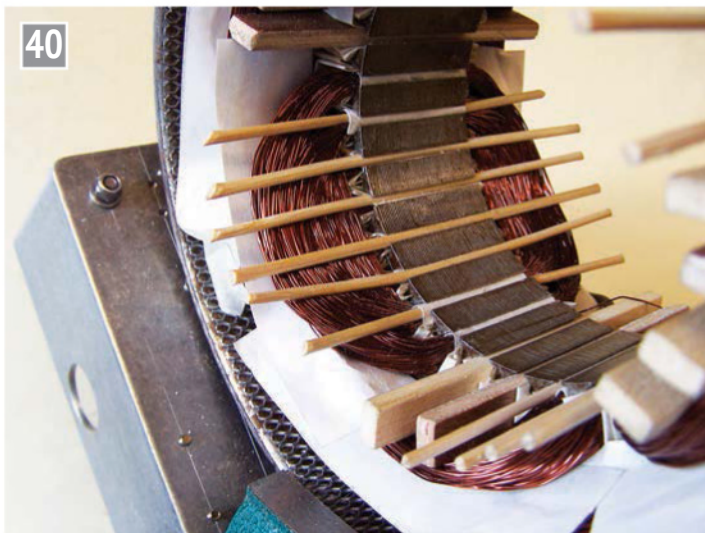
eight-pole winding. This is to keep the conductors per slot constant for each pole as described before.

I used bamboo barbecue skewers pushed down the main winding slots to ensure that the auxiliary winding would not be wound too tightly so as to impinge on the stator bore which would prevent the rotor being inserted on final assembly (**photo 39**). Also visible in photo 39 are small tapered wedges cut from craft sticks to keep this last winding as close to the bottom of the slots as possible, to keep the winding clear of the stator bore. For some strange reason, my local supermarket does not seem to stock bamboo barbecue skewers in January, so planning ahead was necessary to buy them the previous July.

The first pole was wound with 135 turns passing through the inner two slots of the pole, followed by a second set wound through the outer two



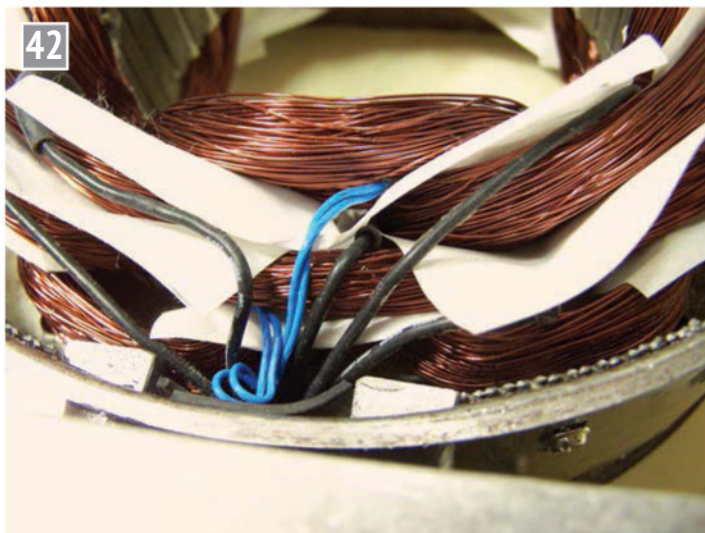
Starting the four-pole second phase winding - note the inter-phase insulation and the tapered craft sticks to space the winding down the slot.



The first pole of the four-pole second phase in place.



Fitting a slot closer with the inter-phase insulation fitted and held in place with masking tape.



The second four-pole phase completed and the PTC thermistors inserted between the phases.

slots (**photo 40**). As the turns were quite difficult to get in, I used a lot of coffee stirrers, bamboo barbecue skewers and wooden craft sticks to press the wire into the slots. The wooden craft sticks are much stronger than the coffee stirrers but, as they are a bit thicker, it can be difficult to fit them down the slots. They do, however, allow the wire to be pressed more firmly into each of the slots.

Finally, all the slot closers were fitted (**photo 41**) along with two thermistors prior to using the electrical varnish to encapsulate the windings. It was a bit of a struggle to get all the turns in along with the slot liners and closers but, with patience and care in equal proportions, I finally managed

it. The masking tape holding the inter-winding and inter-phase insulation could then be removed without fear of the windings coming out of the slots. I used one thermistor for each speed and placed it between the overlap of each of the two phase coils, so that either coil becoming too hot would trigger the thermistor and cut off the supply. As only one winding was in use at any one time, I used a second thermistor for the other winding. I put the thermistor down the auxiliary ('Z' winding) side of the inter-phase insulation and hence in direct contact with the auxiliary winding as this is more likely to run hotter on low load, so the more vulnerable winding would be the more likely to



The rotor wrapped in aramid paper to protect the windings whilst inserting the rotor into the stator.

trip the over-temperature protection (**photo 42**).

The windings and insulation were then liberally soaked in electrical varnish and left to dry. Then it was time to re-assemble the motor taking great care to fit a piece of the aramid paper insulation inside the stator to make sure that when inserting the rotor, the enamel of the windings is not scratched by the edge of the rotor laminations (**photo 43**).

Terminal marking

I decided that since I was rewinding the motor to be completely different in speed and power from the original motor, I should mark the terminals properly. I consulted the appropriate IEC Standard for terminal marking and

direction of rotation (**ref 20**). This details that the terminals for the main winding of a single-phase permanent capacitor machine are designated as U1 and U2, with the auxiliary winding as Z1 and Z2. The direction of rotation is clockwise looking on the drive end of the shaft when the auxiliary winding is arranged with U1 and Z1 connected together to the line and U2 and Z2 are connected to the capacitor, with the neutral to U2. The capacitor connections are designated CA1 and CA2.

Where there are two speeds and two separate windings (as in this case) there is not a specific example shown in the Standard, so I followed the rules given in Section 6 of the Standard for the terminal

It is considered good practice to include a connection diagram and description of the rewinding details inside the terminal box so that the next user of the motor knows exactly what the motor does.

numbering. The rules in the Standard state that for motors with more than one speed, the windings for each speed are prefixed with a number, the lowest number indicating the lowest speed. This meant that for the lower speed, I had to mark the main winding terminals 1U1 and 1U2 and the auxiliary windings 1Z1 and 1Z2. Similarly, the higher speed winding terminals were marked 2U1 and 2U2 and the auxiliary windings 2Z1 and 2Z2. Since I had also installed two positive temperature coefficient thermistors, I labelled the first 1TP1 and 1TP2 for the lower speed and the second 2TP1 and 2TP2 for the higher speed, also in accordance to the Standard. As there is only one capacitor, it was labelled CA1 and CA2. I mounted the

capacitor inside the terminal box and fitted a 470kΩ 0.6W discharge resistor across the capacitor for safety. The connections, according to the Standard, are given in **table 5**. L1 and L2 are the supply lines, in this case with L1 being the live of the supply and L2 being the neutral of the supply. This is strictly in accordance with the IEC Standard.

As my motor needed to rotate counter-clockwise to drive the lathe, I had to connect the auxiliary winding so that 1U2 and 1Z1 were connected together with the capacitor connected between 1U1 and 1Z2. The supply goes to terminals 1U1 and 1U2. That was for the low eight-pole speed. For the high four-pole speed, I had to connect the auxiliary winding so that 2U2 and 2Z1 were connected together with the capacitor connected between 2U1 and 2Z2. The supply goes to terminals 2U1 and 2U2 (**photo 44**). When I tested the motor, the actual rotation was incorrect on one speed, so I interchanged the leads connected to the auxiliary

winding of that speed, which reversed the motor. I also swapped the numbers on the leads for that winding.

Whilst not a requirement of that Standard, it is considered good practice to include a connection diagram and description of the rewinding details inside the terminal box so that the next user of the motor knows exactly what the motor does and can easily connect it to the supply without any problems – no one lives forever and my motor may well outlast me! Therefore, I

made a paper label with this information printed on it and stuck it to the inside of the terminal box lid and covered it with a transparent plastic film. I also had new etched nameplate made and stamped all the details on – just to complete the illusion that the motor had been properly designed. Finally, I painted the motor with a dark 'Admiralty Grey' paint (colour ref: 18B25, **ref 21**) which reasonably matches the common grey colour of many commercial motors (**photo 45**).

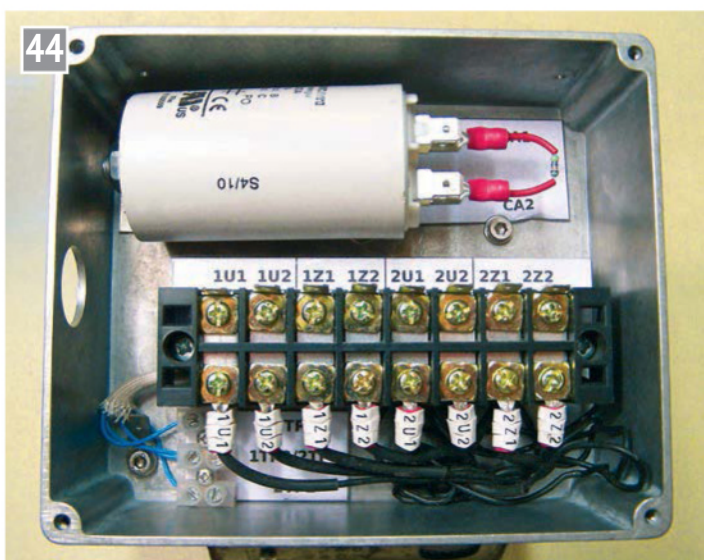
●To be continued.

Table 5. Terminal connections according to IEC Standard IEC 60034-8:2002.

Rotation	L1	L2	Join together
Low speed clockwise	1U1	1U2	[1U1, 1Z1]; [1U2, CA1]; [CA2, 1Z2]
Low speed counter-clockwise	1U1	1U2	[1U2, 1Z1]; [1U1, CA1]; [CA2, 1Z2]
High speed clockwise	2U1	2U2	[2U1, 2Z1]; [2U2, CA1]; [CA2, 2Z2]
High speed counter-clockwise	2U1	2U2	[2U2, 2Z1]; [2U1, CA1]; [CA2, 2Z2]

REFERENCES

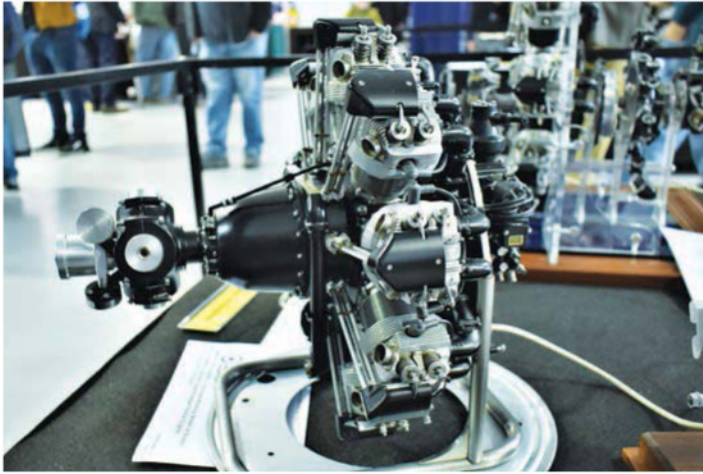
20. International Electrotechnical Commission Standard IEC 60034-8:2002, *Rotating electrical machines – Part 8 – Terminal marking and direction of rotation*.
21. British Standard BS4800:2011 *Schedule of paint colours for building purposes*, Paint Specification No. 18B25 (commonly named 'dark Admiralty grey' or 'Merlin').



The new terminal box with the terminals and leads all labelled.



The completed motor in dark Admiralty grey paint.



Mike Tull's 1/4 scale model of a Bristol Mercury MK 8, nine-cylinder radial engine.



The 1:3.5 scale BSA DBD34 Gold Star motorcycle built by John Luscott.

Midlands Model Engineering Exhibition Highlights

John Arrowsmith gives his initial impressions of the first Midlands show for three years.



I suppose the main highlight was having an exhibition to attend after a period of 2½ years without any similar event in the UK. This was always a regular feature of the model engineer's calendar over the years and the contents, like all past shows, varied from year to year. This one was something special with a range of high-quality exhibits to satisfy the most discerning visitor.

All classes of competition except one had entries and all displayed a range of quality models that really did showcase the wonderful skills of model engineers throughout the UK. This exhibition was the first one without its founder Chris Deith in charge and I know the organisers were wondering what response they would get from both exhibitors and visitors. They needn't have worried because the response was superb. The exhibition also featured a brand-new



The Mercer 35J Raceabout car by Brian Swann.

trophy which was for the best working model exhibited in the competition classes. I can say that all 13 judges agreed on the winner of this new trophy which was a very pleasing result in itself. The trophy was named The Chris Deith Memorial trophy in his honour and to remember the founder of this exhibition and his wonderful contribution to model engineering in general. The winner of this trophy was Mike Tull for his outstanding example of a working 1/4 scale model of a Bristol Mercury MK8, 9 cylinder supercharged

radial engine. This model was also the winner of Class 8 in the main competition. It really was a work of art as far as I, and many other people, were concerned.

The opening on Thursday morning was anticipated with great interest with the queue to get in at 10am stretching right back into the car park. The atmosphere in the hall changed immediately from one of busy endeavour, as the exhibitors and traders all prepared their stands, to the familiar world of old friends catching up with one another



This superb example of a Southern Railway Schools Class 4-4-0 Epsom was built by Paul Norrington.

and the chatter as the exhibits began to be admired with great interest. There was so much to see and enjoy and another model which attracted a great deal of attention was the 1:3.5 scale model of a BSA DBD34 Gold Star motorcycle built and exhibited by John Luscott. This was also a stand out exhibit and one of the judges was waxing lyrical about it because he still owns and rides one of these machines. Another road vehicle also took the eye with the 1913 Mercer 35J Raceabout car built by Brian Swann.

Moving onto the locomotive section was another joy for steam enthusiasts with a range of top-quality models in both competition and display. How the judges sorted this class out I do not know but it must have been very close indeed. The winner here was Paul Norrington with a superb example in five-inch gauge of a Southern Railway Schools Class 4-4-0 *Epsom*. The other five entries were also amazing examples and they will be shown in the forthcoming competition section report in due course. Throughout the show there were countless examples of fine models and the large crowds attending were able to inspect and admire the presentations. The trade input was also excellent with most of the major suppliers taking part and, I understand, having a positive result for their efforts. One

supplier I know has stopped taking orders not because there is anything wrong but because their order books are so full they need to adjust to this situation. Now that is a positive answer to all those who say model engineering is a dying hobby!

This exhibition has always been renowned for its good catering facilities and this year there were four outlets providing services to keep the inner man going but again this year that steak and kidney pie they serve up was first class. At the end of the last day the presentations were made to all the competition winners and these are always pleasant times with many familiar faces getting awards but lots of young people being rewarded for their efforts, which at this show were very much in the forefront of many people's minds and they are starting to show that they are a real force to be reckoned with.

In closing the award ceremony Chief Judge Bob Moore thanked everyone for their support and attendance and echoed the main compliment of the day, that it was so nice to be back again and enjoying a model engineering exhibition. There was hearty applause for that statement. All these competition entries and display areas will be covered in my subsequent reports on the exhibition.



A 1/2 scale model of sailing ketch Ashmead by Anthony Judd.

Moving onto the locomotive section was another joy for steam enthusiasts with a range of top-quality models in both competition and display. How the judges sorted this class out I do not know but it must have been very close indeed.



ME *A small weight driven tower clock by Andrew Dunn.*

Ron Fitzgerald takes a look at the history and development of the stationary steam engine.

Continued from p.531
M.E. 4701, 7 October 2022

The Stationary Steam Engine

PART 39 – MATTHEW MURRAY AND THE ROUND FOUNDRY (cont.)
The fireproof buildings

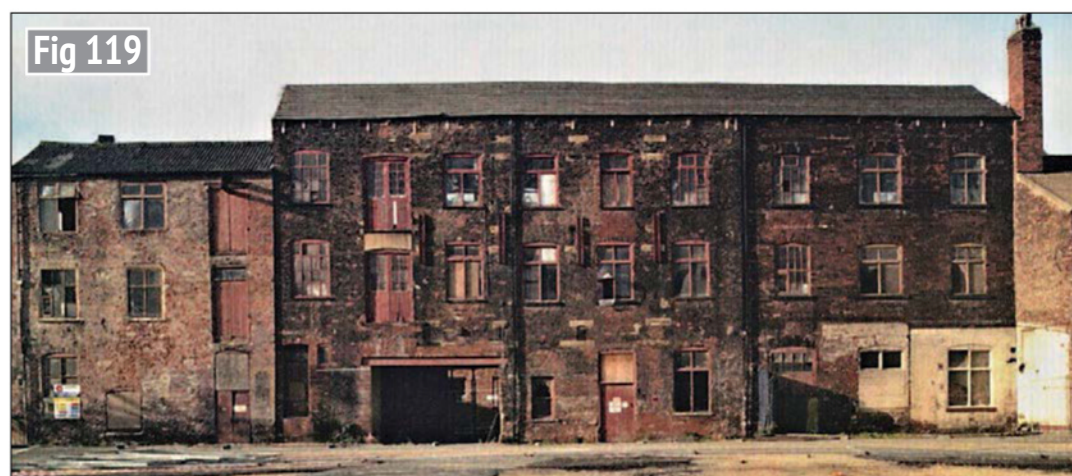


Fig 119
The East Elevation of the two fire-resisting buildings, left to centre and the later building, right, that replaced the engine and boiler house. The Drysand Foundry is on the extreme right. Survey by Structural Perspectives in 2005.

inevitably, fire damage and demolition have removed buildings that were once part of Fenton, Murray and Wood's works but those that survive are uniquely remarkable. There is nothing comparable elsewhere in Britain to the foundry buildings but of the other buildings that remain two can claim national significance beyond being part of the oldest standing engineering works in the world (**fig 119**).

In the course of discussing the Greensand Foundry reference was made to the south pavilion and its fire-resisting floor, datable to May 1796. The system, used to guard against fire, relied upon timber beams spanning between the brick walls with segmental brick arches between the beams which replaced traditional timber bridging joists and floor boards. The historical origin of this floor system has been

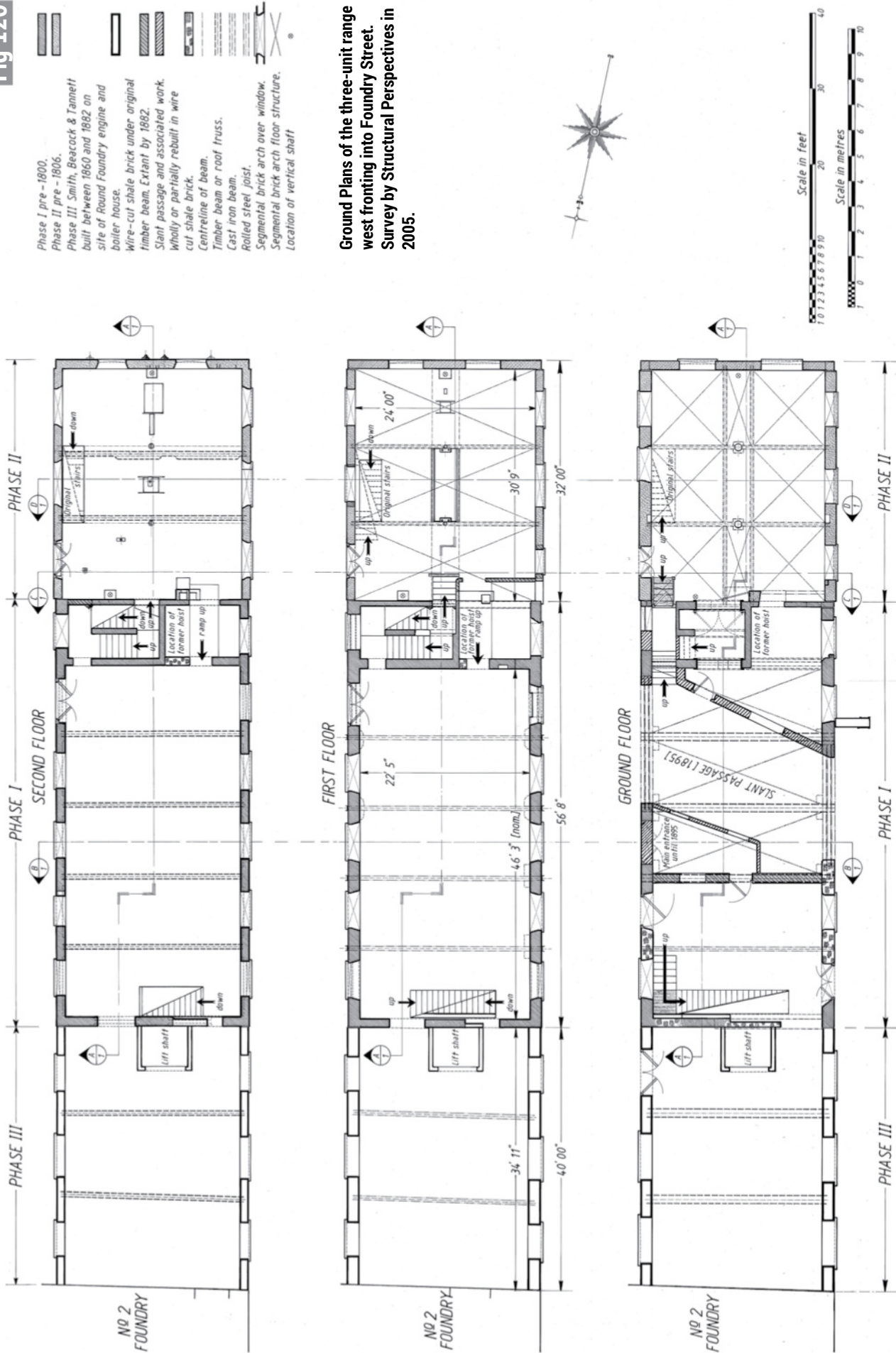
shown to have been William Strutt's mills in Derbyshire built between 1791 and 1792. The next stage in the evolution of the 'fireproof' factory building has also been described, the Ditherington Flax Mill of 1796-1797 by Marshall, the Benyons and Charles Bage. Bage made the decisive contribution by substituting cast-iron beams for the older timber construction. The beams carried segmental brick arches which formed the ceiling and the floor above. Murray was heavily involved at the Shrewsbury mill, supplying the machinery and the second steam engine. It is fair to assume that he was fully abreast of the latest thinking concerning fire-resisting buildings.

The Greensand Foundry with its pavilion was almost certainly complete before construction of the Ditherington Mill was started

(**ref 206**) and Bage's ideas on iron framing would still be emerging as the next buildings on the Murray site were being raised, a range extending south from the Drysand Foundry. This area is today occupied by a brick-built block divided internally into three units. The northernmost of these units consists of three bays built after 1878, occupying the site of the engine and boiler house originally attached to the foundry. The two further units continue the range to the south where they adjoined the forge with its engine and boiler house. The forge and its attendant buildings were also demolished in the eighteen-seventies.

The two older units of the range use the same constructional materials as the foundries, hand-made brick laid in white lime mortar. The larger unit is sandwiched between the post-1878 block

Fig 120



to the north and the smaller block to the south. It has an external length of 56 feet 8 inches divided externally into six window/pier bays (**fig 120**). Internally, the main floor is 22 feet 6 inches wide and 46 feet 3 inches long, made up of five bays; the remaining bay is occupied by a fireproof brick and stone stair tower. Today, the building consists of a ground floor and two storeys above but there is evidence of a third floor which has now been removed from window sill level upwards.

The original interior floor structures throughout most of this building were removed in 1957 following a fire and replaced by rolled steel joist and timber floors but three bays of the earlier floor survive at the south end of the ground floor level. This surviving section of floor construction is of the same pattern as that used in the pavilion of the Greensand Foundry but whereas the timber beams only remain in the pavilion here the beams still carry brick arches, plastered under the soffit. Sufficient evidence remains on the other floors to prove that this fireproof flooring was used throughout the building when it was first built.

The floor-to-ceiling height at ground floor level is loftier than it is on the other floors - 13 feet compared to 9 feet 6 inches. The stair tower gives personnel access between the floors but the vertical movement of goods was by way of loading loopholes at each floor, rising through the penultimate south bay of the yard elevation (**fig 121**). The main personnel entry from the yard was through a semi-circular header-brick arched door, now blocked. All of the other openings, including the slant passage, are more recent.

The second building of this range abuts the south gable stair tower of the five-bay block. The total internal length is 30 feet 9 inches and the internal width is 23 feet at ground floor level and 24 feet within the two floors above. Because it is externally wider

than the five-bay unit there is a vertical half-brick step in the brickwork which runs for the full height on both elevations. There is no continuity in the brick coursing between the two buildings and bonding is entirely absent. The south gable of the building is also anomalous as the ground floor and first floor levels are of more recent date than the top floor, which is contemporary with the elevation brickwork. The lower part of this gable was rebuilt after the adjoining forge engine house was removed. Again, there is lack of bond between the more recent parts of the gable and the side walls. Hand-sized open cracks existed at the angles before restoration.

When first built, the building had its own internal stairs between floors. A flight of stone steps internally cantilevered out from the wall rose from ground level to first floor and similar stairs passed from first to second floor. A circular window stitched in between the two stair flights illuminated the lower staircase and a conventional, enlarged, window lit the upper flight. Goods transfer between levels was again by loading loopholes in the bay next to the stair tower.

Originally there was no internal access between the two buildings and the suspended floor levels are appreciably different. When communication was broken through from the stair tower in the later nineteenth-century steps had to be inserted from the landings into the first and second floors of the smaller block but the arrangement was improvised and awkward. It was probably at this time that the original stairs were removed in the small block.

If the Greensand Foundry pavilion and the five-bay block of this range initiated Murray and Wood into the technology of building fire-resisting structures with timber floor beams and brick arches, the smaller unit marks a notable advance as the interior frame structure is entirely

constructed of cast-iron. The suspended floors at ground and first levels are spanned, north-to-south, by three brick arches each of 10 feet 3 inches cord line span. The arches spring from cast-iron 'L'-section wall plates where they meet the gable and the stair tower walls. Between the gables, two lines of cast-iron beams provide the arch support. Each consists of two separate beam castings with a free span of approximately 11 feet. At the outer ends, the beams are built into the elevation walls but the mid-span junction between the two beams is supported by hollow cylindrical cast-iron columns. At ground floor level the columns have an effective height of 11 feet 6 inches for an external diameter of 11½ inches with no taper. The shafts are plain, terminating in one inch thick, 1 foot 4 inches square plates, top and bottom. The bottom plates rest on ashlar block footings.

The cast-iron beams are of an inverted 'T'-cross section, parallel in longitudinal profile, one foot deep including the bottom flange which has a thickness of 1½ inches and a width of 4¼ inches. At the mid-span support over the columns the bottom flange abruptly increases in width to form a bearing plate and, with its adjacent beam, forms a 1 foot 4 inches square baseplate which is bolted to the top plate of the column. Above the beam baseplate the web of the beam is swelled to form a 'D'-section and each 'D'-section of the abutting beams rises to form a circular spigot above the top edge of the beam. The hollow centre of the columns supporting the floor beams of the next floor is slipped over the spigot, locking the two beam ends together.

The upper floor columns are much more slender, tapering from 6¼ inches external diameter at the base to 5¼ at the cap which is decorated by an annulus and a moulded capital. The beams carrying the first floor are similar to the floor below - inverted 'T'-section with parallel profile

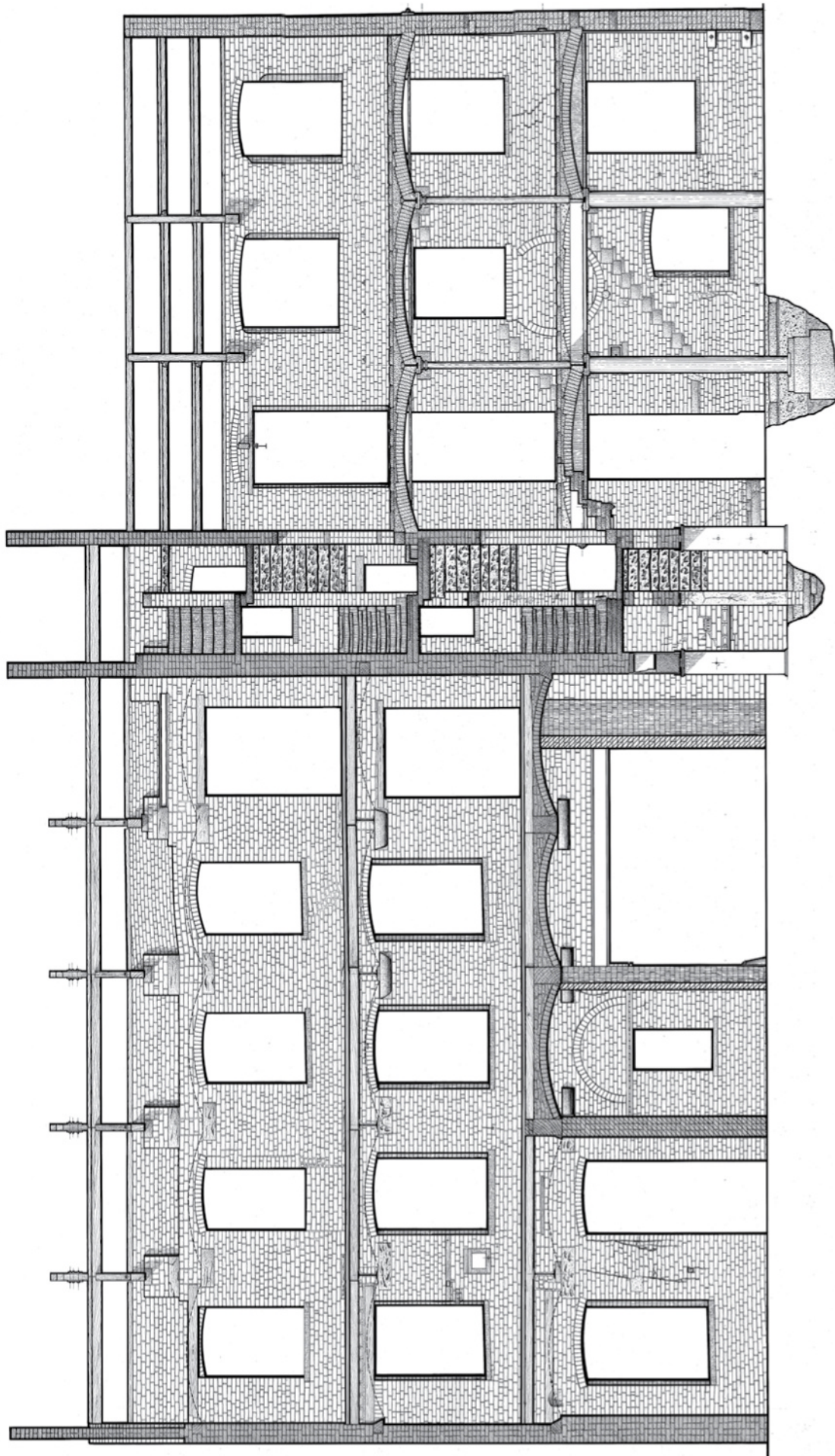
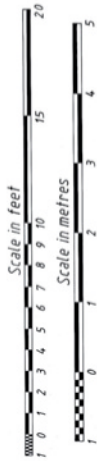
- but the total depth is reduced to 10 inches. The abutting detail is the same as on the floor below but as there is no column on the next floor above a wrought-iron shrink ring is used to draw the two ends together. Where the baseplates of the beams rest on the square top plates of the columns, bolted fastenings are used to secure the beams but the weight and rigidity of the arches is the main agent holding the beams and the columns in place (**fig 122**).

That the emergence of the fireproof factory building in its ultimate development, the iron-frame, is regarded as a watershed comparable to the Watt steam engine in the history of technology stands repetition. The general lines upon which it evolved after the Ditherington Mill have been outlined in a number of articles and a summary of this work appeared in the *Industrial Archaeology Review* Vol. X, Number 2, spring 1988. The next major contribution was made by George Augustus Lee and his partner Phillips when they erected the Salford Twist Mill in 1799. The form of beam used by Lee remains controversial but it is likely that it differed little from the Ditherington beams with prismoidal skewbacks to support the brick arch. What is well established is the use of hollow cylindrical cast-iron columns to support the beams at mid-span in this mill compared to the earlier solid cruciform section used at Ditherington.

Somewhat more certainty prevails when, what is traditionally regarded as the next landmark mill was built, the Benyon brother's flax mill in Leeds, in what later became Sweet Street, off Meadow Lane, within three hundred yards of Murray and Wood's works. The mill was constructed in 1802 and here the beams attained the form which was to be standard for the next thirty years, the inverted 'T'-cross section with the bottom flange supporting the brick arches. Benjamin

Long section through the Phase I and Phase II buildings looking from Foundry Street. Survey by Structural Perspectives in 2005.

Fig 121



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Tel: 01427 340799 Fax: 01427 340795 Mobile: 07764 864441

Grid Reference

Job Number

Site

ROUND FOUNDRY, WATER LANE, HOLBECK, LEEDS.

Drawing Title

TIMBER BEAM FIREPROOF AND
CAST-IRON FRAMED MULTI-STORY BLOCK AT A-A, TRUSSES AT E-E.

Sheet of Surveyed
Sheets Drawn

Transverse section through the Phase I and Phase II buildings.
Survey by Structural Perspectives in 2005.

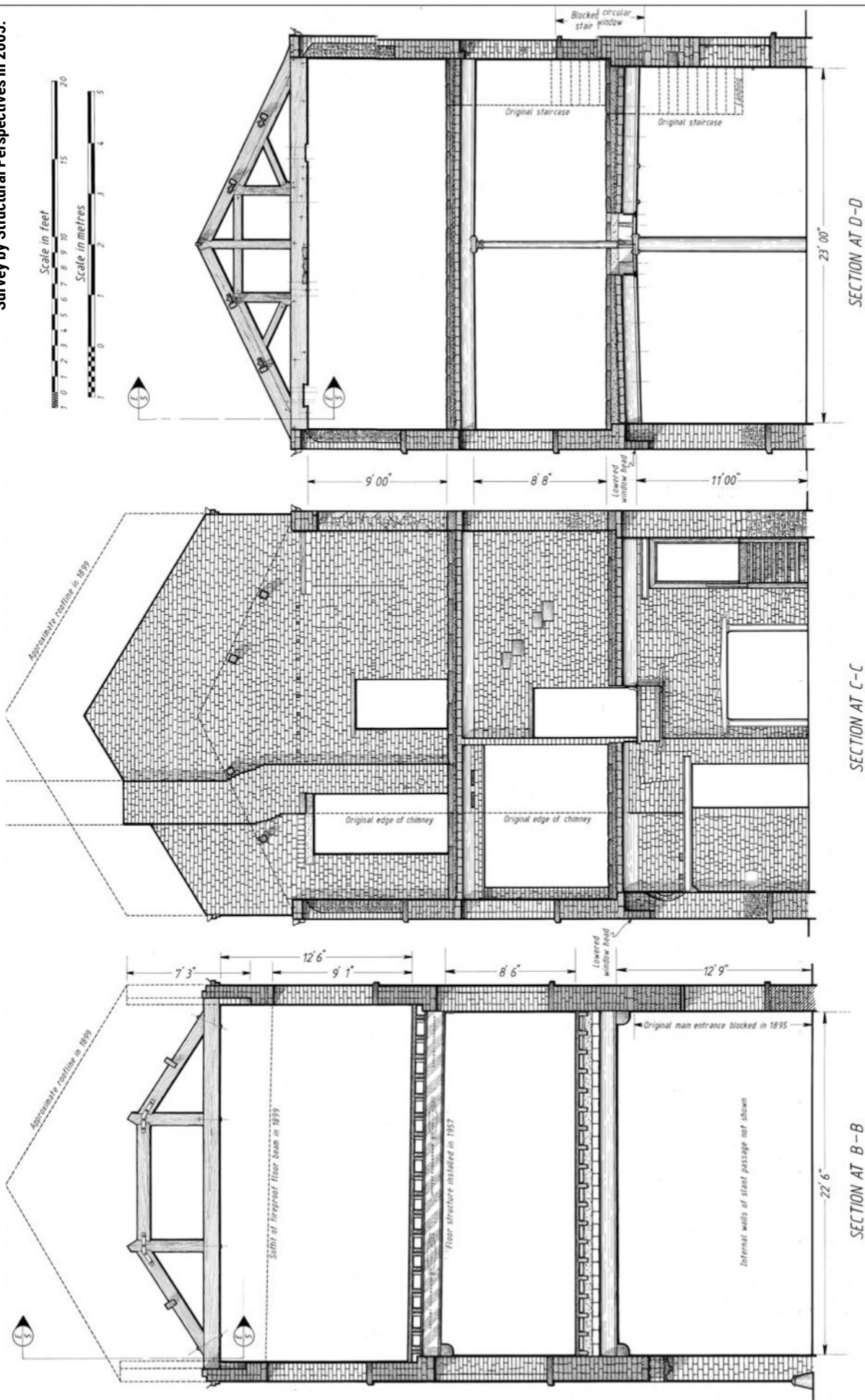


Fig 122

Structural Perspectives © 48 Holdsworth Road, Holmfirth, Halifax, HX3 9SZ. Tel: 01422 240789 Fax: 01422 240785 Mobile: 0776 864841	Grid Reference	Job Number	Site	Drawing Title	Sheet of Sheets	Surveyed Drawn
			ROUND FOUNDRY, WATER LANE, HOLBECK, LEEDS.	TIMBER BEAM FIREPROOF AND CAST-IRON FRAMED MULTI-STOREY BLOCK, AT B-B, C-C AND D-D.		

Gott's Armley Mill followed after 1805. It was heavily influenced by the Salford Twist Mill, Lee being a close friend of Gott. Armley Mill, today the Leeds Industrial Museum, uses inverted 'T'-section beams with plain rectangular bottom flanges and hollow cylindrical cast-iron columns.

This history of the iron framed building has not previously included Murray and Wood's works but by using the insurance policies the dates of the buildings can be determined and this omission rectified. The two most conclusive references are both from 1804 - the Royal Exchange policy of 29th April and the Sun Life policy of the 29th September. The earlier of the two refers to a:

...Building used for machine shops and model chamber (near fireproof)

The Sun Life policy has:

...Another building used as machine shops with under chambers brick ... Fireproof, lettered 'H' nearby.

The Sun Life building can be located most readily. It was identified in the policy by the letter *...H...* and was succeeded by the description of the engine house with engine, boiler maker's shops and forge, lettered 'I', 'K', 'L', 'M'. A clause in the policy then states the following to be the case:

...Warranted that the engine house last mentioned and another smaller engine house no...(?)... situate on the other side of the building lettered 'H' be each divided from the said building by a brick wall carried to & through the roof and that neither of the said steam engine houses have any connection with the said building lettered 'H' than by an aperture in the wall to admit a shaft.

Thus the building *...H...* lies between two engine houses one of which is the forge engine house and the other of which can only be the engine house positioned at the south end of the Drysand Foundry.

The distinction between *...near fireproof...* and *...fireproof...* may be a semantic one in referring to the same building



Fig 123
Parallel cast iron beams in iron framed building. The hatch between floors lies between the columns but was boarded over at the time that the photograph was taken. Lifting eyes and bolts set into main transverse beams. Survey by Structural Perspectives in 2005.

or it may be of consequence as differentiating two buildings, one *near fireproof* by virtue of its having timber main beams and the other more definitively *fireproof* as a consequence of a wholly iron frame. Whatever the case, the inference of the above discussion is that this building or buildings were in existence by the end of 1804.

The 1804 insurance policies describe both of the fireproof buildings as *...machine shops...*. At this period there is nothing other than this statement to further amplify upon the activities that they accommodated but from the evidence of the standing structure it is clear that they were designed with definite functions in view. This is especially the case in terms of the ground floors. In both units the ground floor to ceiling height is greater than on the floors above - 13 feet in the timber beam building and 11 feet 6 inches in the all-iron framed building. In spite of this loftiness neither of the goods access door openings would allow particularly large items to pass into and out of the buildings. The loopholes into the timber framed building are 5 feet 6 inches wide and those the iron-framed building are less at 4 feet 3 inches. The impression is that whilst the buildings were not expected to handle the largest castings or forgings, headroom was important, possibly to allow

loading machine tools from above by cranes or rope tackles.

The construction of the ceiling above the ground floor in the iron-framed building is more specialised than the timber beam floored building and its peculiar form lends some substance the above argument. The most conspicuous feature is the rectangular opening through the floor structure which gives communication between the ground and the first floor. Two parallel, inverted 'T'-section, cast-iron beams run from gable to gable with a separation of 3 feet 6 inches (**fig 123**). Although the beams extend longitudinally for the full length between gables, the open void between floors is confined to the centre bay; the two flanking bays are filled with brick arches. It seems reasonable to imagine that the purpose of this opening between floors was to gain extra height over work being carried out on the ground floor and possibly to facilitate lifting.

Lifting from above is more obviously evident as a function in the transverse cast-iron beams that support the brick arches. At regular intervals throughout their length cast-in holes are provided which pass through the centre of the bottom flange and up through the full depth of the web which is swelled into a cylindrical tube to take lifting bolts. In

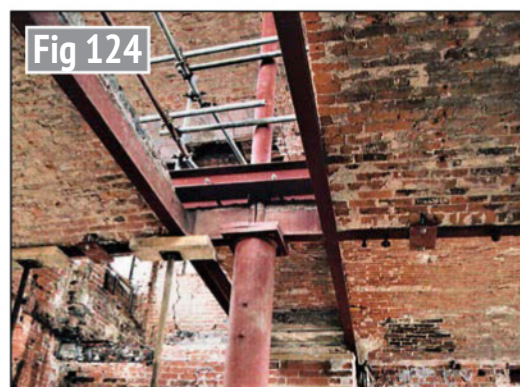


Fig 124
Parallel cast iron beams in iron framed building. Hatch opened up during installation of remedial steelwork. The junction between the transverse beams can be seen above the column top plate. To the right of the longitudinal cast-iron beam the dark patch in the brick arch against the wall marks the position of the vertical shaft. Survey by Structural Perspectives in 2005.

two places lifting eyes are still extant and in other places bolts remain *in situ* (**fig 124**).

Several generations of power distribution by shafting were evident in both buildings but the only place where the remains could be unambiguously said to have been original was at the northern end of the iron-framed building where brick patching in the final arch of the ground and floor above marked the position of a vertical shaft. Other than this, there was nothing in the building fabric or of an archaeological nature to indicate either the type of machinery which worked in the building or its location. It should also be added that these buildings are shown on maps and plans as being used for different functions at different times. In 1844 the two were described as the *...New Boring Mill...* but five years later, after the site was occupied by the successors to Fenton Murray and Jackson, they have become a *...Fitting Up Shop...*

●To be continued.

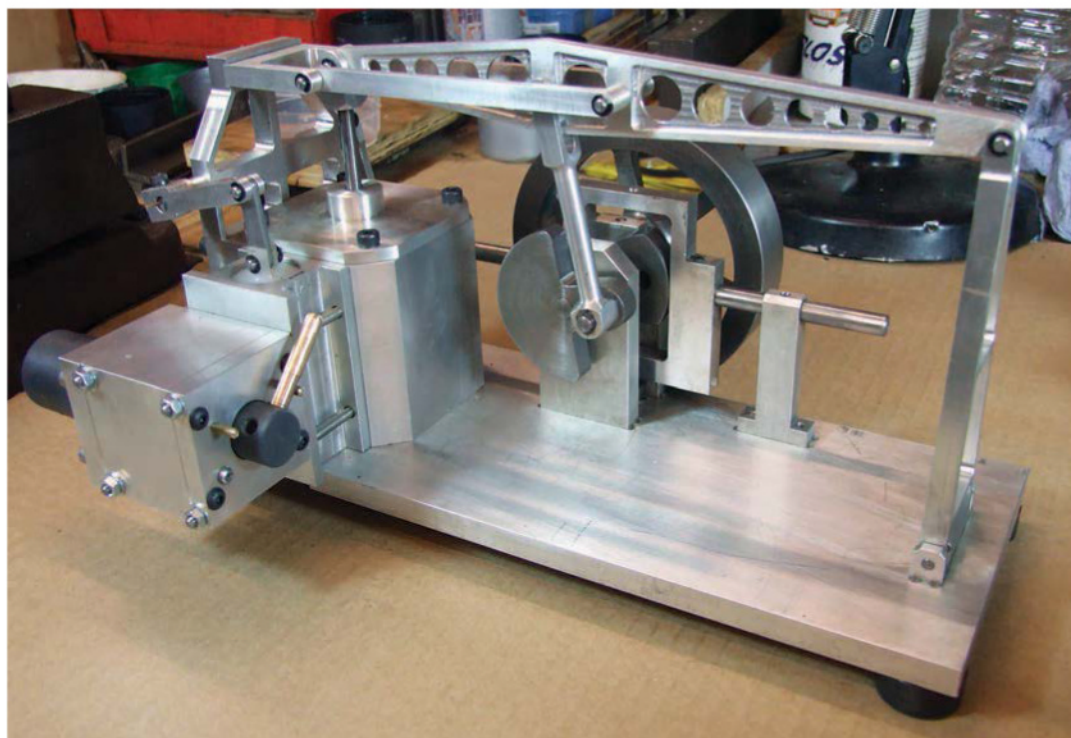
REFERENCE

206. *Ditherington Mill and the Industrial Revolution*
Ed. Colum Giles and Mike Williams, Pub. Historic England, 2015, p.35.

Martin Gearing presents an ideal beginner's project with great potential for the more experienced builder.



Continued from p.551
M.E. 4702, 21 October 2022



PART 6

Grasshopper Beam Engine

Item 10 – Crank Pin (fig 17)

Ø6 silver steel

* Face off the silver steel to length and chamfer each end - put to one side.

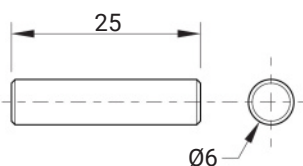
Item 11 – Crank Shaft (fig 18)

Ø8 silver steel

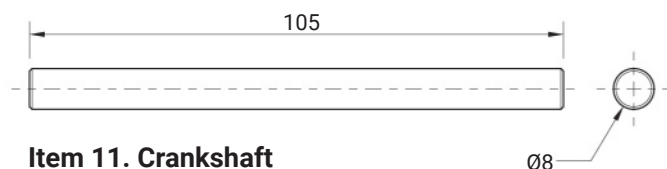
* Face off the silver steel to length and chamfer each end - put to one side.

All dimensions are in mm
Tolerance for all parts in the article - unless otherwise stated:
Non-functional (i.e parts that do not fit all match) $\pm 0.1\text{mm}$
Functional (i.e parts having to match) $\pm 0.02\text{mm}$

Fig 17



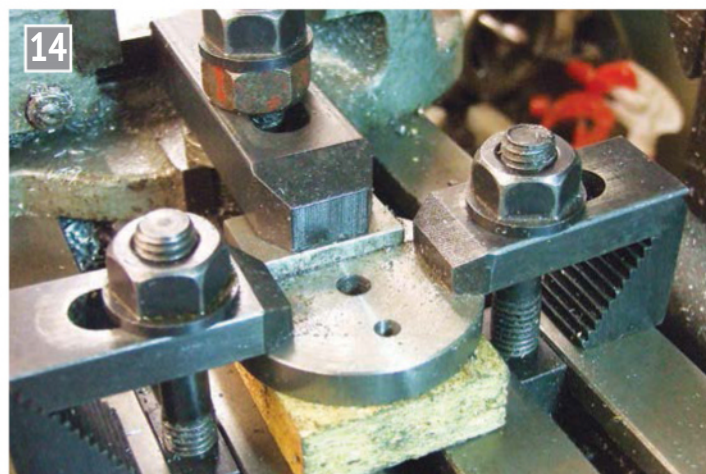
Item 10. Crank Pin
Mat'l: Silver steel
Chamfer all edges 0.5 x 45°



Item 11. Crankshaft

Mat'l: Silver steel
Chamfer all edges 0.5 x 45°

Fig 18



Drilling the holes for the crankshaft and the crank pin.

Item 12 – Crank Web (fig 19)

5083 aluminium plate

* Hold in a self-centring chuck on the lathe using the outside jaw set. Face off and chamfer the edge. Turn over making sure the faced surface is in full contact with all jaws and face off to 10 thickness. Chamfer the edge. Centre drill for reference.

* Place on the mill on a piece of manufactured board at least 18mm thick and clamp in three places close to the edge (for peace of mind with the centre over a tee slot) – two on the Y axis and one on the X axis, all close to the edge.
* Position the spindle to the centre drilled hole and zero the X and Y axes.

NOTE - The following suggestions relate to the blank being clamped as shown in photo 14, and are suggested to avoid initial 'climb milling' when removing the peaks left after close chain drilling.

This is a modified method of conventional chain drilling that I refined over several years to speed up the process and have found to be indispensable for quickly making 'severance' cuts through material when clamped to a milling table, on either a sacrificial plate or manufactured board packing to protect the mill table. It uses a slot drill generally half the material thickness in diameter, with the machine



Fig 20

OP1
Ø5 Slot Drill

OP2
Ø5 Slot Drill

OP3
Ø6 End Mill

OP4
Ø6 End Mill

OP5
Ø5 Slot Drill

OP6
Ø5 Slot Drill

OP7
Ø6 End Mill

OP8
Ø6 End Mill

Crank Web - Waste Removal

Crank Web - Waste Removal

spindle having its depth stop set to allow the drill to feed about 1mm through the plate. After the initial 'start' hole is drilled, the spindle is raised, the plate is moved a small increment (between 1 and 2mm depending on the diameter of cutter being used), and the drill fed down to the stop again before raising clear and repeating the process until the length required is completed. It's very easy to get into a routine (usually the table feed required relates to either a third or a quarter turn of the feed wheel so no time is spent looking at dials), and it's amazing how fast you can cover distance! Because the cutter is only cutting a small crescent of material rather than a full diameter, the centre of the cutter, that 'ploughs' rather than cuts, never becomes involved in the cutting process - so the cutter works freely. The only caveat is the spindle down-feed rate should appreciate the load being imposed on the cutter, so a feel has to be developed. Just don't be too heavy handed when first starting, otherwise you'll end up with the tips of the cutter snapping off – you'll only do it once!

Figure 20 summarises the following procedure for forming the crank web (note that, in the figure, the X direction is vertical and the Y direction is horizontal).

- * Op 1 - Remove the outer Y axis clamp to allow removal of the waste from the one side of the web 'close chain drilling' (described above). Install a Ø5 slot drill (preferably a three flute centre cutting). Set the spindle depth stop, after touching the top surface of the blank, to 11. Go to X4, Y-12, and then in 1mm steps outwards on the X axis, until completely clear of the web.
- * Op 2 - Move to X4, Y-34 and go in 1mm steps on the Y axis until arriving at X4, Y-12. The waste will fall away.
- * Op 3 - Change to a Ø6 end mill. Go to X4, Y-12. Feed the cutter down slowly into the blank 11mm, then feed carefully outwards until completely clear of the web on the X axis to remove the 'peaks' left from the 'close chain drilling'. Slowly return to X4, Y-12 which is technically 'climb milling' but because you are only taking a spring cut there will be no grabbing issues but will give an improved finish.
- * Op 4 - Go to X4, Y-34, then feed carefully to X4, Y-12 on the Y axis to remove the peaks left from the close chain drilling. Slowly return to X4, Y-34 until clear of the web taking a spring cut to improve the finish.
- * Replace the outer clamp on the edge of the machined web and remove the one opposite (inner edge).
- * Op 5 - Change back to the Ø5 Slot drill. Repeat removal of waste by close chain drilling as before, starting at X4, Y12, and then in 1mm steps outwards on the Y axis until completely clear of the web.
- * Op 6 - Go to X34, Y12 and go in 1mm steps on the X axis until arriving at X4, Y12. The waste will fall away.
- * Op 7 - Change to a Ø6 end mill. Start at X4, Y12. Feed the cutter down slowly into the blank 11mm, then feed carefully outwards on the Y axis to remove the peaks left from the close chain drilling until clear of the web. Slowly return to X4, Y12 to give an improved finish.
- * Op 8 - Go to X34, Y12 and slowly feed inwards on the X axis to remove the peaks left from the close chain drilling until back to X4, Y12, then slowly return to X34, Y12 to improve the finish (**photo 15**).
- * Slip a short length of Ø6 stock through the reamed crankpin



Creating the web on the crank disk.



Forming the radius around the crank pin.

- hole and if necessary use two suitable equal width parallels to raise the crank disk just clear of the vice base to enable the crank disk to be held whilst resting on the Ø6 pin. Position the web to vertical by eye.
- * Using a 12 or larger end mill adjust the end face of the cutter to just take a skim when the crank disk is passed under the rotating cutter. Zero the Z axis. Move the work clear on the Y axis.
- * Raise the work 3.9mm. Pass the work under the cutter on the Y axis until clear. Stop the spindle – ON NO ACCOUNT MOVE THE WORK UNLESS THE SPINDLE IS AT COMPLETE STANDSTILL.
- * Loosen the crank disk, re-clamping it after rotating it slightly around the Ø6 pin, before passing it again under the rotating cutter. Stop the spindle.
- * Continue this procedure rotating the crank disk until the web is just short of horizontal. This will leave a number of facets forming a half radius on the end of the web, the size of which will depend on how much you rotated the crank disk each time. Repeat for the second side of the web end.
- * Removing the bulk of the waste in this manner only requires the brief application of a file to produce an acceptable radius true to the crankpin centre (**photo 16**).
- * Hold the crank disk with the Ø8 reamed crankshaft hole visible and the machined surface of the balance weight at 45 degrees to the vice jaw. Zero the spindle to the centre of the width and clamp the slide.
- * Set the spindle central to the crank disk outside diameter/crankshaft hole by the use of a strip of steel (I use a straight piece of steel strapping in preference to the more commonly used steel rule) - just gripped by the tip of the point machined on the end of a short stub of silver steel is acceptable. Move the disk back and forth on the X axis until the strip of steel is horizontal/parallel to the top of the vice jaws and clamp the slide.
- * Centre drill and drill Ø4.2 through to the Ø8 reamed crankshaft hole. Drill Ø5 x 10 (to reduce the length requiring threading and to guide the tap). Tap M5. Take care not to run either the drill or the end of the tap into the opposite face of the crankshaft hole. Repeat for the second M5 as indicated (**photo 17**).
- * The crank pin may be fitted into the crank web and secured with Loctite® (or equivalent) retainer after ensuring the bore and pin are completely clean. Allow to cure.
- * After the retainer has cured fit the web to the crankshaft and secure with two M5 x10 grub screws.

●To be continued.



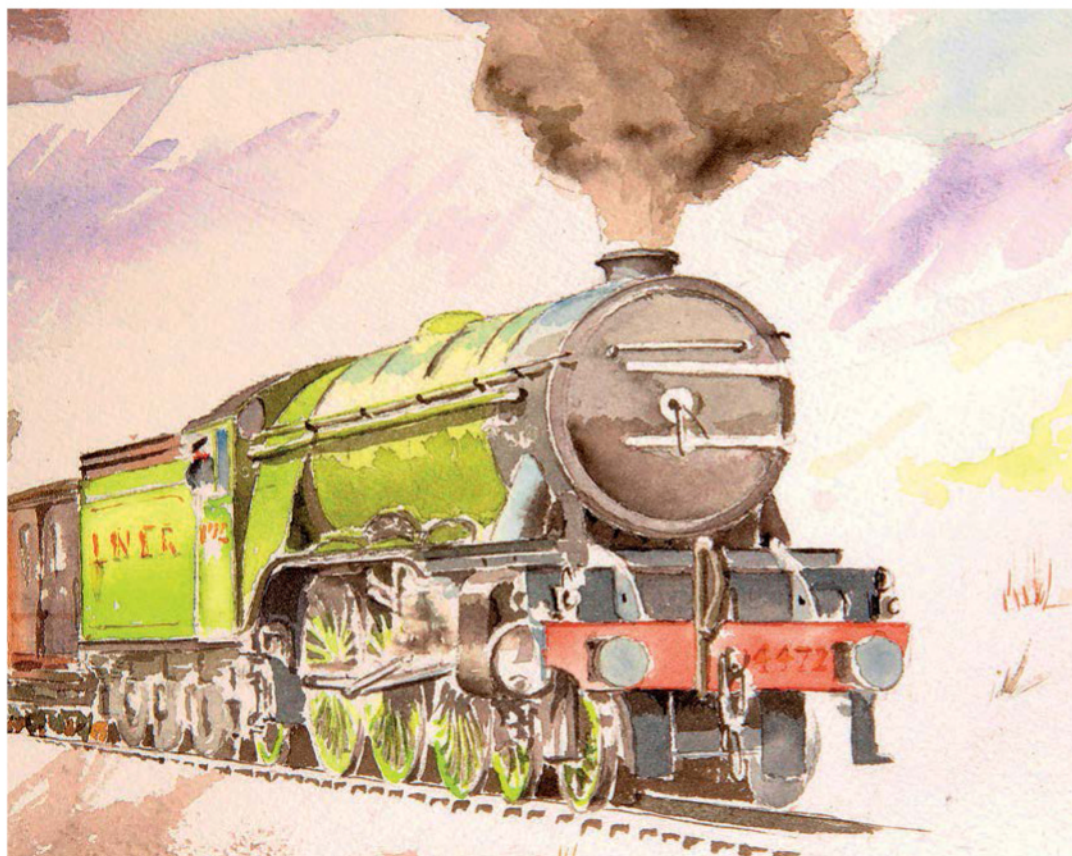
Drilling and tapping for the securing screws.

Peter Seymour-Howell

builds a fine, fully detailed model of Gresley's iconic locomotive to Don Young's drawings.



Continued from p.580
M.E. 4702, 21 October 2022



Painting by Diane Carney.

PART 46 – BRAKES

Flying Scotsman **in 5 Inch Gauge**

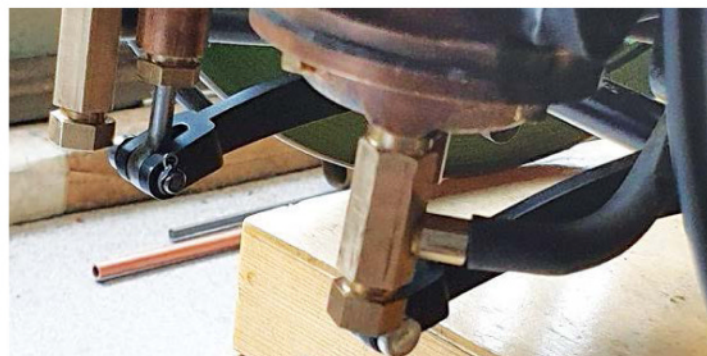
The brakes on *Scotsman*, as with most locomotives, consist of a large number of quite simple components. Perhaps the most numerous of these are

the pins which hold the entire braking system together. They are simple turning jobs and come in just two sizes, so they are a good place to start.

Brackets

These are the most complicated parts of the braking system. The hangers on the rear pair of wheels are

1. Here's a nice collection of pins. As for the tender they are made of two parts, with the pin itself and the head silver soldered together and then cross drilled for a split pin.



2. Here I have fitted the first two to connect the brake shaft to the vacuum cylinders, replacing the temporary bolts used before.



LEFT: 3. Here is the rear hanger pin in situ. RIGHT: 4. The next job was to hold all four brackets in the machine vice and machine the shape - tops, bottoms and, here, the slot to accommodate the hanger. Note the piece of brass shim - I hadn't noticed when machining the top and bottom that one blank was a fraction undersize - well not really as they are all oversize but I think you get my drift. The thinnest shim that I had soon sorted this out.



LEFT: 5. I then moved on to reducing the rear body. After machining the other side to match this left the final machining operation and that was to remove the small amounts from the front face. Suitable packing was used as can be seen in the picture. RIGHT: 6. After a good few hours and hand shaping to finish off, I could trial fit the first bracket. The next job is to make the pin plates.

simply pins secured into the frames, just inserted from the outside and secured with a nut and washer on the inside. The frames in this part of the chassis are triple thick so

perhaps why a bracket like the other wheels isn't needed as this should be strong enough. The rear pins are simple turning jobs with 6BA threads either end and, for the outside end, there is a small spigot which is cross-drilled for a split pin. The pin has a thin collar that sets its position against the side of the frames.

The other four brackets begin life as a length of $\frac{3}{4} \times \frac{1}{8}$ inch BMS flat, hacksawed into separate blocks and then machined square. The width and length are initially a few thou oversize as these have a radius to be profiled.

The first job to do is to plot and drill the four holes, three for the mounting bolts into the frames and one for the brake pin. I took extra care when drilling these as the blocks are nearly $\frac{3}{4}$ inch thick.

Brake Hangers

These started life as one of the few remaining laser cut items left in my arsenal and thus saved some valuable time. They still required some fabrication as they have bosses of various sizes to turn/drill and silver solder in place.

Brake shoes

The shoes come as a ring of steel which is rather thicker than the finished size. There are ten in the ring so I get a few spares. Although the steel was pretty flat I still faced off one side before clamping it to the faceplate. I used the three-jaw



7. Here, the hangers have been painted and fitted. The pin plates have also been made and painted and are awaiting the hangers before being fitted. I have cut the four pieces of studding to length ready to do this.

9. The hangers are tested in situ to make sure all is as it should be. One thing that does stick out is the steam sander pipes need moving a little. They should be a lot closer to the wheels but I left them as was until I could sit the chassis on rails and judge correctly where they go.



8. Here's the hangers after being silver soldered together, remembering to make 3 opposite pairs. As with previous such assemblies, the parts are held together with suitably sized bolts, these, in turn, have their threads coated with a bar of soap and careful application of the flux to avoid any foul-ups during the brazing process.





10. Very carefully machining the ring with the top slide set over at three degrees to match the wheel taper.

chuck with reversed jaws to hold the ring for this job. It was a little precarious but it was clocked and then tightened fully. With that done I then fixed the ring to the faceplate. This was pushing my machine's limits - not the workload but the capacity. I barely managed



11. Here we are after machining the shoes to their correct thickness, ready for final profiling, remembering to remove the metal from the face that was up tight against the faceplate to remove the resulting lip. I removed most from this side just leaving a few thou to come off the other face.



to hold it on the faceplate with the clamps being very much on the 'edge'. With the top slide set at three degrees I carefully machined the taper to match the wheel treads. As the part is much thicker than required, this allowed me to do away with any protective packing and just

machine close to the face. The shoes could then be separated from the ring and machined to the correct thickness, and the slot machined for the hanger.

Brake beams

The next stage for the brakes was the brake beams. The beam flat sections were cut by Malcolm at Model Engineers Laser but the end pins needed to be machined. Using my normal method, I did these in two parts which were then



14. The three brake beams with the holes drilled for the pull rod pins - from top to bottom, trailing wheels, centre and leading wheels.



15. Here are the three finished brake beams with their hangers and shoes fitted..



12. To produce the slot for the hanger, they were simply centred in the machine vice, chocked up on parallels and machined with a 3 mm slot drill.

13. A picture to show Scotsman with his shoes on.

silver soldered together. As can be seen Malcolm has cut out small sections for the pins to locate into - that helps to centre the pins on one axis but not the other. To centre the pins on both axes I have made the pins a little longer than the depth of Malcolm's cutouts, the extra length having slots cut so that the pins will locate centrally on both axes.

Links and compensators

There two types of compensators; the smaller 1:1 compensators are for the middle beam with the larger for the front brake beam. These parts are the final laser cut items from Malcolm's brake set - alas there are no parts for the eight straight links so these had to be done the traditional way.

I simply held each batch of four in the machine vice, Loctited together, zeroed on centre and then moved along for the first hole. Once that was drilled I inserted one of the pins to ensure nothing moved,



16. This picture shows one of the group of parts held in the machine vice. First the ends were machined square and after that I machined the scallop on either side.

advanced by the right distance and drilled the second hole. I then cleaned up all eight parts, removing any Loctite residue and burrs from drilling. The two groups of four were then bolted back together using 5BA screws. I used long enough screws for a nut to tighten them up with and also a long enough section for the parts to be both held in the machine vice for the next machining operation and also to hold them in the rotary table afterwards.

Pull rods

On to the pull rods. I began with the 'U' shaped ends which slide over the beams and are then secured with the remaining pins. There are two sizes - small which connect to the beam behind and long which slide over the beam in front and then connect to their relevant compensators. The rods themselves are of two different lengths plus the leading pull rods which are different altogether.



17. It was then over to the rotary table. I didn't trouble myself with making any 'button's as the screw heads are slightly smaller than the required size so I judged it by those and worked by eye - of course, all four ends were machined to the same diameter.



18. After a quick filing and polish we end up with these parts..



19. Lastly for the compensators and links here they are assembled. I have laid them out as if the locomotive is facing to the right.

20. The first picture shows the parts cut oversize and centre drilled ready for heating and folding. With the holes drilled I then drilled a cross hole into some steel bar to use as a jig for forming the 'U' and the same drill was then bonded into the bar to act as a pin. This gave me a method of ensuring the bend is in the middle of each 'U'. As can be seen, we need four long and six short 'U' shaped ends.

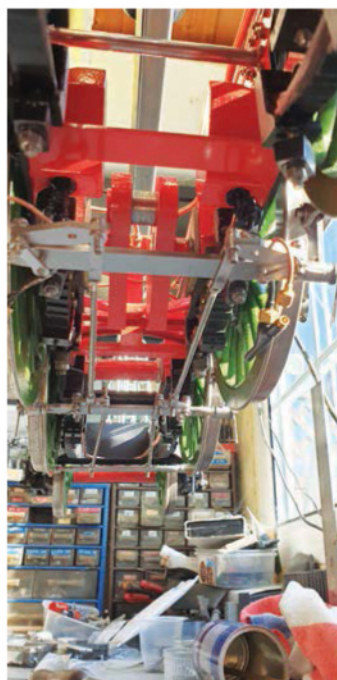


21. The next job was to heat each to a cherry red, slide onto the pin and form around the bar. I used forceps to hold each piece, only heating the middle section around the hole. I then checked that the 'U' was square to itself, i.e. that both parts were inline with each other. I then needed to drill the holes for the pins that secure the rods to the beams. To keep the two 'wings' apart a short length of bar was cut and wedged into the part. I had deliberately cut these over-length so that I could drill the holes without having to drill through anything in between and also to do the final shaping at the end.



22. Now, as with the links, the middle section is also reduced, although in this case there is only one end with a hole to the reduced part goes right the folded end. This may look a bit precarious but it worked out very well - as mentioned before I had cut the steel over-length, it's at this stage that I used that extra metal to hold each 'U' securely for me to be able to reduce the end, machining both top and bottom wings in one go.

23. Then to the rotary table to round off the ends...



LEFT: 24. After a general clean up the centre holes were opened up for a 5BA tap. RIGHT: 25. And lastly directly from underneath, nothing is secured yet, with the pins being loose for now. Once happy with the fine tuning I'll fit the various washers and split pins required to make the brakes tight and free to operate.

● To be continued.

Club Diary

4 November 2022 - 18 January 2023

November

4 Guildford MES

Open Day, Stoke Park, Guildford 11:00 – 15:00. See www.gmes.org.uk

5 York Model Engineers

Fireworks, Running and Supper. Contact: Bob Polley: 01653 618324

6 North Wilts MES

Public Running, Coate Water Country Park, Swindon 11:00 – Dusk. Contact: Ken Parker, 07710 515507

10 Cardiff Model

Engineering Society
Talk: Five Boys and a Pasty, Heath Park, Cardiff. See www.cardiffmes.co.uk

12 York Model Engineers

Evening Talk – 7pm. Contact: Bob Polley: 01653 618324

13 North Wilts MES

Public Running, Coate Water Country Park, Swindon 11:00 – Dusk. Contact: Ken Parker, 07710 515507

16 Bristol SMEE

ZOOM Meeting – On the computer, 19 :30. Contact : secretary@bristolmodelengineers.co.uk

19 Cardiff Model

Engineering Society
Steam-up and Family Day, Heath Park, Cardiff. See www.cardiffmes.co.uk

20 North Wilts MES

Public Running, Coate Water Country Park, Swindon 11:00 – Dusk. Contact: Ken Parker, 07710 515507

27 North Wilts MES

Public Running, Coate Water Country Park, Swindon 11:00 – Dusk. Contact: Ken Parker, 07710 515507

December

1 Cardiff Model

Engineering Society
Talk: Old Pictures of Cardiff, Heath Park, Cardiff. See www.cardiffmes.co.uk

4 North Wilts MES

Public Running, Coate Water

Country Park, Swindon 11:00 – Dusk. Contact: Ken Parker, 07710 515507

10 York Model Engineers

Evening Talk – 7pm. Contact: Bob Polley: 01653 618324

11 Bradford MES

Santa Comes to Northcliff 2022. Northcliff Railway 11:00 – 15:00. Contact: Russ Coppin, 07815 048999

11 Guildford MES

SMSEG Open Meeting, Stoke Park, Guildford 14:00 – 17:00.

See www.gmes.org.uk

11 North Wilts MES

Public Running, Coate Water Country Park, Swindon 11:00 – Dusk. Contact: Ken Parker, 07710 515507

18 North Wilts MES

Public Running, Coate Water Country Park, Swindon 11:00 – Dusk. Contact: Ken Parker, 07710 515507

21 Bristol SMEE

ZOOM Meeting – Look

back at the year, 19 :30.

Contact : secretary@bristolmodelengineers.co.uk

25 North Wilts MES

Public Running, Coate Water Country Park, Swindon 11:00 – Dusk. Contact: Ken Parker, 07710 515507

27 Bradford MES

Mince Pie Steam-Up 2022, Northcliff Railway 12:30. Contact: Russ Coppin, 07815 048999

January 2023

4 Bristol SMEE

Talk : 'The Camerton Line', Begbrook Social Club 19 :30. BS16 1HY. Contact: secretary@bristolmodelengineers.co.uk

18 Bristol SMEE

Small, non-locomotive engines evening, Begbrook Social Club 19 :30. BS16 1HY. Contact: secretary@bristolmodelengineers.co.uk



Oddity

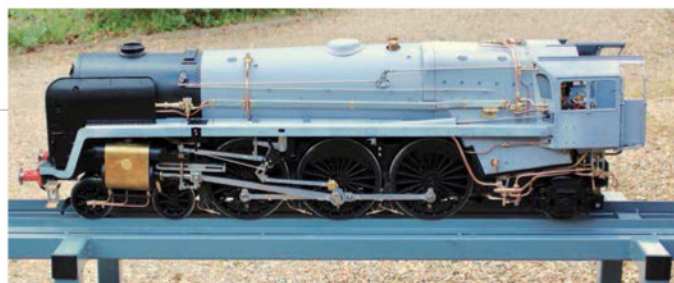
Dear Martin,
I write in awe of the readership knowledge tapped by the *Model Engineer* magazine. Mr Baxendale has solved the problem of the 'Dial Oddity' (Smoke Rings M.E.4697, August 12) concerning its use that has defeated myself and a good friend for years (Postbag M.E.4700, September 23). All is now explained and we can consign 'Airships, Submarines, et al' to the scrap bin! Unfortunately, all we know about the originator of the photograph is lost in the mysteries of time and so any future information must rest there. Unless, of course, you, dear reader, know differently? Thank you again.
Regards, Roger Clay
(Rye, East Sussex)

Dear Martin,
Having read a recent edition of *Model Engineer* (M.E.4699, September 9), and your oddity reference in Smoke Rings, Stewart Bryant is absolutely right in identifying the device as a Leigh light position indicator.

At home here, I have a copy of the Haynes Owners' Manual for the Wellington bomber (1936-1953, all marks). The Haynes publications are probably more familiar to us as being a great number of car maintenance manuals. They also have published a vast number of non-automotive owners' handbooks on aircraft, cars, tanks and railway locomotives etc. etc.

On reading through the index there are several references to the Leigh light as fitted to the Wellington Bomber. When WW2 broke out the Wellington was probably the most modern bomber in the RAF and held the front line until the four-engined heavy bombers, i.e. Stirling, Halifax and Lancasters, came on stream so to speak and the Wellington was relegated to less strenuous duties.

One of these duties was when they were passed on to RAF Coastal Command which,



Rubbing Down

Dear Martin,
I am always a little behind in my reading and recently came across in M.E.4695 (15 July) the article by Norm Norton where he has started painting his Modelworks rebuild of a BR Britannia class 7. In it, he touches on the question of rubbing down between coats of paint, especially where detail e.g. rivet heads is involved. A very accomplished painting instructor once told me that rubbing down between coats of paint was always desirable and where detail such as rivet heads was concerned this could be accomplished quite easily with the gentle use of steel wool and indeed it can.
I hope this will be of use to fellow modellers.
Best wishes, Stuart Merton

apart from the Sunderland flying boats, didn't have anything with a long range for patrols until the American built Catalina came into service.

One duty the Wellington undertook was to act as a flying minesweeper and was thus fitted with a magnetic circle that surrounded the aircraft and as it flew fairly low over the sea its magnetic field caused any magnetic mines to explode.

The Wellington also was used in anti-submarine patrols, hence the fitting of the Leigh light, which along with radar sets to detect a surfaced submarine at night used the light to pick out the U-boat while attacking it with either bombs or depth charges.

There were two instruments in use - the position indicator and also with it was another dial which showed the depression and elevation. These were in the nose of the aircraft and the operator used these to guide weaponry onto the target. There is quite a detailed description of how this worked. There was an hydraulic system to lower or raise the light which was electrically controlled.

I believe from reading this that the device operated in a similar way to how we control our radio controlled model aircraft and boats.

It is amazing the amount of knowledge out there among

our readers - anyone who has a question or a problem only has to put out a request and there is almost always somebody who can come up with an answer, especially from our older readers.

So, as you quite rightly say, this was a really odd thing to come up with but please do keep on throwing these things to us as they stir up the grey matter, so to speak, with such oddities.

As a lot of our older readers will probably agree a lot of engineering advances and other advances have been due to a military requirement, for instance the transistor as we know it was developed towards the end of WW2 to enable the man portable radios used on the battlefield to be more robust instead of using valves etc. which in the rough and tough of battle could break quite easily.

As somebody who has served in the British Army I am not saying that we should be continually at war just to advance technology, but sadly this can be a spin off from combat experience. For instance the substance we call superglue was originally developed for surgical use in operating theatres and as we know it is now used as a general purpose adhesive.

Yours sincerely, J.E. Kirby
(London)

Write to us

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Tools and Machinery

■ Dean Smith and Grace lineshaft driven lathe, 18" swing, 32" gap, 6' between centres, 92mm bore, this Rolls Royce of lathes was new to Levant Mine in 1920 mining work from then to today, 3 tons interest? **T. 0750 448 2222. Torquay.**

■ Slip Gauges. C.E. Johansson – Set E2, No. 765662, Grade 4 -Workshop to BS 888. Matrix/ Coventry Gauge and Tool, Set M33/2 (grade 2), Huffam Precise Combination Distance Pieces + charts (same idea as slips but different format). Offers. **T. 01205 290312 Nr Boston.**

■ Sip Tig 160 AC-DC Tig welder 240 volts, light usage by model engineer, £600 buyer collects. **T. 07434 873432. Alfreton, Derbyshire.**

■ Drummond metal turning lathe, Pre-B 3 jaw chuck, other pieces available,

good condition, could be driven from a stationary engine, £100.

T. 01246 556330. Chesterfield.

Parts and Materials

■ Kit of fully machined parts for the assembly of a 5" gauge 9F "Black Prince" locomotive with full assembly instructions, includes unused boiler. Sensible offers sought. Buyer collects. Ditto an A4 Pacific. **T. 01342 311540 East Grinstead W. Sussex**

Magazines, Books and Plans

■ LBSC G.W. County 4-6-0 drawings Swindon Tender G.A drawing and county photos, £50. ¼" Coventry die head spades, Boxford change wheels, ring me.

T. 02089 321093. North West London.

■ Model Engineer numbers 4472 –4627 (2014 –2019), free to good home. New owner collects from Gateshead area or arranges to pay for shipment.

T. 0191 4140500. Gateshead

Wanted

■ I require one drive motor for a Unimat 3, it will of course be second hand condition as the originals ceased production in 2017 and cannot be purchased new. **T. 07783 649546. Belfast, Northern Ireland.**

■ Wanted – a set of three base jaws for TdeG 160mm dia chuck 65mm Lg 22mm wide 30mm high Maker ref 1GU3316000. **T. 07942 269819. Dorset.**

■ Wanted a copy of the book 'Making the most of the Unimat' by Reg Tingey, must be in good condition. **T. 07759 578688. Manchester.**

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Ballaarat Copper Boiler PART 5

Ron Collins offers an alternative copper boiler for *Luker's Ballaarat* locomotive design.



Continued from p.571
M.E. 4702, 21 October 2022

The fifth part of this series will provide details and some help in the construction and assembly of the copper boiler. Please note that the photographs are examples only and not specific to the *Ballaarat* boiler.

In Western Australia, especially the Northern Districts Model Engineering Society (NDMES), we have completed approximately 60 copper boilers over the last six years; these copper boilers range from very small Gauge 1 up to a 7¼ inch gauge boiler for a Paddington.

Based on this extensive experience, the intention is to describe the NDMES method of building copper boilers. This is not the only method; please select the procedure that suits your style of building a copper boiler.

If you have been following this series, you should by now have a pile of flanged plates. There should be a boiler tube, rolled and bronzed together, along with butt strap, outer wrapper, inner firebox wrapper, firehole and four copper foundation bars. The time has come to start the assembly of all these components.

As described previously, the barrel should be rolled and the longitudinal joint brazed and ground smooth. The longitudinal joint should have matched drilled 3.2mm diameter rivet holes to suit fitment of the butt strap. The barrel is now ready to assemble to the throatplate.

It is prudent to Tobin Bronze the barrel to the throatplate as subsequent component assembly will result in a fair amount of heat and we do not want the throat plate and barrel to separate or become misaligned if only silver soldered.

There are a couple of ways to assemble the barrel and throatplate. The suggested



The boiler butt strap ready for soldering.

method is to place the throatplate flange down. The barrel is then vertically inserted through the throatplate and spaced such that it is protruding 2mm through the throatplate as indicated on the drawing. Heat both barrel and throatplate and place four small spots of bronze equidistant around the junction of the throatplate and barrel.

Whilst still hot, using welding gloves or similar, turn the entire assembly through 180 degrees so the throatplate is horizontal and facing upwards with the 2mm barrel protrusion facing the operator.

Tobin bronze completely around the barrel/throatplate junction; this will provide a strong neat bronze fillet.

After completion of the bronzed joint, the assembly must be cleaned of all oxides. The best method is citric acid dip followed by good old elbow grease and Scotchbrite

scouring; a small amount of Ajax or similar will assist in removing the oxides.

The cleaned throatplate and barrel assembly is ready to receive the check valve bushes, the blowdown bush in the throatplate, the rolled throatplate strap and the butt strap. These items will be silver soldered into position. The butt strap must have a slight longitudinal curve that is a close fit to the barrel. The butt strap can be fitted external or internal to the barrel - if fitted internally it is more difficult to silver solder due to the close confines of the barrel. The butt strap inner curve is liberally covered in silver solder flux, as is the barrel.

The 3.2mm (⅛ inch) diameter rivets are cut to length with a 3-4mm protrusion inside the barrel. Assemble the butt strap to the barrel and insert the rivets, lightly tap each rivet, just

enough to hold the rivet in place. It is a messy business with all the flux but it is important that there is flux between the two surfaces so the silver solder will flow by capillary action between the two surfaces to create a sound joint. The idea is not to tightly hold the butt strap to the barrel but to hold the butt strap in position so it is a close fit to the barrel. The capillary action of Grade 245 or SF55 silver solder will allow it to flow between the copper plates and around the rivets, both internally and externally.

The throatplate strap is rolled and curved to provide a close fit to the barrel. Use a couple of copper rivets to hold the ends together. It may be necessary to slightly notch the throatplate strap where it meets the four small bronzed spots at the barrel/throatplate junction. Assemble the throatplate strap with flux as detailed for the butt strap and lightly rivet the ends closed.

Flux the three bushes and ensure they all fit - you may need to fit them whilst the assembly is hot, so check them beforehand.

The throatplate and barrel assembly can now be silver soldered. Ensure all joints and rivets are sealed and silver solder the bushes into position. Note the bronze bushes will melt if too much heat is applied directly upon them. To successfully silver solder bushes in position, keep the torch heat directed to the copper plate, not the bush, and the indirect heat will be sufficient to melt the silver solder around the bush.

Clean the completed assembly and set aside for the moment (**photo 7**).

The firebox backhead and firehole assembly should be treated in the exact manner previously described for the throatplate/barrel assembly. Tobin bronze the firehole ring into the firebox backhead, clean it up and then silver solder the copper spacer ring to the firehole and firebox backhead (**photo 8**).

The next step is to assemble the firebox tubeplate to the firebox wrapper and Tobin bronze the two components together. The Tobin bronzing of these two components is especially important as the

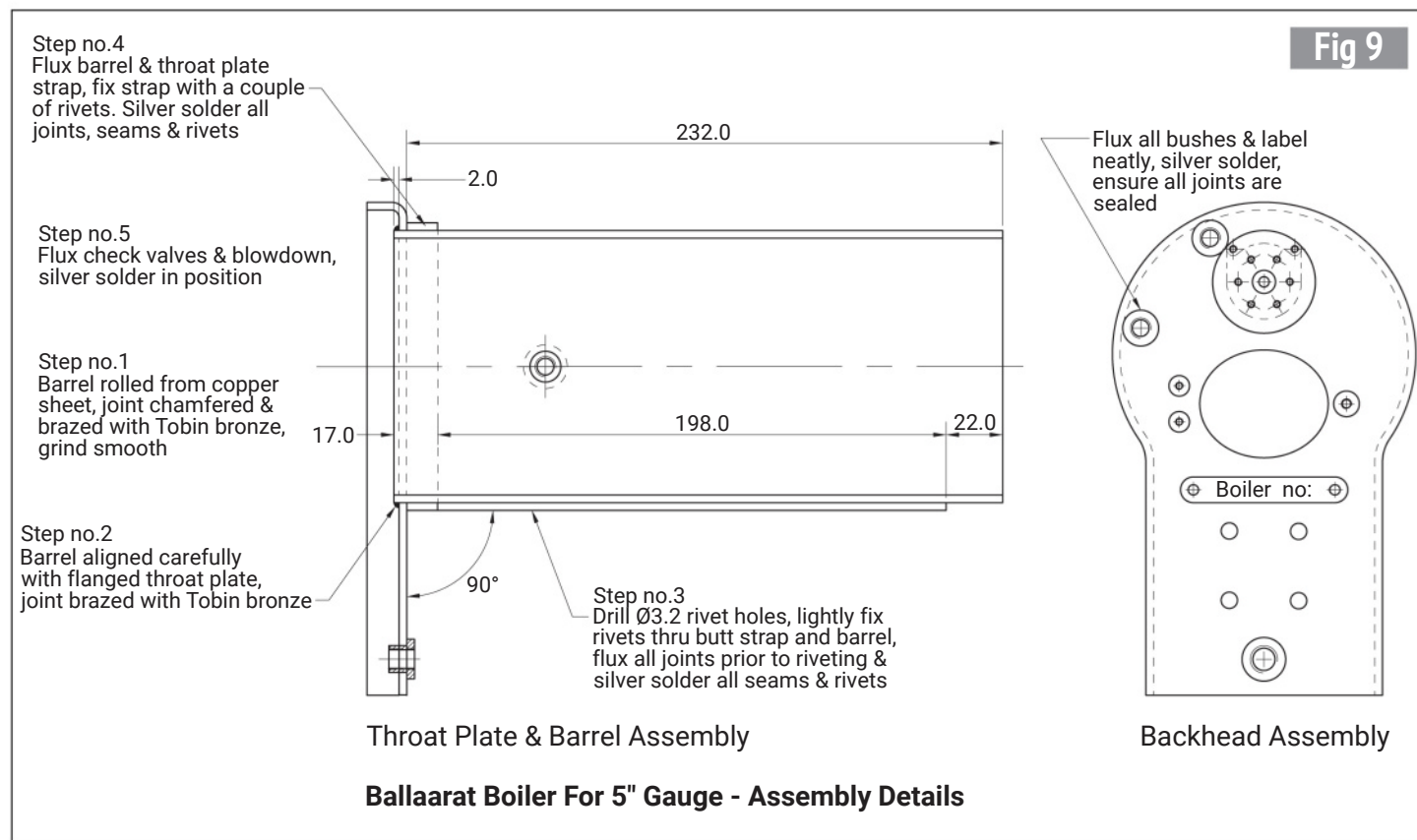


The firebox backhead with fitted firehole ring.

silver soldering of the tubes into the firebox tubeplate will create a lot of heat and it would almost be impossible to maintain the wrapper and firebox tubeplate in alignment if it was only silver soldered. The firebox wrapper is drilled 3.2mm diameter in five or six locations (two holes each side, one or two holes at the top) near the edge of the wrapper. The firebox tubeplate is inserted into the firebox wrapper and match drilled to accept 3.2mm diameter copper rivets. The firebox

wrapper and firebox tubeplate can be fluxed on both faces and then assembled with the rivets tightened down to securely hold the plates together. The firebox tubeplate is arranged with the top face towards the operator and the flange radius of the firebox tubeplate and the sides of the wrapper facing down. This will provide a perfect area to fill with Tobin bronze.

Clean the completed assembly and set aside for the moment (**photo 9**).



The next step is the assembly of the fire tubes and the firebox throatplate/wrapper. To successfully assemble these components it is necessary to make a quick support stand. This is just a flat piece of plate 5-6mm thick with a column, made of square tube or angle, welded at right angles to the rear of the plate. **Photograph 10** shows the simple but much mistreated and misaligned support column we use.

The smokebox tubeplate is placed on the base of the stand, the firebox throatplate/wrapper is clamped to the column at approximately the correct height and then the fire tubes are inserted through the holes down into the corresponding hole in the smokebox tubeplate. When all the tubes are inserted, it will be necessary to carefully position the firebox throatplate/wrapper at the correct height, align it so it is perpendicular to the base and also ensure it is square to the column. The smokebox tubeplate can then be twisted and manoeuvred to align all the fire tubes so that they are parallel and at right angles to the face of the firebox tubeplate (**photo 11**).

Once successful alignment of the fire tubes and firebox throatplate/wrapper has been achieved, the next procedure is



The throatplate brazed to the barrel.



A simple support column.

to thoroughly flux the tubes in the firebox throatplate wrapper, followed by silver soldering.

It is worth offering several suggestions about silver soldering of the fire tubes. It is very important to systematically silver solder each tube, ensuring each tube is soldered all round before going to the next tube. We always start at the tubes closest to the operator, so that by the time you reach the rear tubes the entire assembly is hot enough for the silver solder to flash around the tubes near the firebox throatplate flanges, as these tubes are difficult to observe. Once the tubes are all silver soldered it is a very good idea to apply silver

solder in the joint between the firebox throatplate flange and the wrapper to ensure a leak proof joint. Don't forget the flange rivets - all the rivets need a touch of silver solder on the inside and outside of the wrapper to seal them.

If fitting the optional arch plate, now is the time to silver solder the support bar in position. Silver solder all around it and ensure the rivets are sealed.

Just before finishing this heating session, go around each of the tubes and ensure a complete, neat fillet of silver solder can be seen around each tube - you do not want to be trying to fix a leak in the firebox throatplate tube bundle

once the firebox backhead and backhead are fitted. Touch up anything that looks suspicious.

Clean the completed assembly and set aside for the moment.

The fitting of the bushes and boiler label to the backhead will provide a nice break from the high temperatures involved in the previous stages of assembly. Flux all bushes and the backhead and then uniformly heat the backhead. Remember the bushes will melt if exposed to high direct heat, so play the flame around on the copper plate and let the indirect heat melt the silver solder under and around the bushes (**photo 12**).

The next stage of this copper boiler construction is the assembly of the outer wrapper to the brazed throatplate/barrel assembly.

The outer wrapper and the throat plate and barrel assembly need to be securely joined. The easiest way is to drill approximately seven equally spaced 3mm diameter holes on the edge of the wrapper. Match drill the throatplate flange and temporarily hold the throatplate/barrel assembly to the outer wrapper with some M3 screws and nuts. This temporary fixing will allow any adjustments to be made



The boiler tubes assembly arrangement.



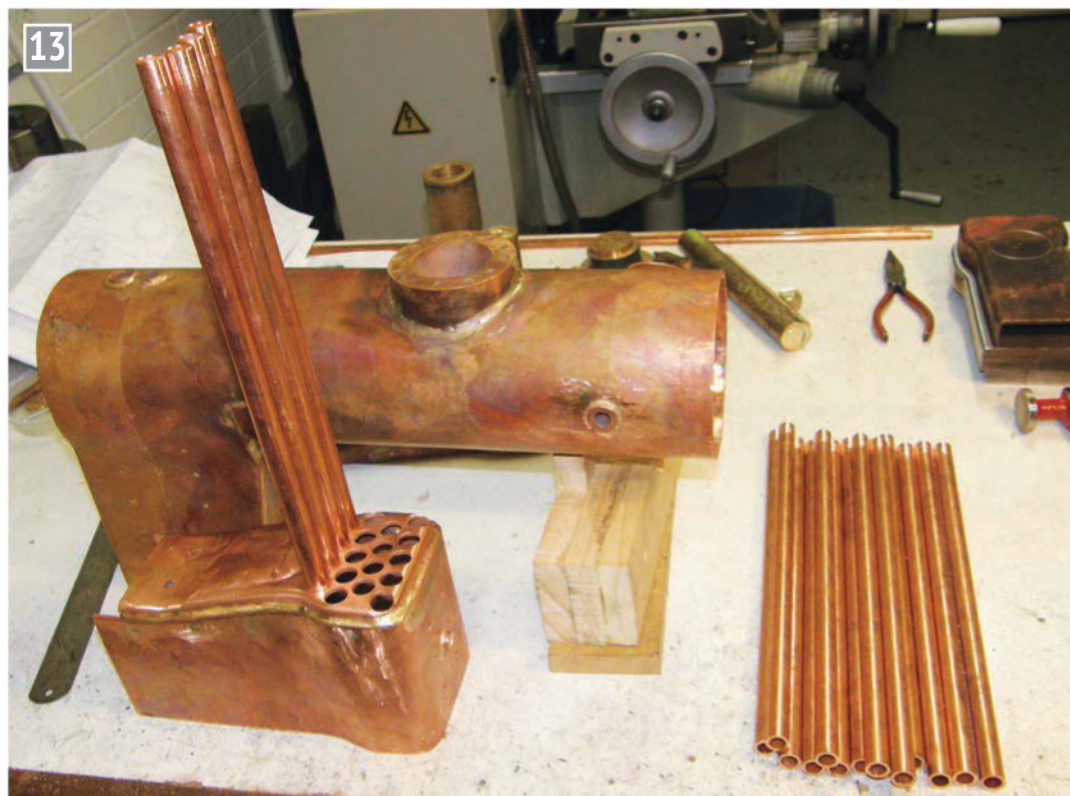
Backhead bushes and label fitted.

to ensure the barrel centre line and wrapper are perfectly aligned both horizontally and longitudinally. The M3 screws can be removed one at a time and are to be replaced with a 3.2mm diameter copper rivet. Once the rivet placement is complete, apply a thin watered-down flux mixture over and around the joint - ensure a watery mixture of the flux goes in between the flange and wrapper.

Do a fitment check on the steam dome bush and be ready to silver solder it in position along with the small blind bush behind the steam dome.

The wrapper/barrel assembly should be placed with the barrel pointing vertical. The flange wrapper joint can then be easily accessed for silver soldering. When silver soldering the outside is complete, turn the complete assembly through 180 degrees and silver solder the inner flange area, not forgetting a dab of silver solder on all the rivets both internally and externally.

At this stage it would be possible to continue with the



Outer wrapper complete with steam dome.

placement of the steam dome and silver solder it in position, however! ...

It may be more prudent to stop, clean all oxides off the soldered assembly, set the

steam dome into position ensuring it is level and square in all directions, reflux, reheat and silver solder the steam dome and bush as a separate exercise. This is particularly

important if there is any wobble of the dome in the barrel (photo 13).

●To be continued.

NEXT ISSUE

Eating Elephants

Steve Goodbody says that model engineering is like eating an elephant – best tackled a bit at a time.

Flying Scotsman

Peter Seymour-Howell makes the conjugated valve gear for his 5 inch gauge A3 locomotive

Waverley

Roger Backhouse cruises along the Clyde in the world's last sea-going paddle steamer.

Little Demon

Mick Knights adds the Hall effect sensor to complete his supercharged V8 internal combustion engine *Little Demon*.

Ballaarat Boiler

Ron Collins completes his copper boiler for the *Ballaarat* 5 inch gauge Australian narrow gauge locomotive.

Content may be subject to change.



ON SALE 18 NOVEMBER 2022

The *Little Demon* Supercharged V8

PART 17

Mick Knights describes the construction of a supercharged V8 internal combustion engine.

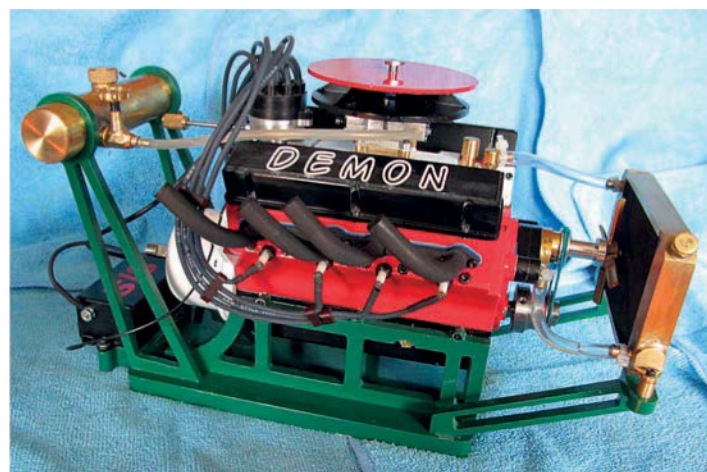


Continued from p.583
M.E. 4702, 21 October 2022

Now is the time to set the camshaft in its correct orientation to the crankshaft. Steve (the designer) gives a description of how to set the cam and crankshaft but this all depends on the #1 exhaust cam lobe being in the correct TDC position while the camshaft drive gear is left un-tightened before starting the process. The method entails installing the camshaft then, using the two small angular holes to the top back face of the cylinder block, which we briefly touched on at the very outset of the build, inserting two lengths of 0.062 inch diameter silver steel and securing both with M2 grub screws. These will tighten against the outer casing of the ball race and this will lock the camshaft in position. Then rotate the crank anticlockwise 109 degrees, tighten the camshaft drive gear, with the #1 exhaust cam still hopefully in its TDC position, and rotate the crank back to 35 degrees before TDC where the ignition will take place. With this method the #1 exhaust cam needs to be at its TDC position. As this cannot be directly set or observed, it has to be judged by the position of the gear clamping flats milled on the end of the camshaft.

I thought the exhaust valve movement itself would be a better indicator of the camshaft being in sync. with the crank, so what I needed to confirm was how many degrees past TDC the exhaust valve starts to open.

I did email Steve to see if my calculations were right. He replied that after one



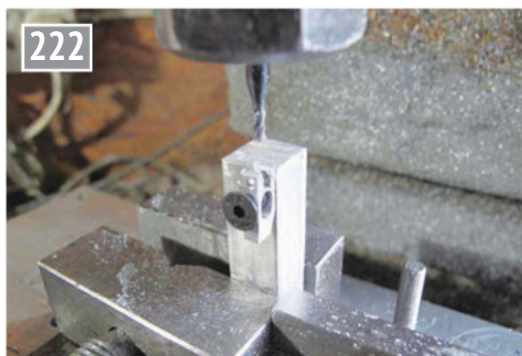
complete 360 degree rotation of the crankshaft from TDC the exhaust valve should have just closed and the inlet be just starting to open. I had reached the conclusion that #1 valve should start to open at 74 degrees past TDC (109 degrees – 35) so with the cam duration of 280 degrees the total movement would be 354 degrees which would appear to be right being 6 degrees short of a complete rotation - anyway that's the route I intended to go.

I engraved some graduations on the periphery of the flywheel - eight at forty five degrees. Taking one 45 degree graduation as number one cylinder TDC position, two more graduations were produced either side. The first at 35 degrees BTDC was where ignition should occur, and the timing light on the Hall sensor should go out indicating that it's fired, while the other graduation is at 74 degrees past TDC where the #1 exhaust valve should start its travel.

The position of #1 piston TDC has to be achieved before

the cylinder head is fitted. Then the flywheel is fitted and the graduation chosen as #1 cylinder TDC is set to 12 o'clock and the locking nut tightened. When fully tightened a pointer is fitted to the block and aligned with the #1 graduation and the timing process can begin. It may well of course take several attempts at positioning the camshaft and then tightening the drive gear to its new position in relationship to the crankshaft gear in order to achieve the correct valve movement.

When #1 exhaust and inlet valves are moving as intended, the crankshaft is rotated ninety degrees past #1 TDC which will bring #8 cylinder to its TDC position and the whole process of valve movements can be checked again. By advancing the crankshaft ninety degrees past the previous TDC position all sixteen valve movements can be checked. If the #1 cylinder valve movements are correct it follows that the others should be as well but as all the cam



Milling out the valve stem roller location slot.



Completing the valve stem roller location slot.

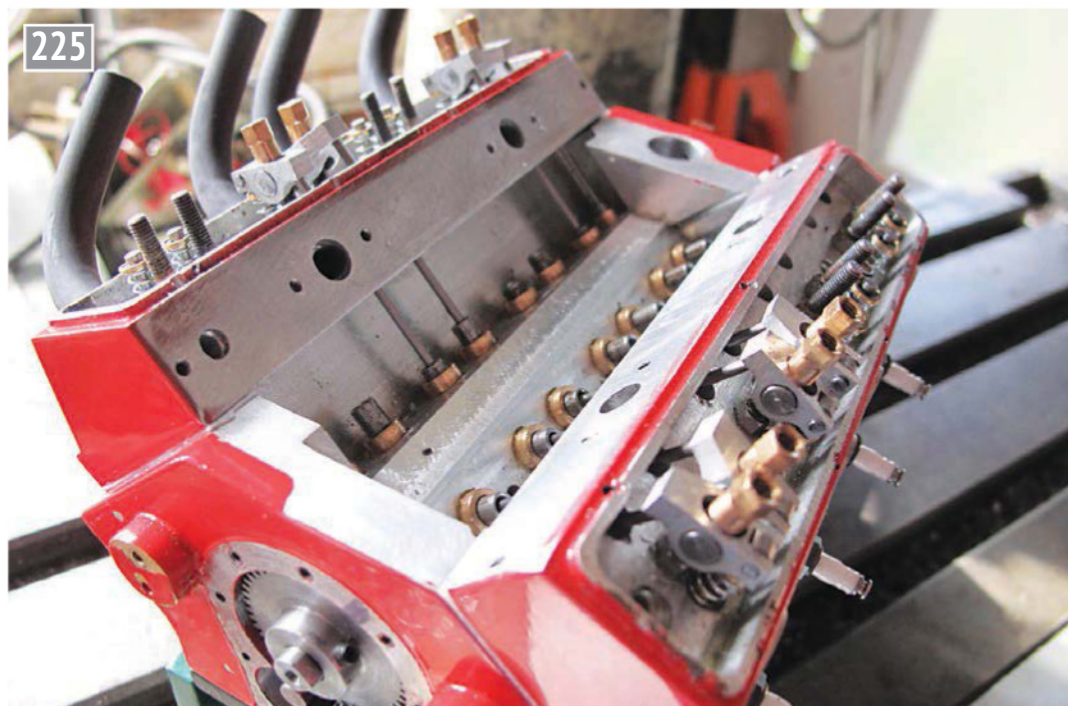


Push rod locating dimples.

positions have either been machined from solid, or in this case bonded in position, then all the valve movements should be checked.

This is the theory but in practice I came across a situation that slightly impeded the valve movement. This was caused by the position of the push rod location at the back of the rocker. We're only talking a few thou here, but it was enough for the push rod to rub against the back face of the push rod clearance hole in the head just as the push rod was opening the valve. The push rod locates inside the head of a M2 socket headed screw. Removing the screw did provide a little more clearance but the push rod was now locating against the square face of the larger counterbore rather than the more positive form of the socket head and of course the counterbore had a M2 tapped hole. The push rod diameter being 0.062 inch, which is near as dammit to the tapping size for M2, brought its own problems. Filling the tapped hole would have been straight forward but that still leaves the larger counterbore for the push rod end to rattle about in. Faced with this situation, and also with the tiny amount of material that was left of the rocker arm itself after all the machining, there was really only one path forward - to bite the bullet and produce another set of rocker arms with a slightly modified design.

To locate the radiused end of the push rod I produced a 2.5mm diameter dimple at the same offset dimension, and the same distance from the



Assembling the rockers.

centre of the pivot as before. This slight modification of the dimple actually being in the rocker arm had the effect of positioning the push rod back into the centre of the clearance hole. A 2.5mm diameter solid carbide ball nose cutter was sourced from APT tooling for under £3 + p&p - I really don't know how they do it.

The machining operations were similar to the original rocker arms with the exception of the offset radial form to accommodate the cap head location for the push rods, which was no longer required. **Photograph 222** shows the generation of the 0.100 inch wide by 0.140 inch deep valve stem roller location slot. The radial scallop to clear the valve spring retaining plate was generated in the same simple milling fixture. Using a

counter sunk screw to secure the rocker arm by its central bore ensures the whole batch is identically presented (**photo 223**). The two 2.5mm diameter push rod locating dimples are shown in **photo 224**.

With the push rods now moving freely in the clearance

holes the rocker assemblies were again established; first cylinder #1, then #8, #4 and #3 (**photo 225**). **Photograph 226** shows the completed valve/rocker assembly minus the M3 locking grub screw.

● To be continued.



Completed rocker assembly.

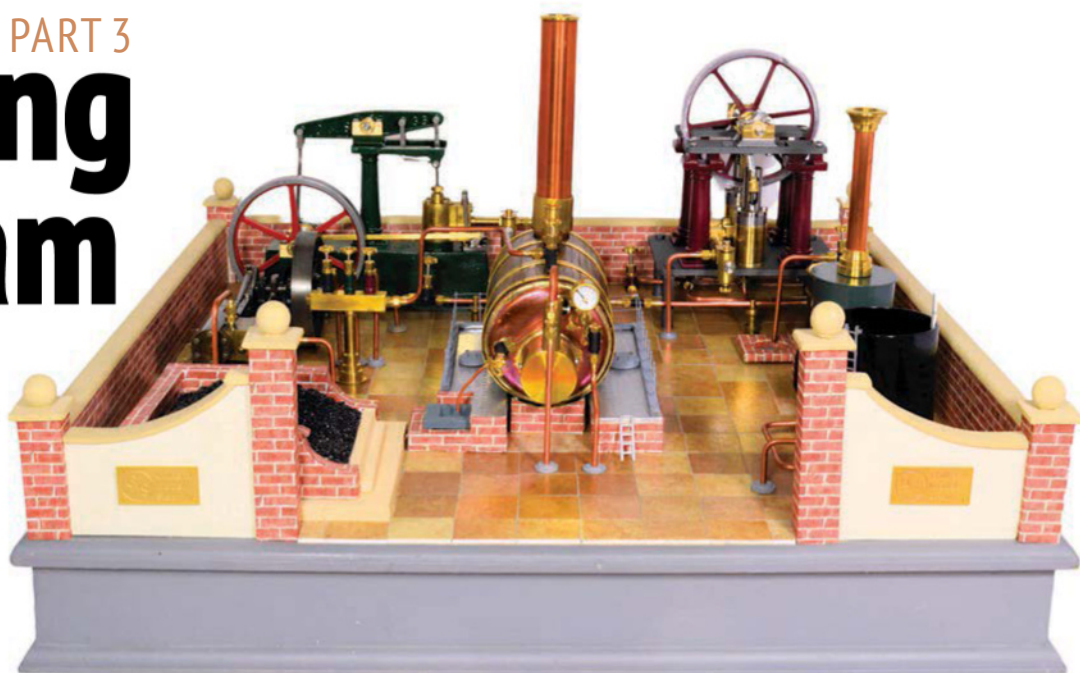
Growing a Steam Plant

PART 3

Ian Beilby invests his spare time into the cultivation of his own steam plant.



Continued from p.559
M.E. 4702, 21 October 2022



A general view of the steam plant.

In the previous part of this article on my assembly of a steam plant I described some of the accessories/components that I made for the plant. We are now going to look at two other engines featured on the plant and how I organised the layout of the engines and other components on the base unit.

I was so pleased with the beam engine kit that I bought from Chiltern Model Steam that I didn't hesitate to buy a second engine from them. The second engine that I bought is what the manufacturers have named a 'Bitsa' Engine - the name is derived from the fact that it is basically made from bits or parts of other engines in their catalogue, some of which could not be used, and consequently was a limited edition. It is an ingenious design and I knew it would visually complement the beam engine that I had already built and represent much more of a challenge. The finished engine is shown in **photo 27** and you can see it is constructed using some of the same components used on the beam engine, the large fly-wheel, the bearings and the four pillars supporting the raised platform in particular.

It differs from the beam engine in so far as the fly wheel is driven by twin cylinder vertical pistons, raised on a fabricated platform as opposed to being housed on a solid cast base. Standing side by side the two engines certainly complement each other in both appearance and scale. The construction is a little different to the beam engine, however, as when

assembling the beam engine, as long as you read the instructions and familiarise yourself with the component parts, assembly is straight forward. One of the other benefits I found in assembling and building your own engine is that you can paint the engine or different parts of the engine in whatever choice of colour you want.

You can devise your own colour scheme.

Readers who have visited some of the remaining Victorian steam pumping engines will know that the Victorians took great aesthetic pride in these engines and although some were seldom visited or seen by the general public a lot of thought was given to the appearance of the engines - some of the columns and capitals were even highlighted in gold leaf! I have not gone to those lengths with my engines but hopefully the colours I chose are considered appropriate.

Many of these stationary Victorian steam engines were constructed for use in mines, pumping stations and factories during the mid-19th century. One of the most common was perhaps the single cylinder horizontal engine used to power machinery in the process of spinning and weaving.

27



The 'Bitsa' engine.

I have always admired the model engines produced by Stuart Turner - the attention to detail is excellent and the components well made. One of their most popular engines, often made by model engineers, is the Stuart Turner S50 horizontal engine, frequently referred to as a 'flat bed mill engine' owing to the large number of this type of engine used in the 19th century Yorkshire and Lancashire cotton mills. So iconic is this design of engine that I decided I wanted to feature a Stewart S50 on the plant. Kits or even complete ready to run models can still be bought from Stuart Turner, however I decided I would like to buy a second-hand engine in reasonably good condition and re-furbish it if necessary. This again would save time and also enable me to have some practical input in the making of the plant.

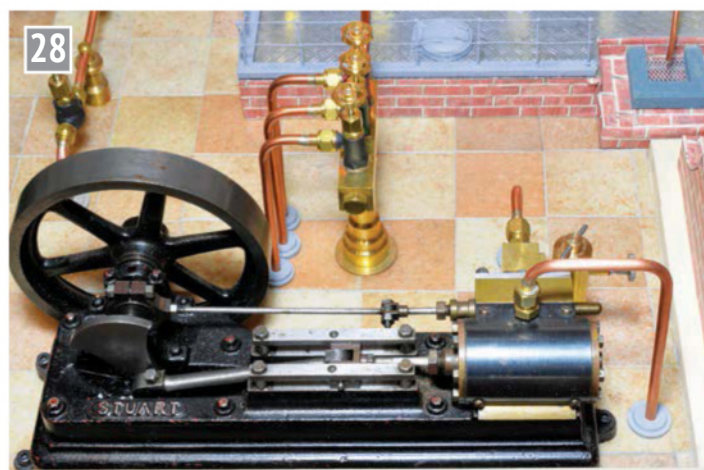
Buying a second-hand engine can be fraught with problems and again I spoke with my friend Crispin regarding what faults to look out for, what was practically possible for me to repair and what would be beyond my capabilities. His advice was invaluable and, after looking at several engines on the second-hand market, I bought the engine shown in **photo 28**. I was lucky in that the engine had been well constructed and finished and had been looked after. Even though it had not been run on steam for a number of years there were no missing or corroded parts. It initially ran quite well on pressurised air and only required some minor adjustments to the crank and fly wheel for it to run much better. There was only one component that needed attention. The hole for the steam fitting in the valve chest cover had for some reason been drilled slightly off centre and had been soldered up, re-drilled and tapped. It was steam-tight and made no difference to the running of the engine but was an eyesore and spoiled the look of

what was otherwise a well-made engine. Fortunately, the building plans for the engine and many spare parts and components are still available from Stuart Turner so I bought a set of plans and a casting for a new valve chest cover which only required finishing, drilling and tapping.

Photograph 28 shows the Stuart Turner engine *in situ* on the plant and you can see the engine has not been fully re-furbished at present. It is my intention with the aid of the plans and assembly instructions to fully dismantle, clean and re-paint the engine at a later date. Again, for a beginner, refurbishing a second-hand engine, depending on its condition, can be a most interesting and fulfilling project and another good introduction to model engineering.

With the two Chiltern Model Steam engines assembled, the Stuart Turner engine in good running order and the boiler, condenser, exhaust chimney, water tank and steam turret to hand it was now time to make the base unit and lay out the different engines and components in relationship with one another.

Whilst designing the plant some months earlier I set myself several objectives and goals that I wanted to achieve in order to produce an efficient working plant. I wanted the plant to be laid out so the engines could be clearly seen and did not obscure each other. I also wanted the central focal point of the plant to be the boiler. The operation of the plant had to be practical, accessible and easy to run with no confusion regarding



Stuart S50 mill engine.

which valve operated which engine or exhaust outlet. The exhaust from each engine was designed to run into a common exhaust pipe which led to the condenser and exhaust chimney. Both the gas and water supply for the boiler had to be easily accessible and located near the boiler. The pipe runs had to be kept as short as practically possible in order to obtain maximum efficiency and reduce heat loss, but at the same time I did not want the feed and exhaust pipes for each engine running all over the plant which would not only be a visual distraction but lead to confusion in operation.

Another important consideration was maintenance and possible future repairs, so each engine or sections of pipework had to be easy to dismantle and remove from the plant should the need arise. After much thought I decided that one practical way to achieve an orderly layout and meet my objectives was to construct a base in the form of a square box with 2½ inch deep sides and a hinged lid which

would be used to form the baseboard for the steam plant. Sections of pipework could then be obscured by running lengths of pipework beneath the baseboard. This method ensured that more direct and shorter runs of pipework could be used between the engines, boiler, exhaust and condenser. This underneath space or 'basement' would also be highly practical from an operational point of view, providing space for containers to collect water from the condenser and blow-down valve.

Photographs 29 and 30 show the baseboard during construction and in **photo 31** the beam engine, steam turret and some of the other components represented by slips of paper being laid out on the baseboard of the plant. **Photograph 32** shows the inside of the base with the baseboard raised and retained in place. I knew the completed plant with three engines, boiler and other components would be very heavy and strong hinges and bolts were fitted to the baseboard to ensure that when the baseboard is raised it



Baseboard under construction.



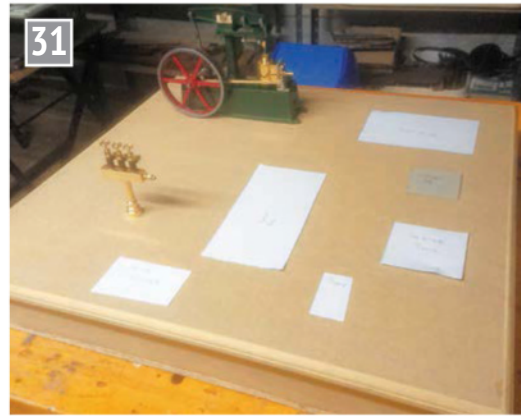
Completed baseboard.

Most of the Victorian steam boilers were designed to stand high working pressures and as such were made from riveted steel.

remains stable and can be held open safely.

As well as building a practical model steam plant with working engines, I wanted to make the steam plant visually interesting and also give it a sense of scale, so I placed a brick effect wall around the perimeter of the plant as shown in **photo 33**. **Photograph 34** shows the base with the beam engine, boiler and three other components in place. At each stage the different engines and other components were tried on the baseboard to verify their eventual positions and confirm the feasibility of the design.

All the engines and fittings would have to be securely fixed



Planning the layout of the steam plant.



Access to the underside.

to the baseboard and I did not want to drill any holes or other apertures in the baseboard until I was completely sure of their correct locations. I decided the best way to achieve this was to make a template board just under the size of the baseboard, locate, drill and fix the engines and components in place on the template and then after removing the engines and components simply drill through the holes in the template into the baseboard. **Photographs 35 to 37** show some of the components at

different stages whilst being fitted to the template board. The base, engines and other components were now finished and it only remained to lag the boiler with wooden planking before fitting the components to the base.

Most of the Victorian steam boilers were designed to stand

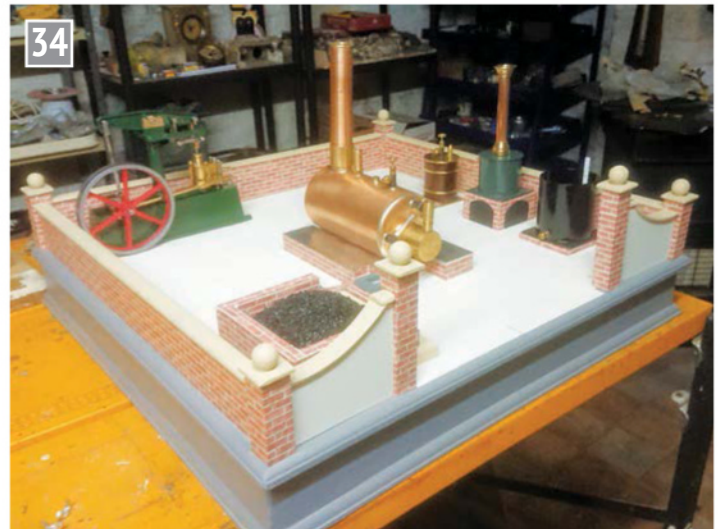
high working pressures and as such were made from riveted steel. For thermal efficiency they were often lagged with wooden planks held in place with steel bands. Model steam engines run on much lower pressure and so their boilers are usually constructed from copper. Copper is much easier

33



Boundary wall.

34



Initial units in place.

35



Trial fit of the boiler.

36



The plant begins to grow.

to work with - it can be silver soldered and does not rust. Irrespective of whether the boiler is made from steel or copper, for thermal efficiency, a boiler should be lagged.

Photograph 38 shows the boiler after being lagged and **photo 39** shows the finished boiler.

Before fitting the engines to the baseboard, I decided to cover the baseboard with 1 ¼ inch square imitation terracotta tiles cut from vinyl sheeting. The engines, boiler, steam turret and water pump were all fixed to the baseboard with nuts and bolts which would securely hold them in place but allow them to be easily removed in the future if necessary.

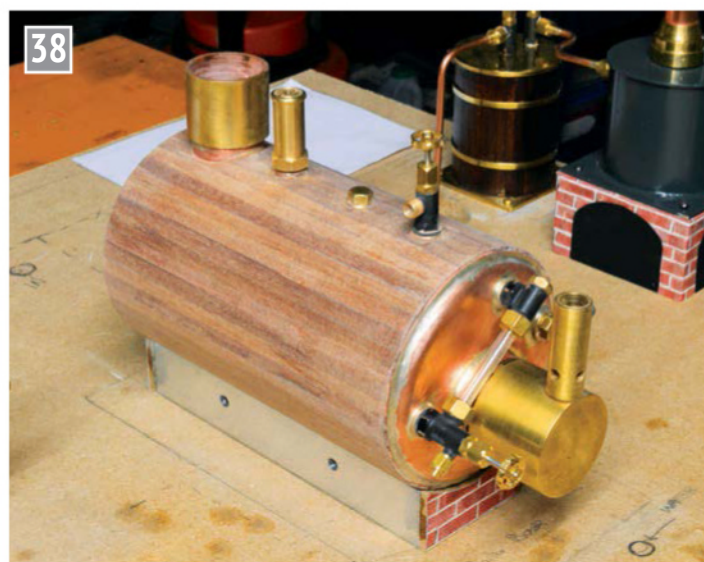
With the engines, boiler and other components firmly in place on the baseboard it was easy to visualise the planned pipework connecting the steam turret to the boiler and exhaust pipe to the condenser. Other smaller runs of pipework from the condenser to the exhaust chimney, water tank to the boiler and the fitting of drainage pipes were mostly



Some of the ancillaries in place.

carried out during the final stage of construction.

Holes were drilled in the baseboard to allow the pipework to be run beneath the baseboard from the steam turret directly to the engines. Provision was also made for the gas canister which fuels the burner to be located adjacent to the boiler and hidden from view under a 'coal-heap'. **Photograph 40**



Lagging added to the boiler.

shows the underneath of the baseboard and you can see the three engine feeds from the steam turret going directly to the engines. The respective copper pipes and elbows were colour coded to make sure each feed went to the right engine! Remember, I was working upside down and it is easy to become disorientated.

In the next and final part of this article I will show some

of the tools and fittings that I used and found essential in the construction and finishing of the steam plant. I will also describe the finished steam plant in more detail and discuss the operation of the condenser, water tank, the firing and operation of the boiler and performance of the engines.

● To be continued.



The finished boiler.



Underfloor plumbing.

An Engineer's Day Out **'Doon the Watter'** A sentimental journey down the Clyde aboard *Waverley* **PART 1**

Roger Backhouse takes a trip on the last sea-going passenger-carrying paddle steamer.



Paddle steamer *Waverley* sets off down the Clyde. The turbine ship *Queen Mary* is visible in the background.

No excuses are needed for another article about the *Waverley* (ref 1). The world's last sea going paddle steamer made her maiden voyage on 16 June 1947 so 16 June 2022 saw her Diamond Anniversary steaming (ref 2 and photo 1).

A trip aboard *Waverley*, taken in 2021, was an opportunity to relive a journey 'Doon the Watter' from Glasgow to the Kyles of Bute and Tighnabruaich made in 1966 with my family on the turbine ship, *Queen Mary*. The Clyde at that time presented a very different picture.

A steamer cruise to Clyde resorts used to be the way for Glaswegians to start their holidays but now there are only special summer excursions on the *Waverley*, arguably the best steam powered journeys in Britain with wonderful scenery combined with the sheer enjoyment of watching steam engines working.

Creating the navigable Clyde

Despite the great traffic it carried and the number of ships launched on the Clyde, the stretch from Glasgow Bridge to below Clydebank was made navigable for large vessels thanks only to heavy engineering. Eighteenth century soundings found the river was only 18 inches deep at one shoal. Shipping loaded at Greenock and the specially created Port Glasgow because of navigational difficulties upstream.

Engineers including John Smeaton, John Rennie and even Thomas Telford were consulted and effective methods to deepen the river included building retaining walls, narrowing the river and putting dykes out towards the centre of the river to channel the flow and deepen the channel.

From the 1770s onwards, however, dredging had most

impact. At first dredgers were hand operated using scoops or the 'bag and spoon' method. Steam powered bucket dredgers came in 1824 but were not self-propelled. They unloaded into barges.

Andrew Brown (1825 - 1907) became known as the 'father of the steam dredger'. Self-propelled hopper barges appeared in 1862 and several Clyde builders including Lobnitz and Co. of Renfrew and Ferguson Brothers, specialised in dredgers, building worldwide sales. Their yards, however, had all closed or diverted to other work by the 1960s.

Glasgow's population increased and the Clyde had to carry away the city's sewage. The stench dissuaded many from steamboat travel but once an adequate sewage system was in place, passenger traffic returned. Edwardian photographs of the Broomielaw show several



Turbine ship *Queen Mary* built in 1933 by William Denny's shipyard in Dumbarton.

steamers at the quays and large crowds waiting to travel to Clyde resorts.

The cruise then

Our 1960s journey on the *TS Queen Mary* started at Bridge Wharf near the Broomielaw, the traditional departure point for Clyde sailings. She was built by William Denny of Dumbarton in 1933 but after the launch in 1936 of the giant Cunard liner, *Queen Mary* was renamed the *Queen Mary II* to avoid confusion (**photo 2**). She was converted to oil firing in 1956 - 57 when a second mast was added and the twin funnels replaced by a single one. *Queen Mary II* reverted to her original name when the Cunarder retired.

After cruising to Clyde resorts for many years, by the early 1960s those holidays were less popular and traffic fell off markedly. Roads improved and more Glaswegians could holiday abroad where the weather was predictable and usually better. Many ships were scrapped including nearly all the paddle steamers.

Queen Mary was, in turn, retired from service in 1977. What followed was a period of chequered ownership which saw her, for a time, moored on the River Thames as a hospitality venue. Here her machinery was removed. Now, however, she is moored close to the *Waverley's* regular berth close to the Glasgow Science Centre. A charitable trust is working to restore her and has

reinstated the twin funnels. (www.tsqueenmary.org.uk)

Queen Mary's turbines gave a smooth passage with no vibration. *En route* passengers were treated to an accordion band, once a regular feature on board Clyde steamers.

At that time the Clyde was a highly industrialised river. Apart from several busy shipyards there were many general engineering works and General Terminus Quay handled iron ore cargoes for Ravenscraig steel works. There was Braehead power station and a thirteen storey high granary at Meadowside near Partick handling cargoes of Canadian wheat. The Anchor Line had a base at Queen's Dock near the heart of Glasgow. Very much a Scottish company it operated transatlantic services without the publicity attracted by Cunard.

Several ferries crossed the Clyde including the Renfrew and Erskine ferries. The Erskine Bridge wasn't opened until 1971. The Forth and Clyde Canal entrance at Bowling reminds travellers that the Clyde was linked, by canals across central Scotland, to the East (**photo 3**).

Some shipyards had already closed by the time we were steaming down the Clyde. Beardmore's yard closed in 1930 and the Pointhouse shipyard of A. & J. Inglis, where *Waverley* was built, closed in 1962. Overseas competition was making a



The entrance to the Forth and Clyde Canal at Bowling reminds us that Glasgow and the Clyde once had waterway links across Scotland.

major impact and Clydeside working practices were not always up to date. However, I recall a highlight of the cruise was seeing the *Queen Elizabeth 2* under construction at John Brown's Clydebank yard. She was launched the following year and entered service in 1969.

Further downstream we passed Dumbarton Castle rock. Nearby Denny's shipyard

had closed in 1963 due to lack of orders. It was there that William Denny, a pioneer in scientific hull design using William Froude's ideas, created a long tank where hull form models could be tested. That still exists as part of the Scottish Maritime Museum (**ref 3** and **photo 4**).

Passing Port Glasgow we saw Fergusons, Scotts and Lithgow's shipyards although I



Contouring machine making hull forms for testing in the Denny ship tank.

cannot remember anything of them, nor of Greenock with its James Watt Dock and sugar refinery. We called at Gourrock, however, where I recall that paddle steamers including the *Jeanie Deans* were laid up.

Another paddler, probably the *Caledonia*, was crossing from Dunoon. After time on the Thames as a restaurant ship, but then suffering a fire, she was later scrapped. The engines are preserved at the Hollycombe Steam Collection in Hampshire.

We then sailed on to the Kyles of Bute, a narrow channel between the Isle of Bute and the Cowal peninsula where ships have to slow down in order to navigate through. We stopped at Tighnabruich, a pretty village of which I recall nothing, before returning up river to Glasgow.



Several new bridges now block passage further upstream for the *Waverley*. Many locomotives built for overseas by North British were once loaded on to ships by the Finnieston crane in the background. (It appears daily in BBC Scotland's TV news bulletins.)

Cruising on the *Waverley* today

Since the building of several bridges, *Waverley* cruises sail from the Glasgow Science

Centre (near the *TS Queen Mary* and Clyde Tower). The Finnieston crane that once loaded locomotives from the North British Works at Springburn, for export all over the world, is on the opposite bank (photo 5).

Waverley was built for the London and North Eastern Railway Company in 1947 as an addition to its fleet, replacing an earlier *Waverley* sunk assisting the Dunkirk evacuation. She was built in Glasgow - to a design that had essentially changed very little for fifty years - and originally operated as a two class vessel transporting up to 925 passengers of the then considerable traffic to Arrochar and Lochgoilhead. She was withdrawn by British Rail's Sealink arm in 1973 and an

appeal, instigated by a former Master and members of the Paddle Steamer Preservation Society, resulted in giving new life to *Waverley* in preservation. Clyde cruises continued but she also began operating trips around the coast of Britain with summer and autumn visits to the English south coast, East Anglia and on the Thames.

Various alterations have been made to *Waverley* throughout her life and a major refurbishment took place in 2000 at George Prior's shipyard in Great Yarmouth. This replaced many original fittings and brought the vessel up to Board of Trade Standards.

'Going to see the engines' was a Glaswegian euphemism for popping down to the bar for a drink because, on Clyde



Waverley's engine has a viewing gallery at the sides. Little else in the steam world gives quite the same impression of power.



Crossheads run on the slides and Stephenson's valve gear is visible. There are traces of steam in the engine room and there's nothing quite like the smell of warm oil.



Watching the engineers watching the telegraph as they handle mooring is a fascinating sight.



The worm wheel in the foreground is used to turn the engine over during winter to prevent pistons seizing in the cylinders.

steamers, the engines were indeed a public feature. They are mesmerising to watch and *Waverley* has viewing galleries (photo 6).

The engine was built by Rankin and Blackmore at the Eagle Foundry in Greenock. It is a three crank, triple expansion, diagonal type with a central high pressure cylinder. During trials it produced 2100 indicated horsepower and attained a trial speed of 18.37 knots at 57.8 rpm. Steam admission is controlled by a set of Stephenson valve gear for each cylinder. The centre (high pressure) cylinder is 24 inches diameter, the intermediate 39 inches diameter and the low pressure 62 inches diameter. The stroke is 56 inches (photo 7).

There is a Cockburn–McNichol regulating valve below the starting platform controlled by the right-hand lever (photo 8). The left-hand lever controls reversing which is assisted by a Brown Brothers steam hydraulic reversing engine. From the low pressure cylinder steam is fed to the condenser helped by a Weir pump drawing condensate.

The hand operated worm gear to one side of the

crankshaft is used when the ship is laid up to move the pistons and so prevent seizing up (photo 9).

As built, steam was generated in a double ended Scotch boiler with three coal fired furnaces at each end. This was converted to oil firing in 1957. At the 2000 renovation the single boiler was replaced with two new Thermax boilers. By having two boilers the centre of gravity was lowered. A further boiler refit followed in 2019 costing £2.3 million. Steam preservation is expensive but *Waverley's* historic status helped attract funding.

The massive paddle wheels each have eight floats made of iroko timber, feathered



Fully working steam winch on deck; mooring and setting off is a complex process but handled deftly.

to present the face of the float square to the water, maximising efficient operation. Feathering each wheel separately also helps control the boat's approach to harbour

sides. Watching the engine controls during mooring is quite a sight, as is the view of the working steam winches on deck (photo 10).

● To be continued.

REFERENCES

1. See: *An Engineer's Day Out. Paddle Steamers Waverley and Kingswear Castle. Model Engineer. Vol 186, no 4146, pp 478-480* 18th May 2001.
2. *Brewer's Dictionary of Phrase and Fable* (Cassell. 1981) says that a Diamond Jubilee, strictly speaking, is the 75th Anniversary but it became known as the sixtieth following Queen Victoria's Diamond Jubilee of 60 years on the throne. Now you know.
3. See: *An Engineer's Day Out. The Denny ship model tank. Model Engineer. Vol 220 no 4584 pp 562-565.* 13-26 April 2018.

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Wainwright's Swansong

The End of an Era

PART 2

Nick Feast builds a 3½ inch gauge version of one of the last of the elegant Edwardian locomotives.



Continued from p.586
M.E. 4702, 21 October 2022

Reading through the notes that came with the part-built model took some time. Clearly a huge amount of time had been spent on researching the history of the L class but until the class received new smokeboxes and chimneys during the 1920s, most of the changes were minor and not material to the appearance of the locomotive. For example, piston tail rods were dispensed with around 1923 but these are not visible anyway. Cylinders were reduced in diameter from 20½ inches to 19½ inches at around the same time.

Figure 1 shows the overall dimensions of the class as detailed in the weight diagram. This shows how restrictive the civil engineering limits were on the South Eastern's lines as this was the largest locomotive that could have been designed for use at the time of construction in 1918. Width was just over 8 feet, limited by the restricted clearance on the Hastings line.

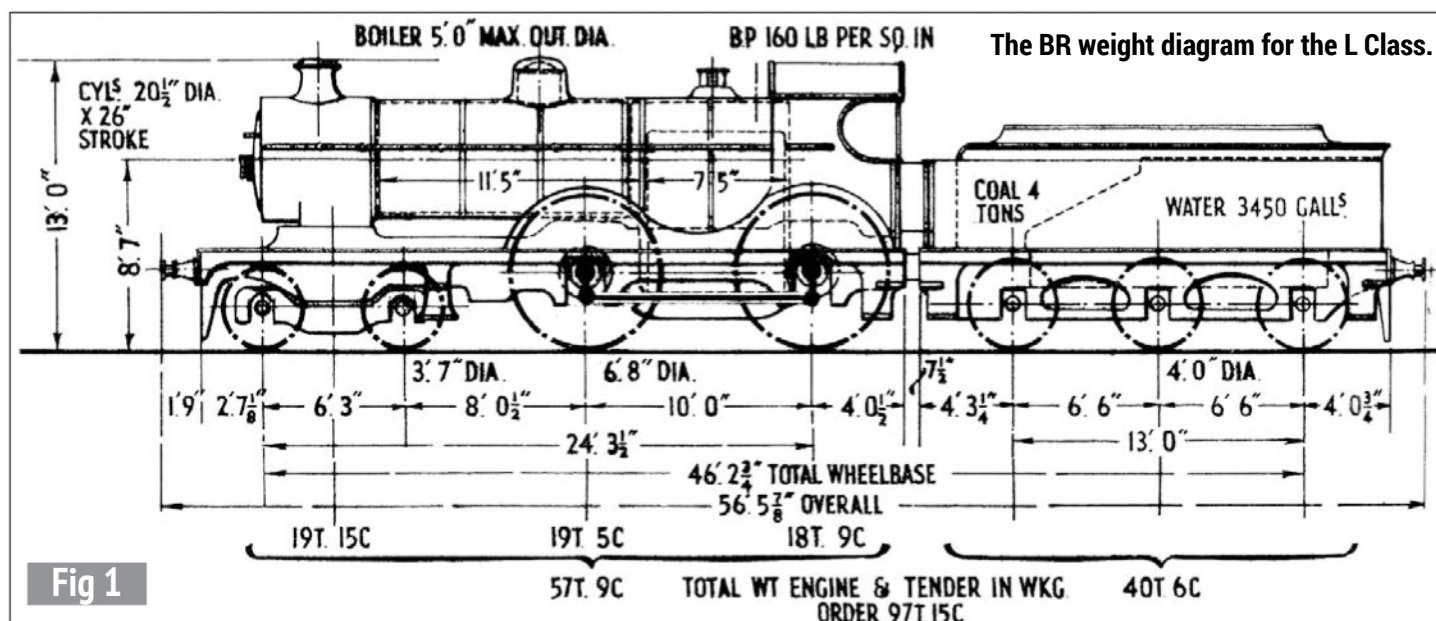


The 4-4-0 wheel arrangement was the standard for express passenger engines over most of the British railway system before the first world war; even railways that had far better track than the SECR were happy to persevere with this type, using double heading for the heavier services.

The model locomotive, as purchased, was a rolling chassis with no cylinders or motion fitted, although the cylinders, valve chests and all the necessary castings had been included in the sale. The four locomotive sandboxes

had been accurately cast; these items are often not present on similar models such as the Schools class *Roedean* by LBSC. There were also two sandboxes on the tender footplate; again these are usually omitted on models as well. These are essential on the full size for running in reverse in slippery conditions.

Unfortunately, the designer had begun to paint the locomotive in his chosen livery of 'Great War Grey', I felt that this would not do justice to such a handsome design, however historically interesting



it may have been, and decided to get as close as possible to the appearance that the engines would have had once the SECR livery had been applied when new. They would have carried this until their first repaint during the Great War. The locomotives and tenders were then painted all over in dark grey with no lining and with the engine number in large white numerals on the tender side. A small, cast brass SECR owner's plate would be fitted on the cab sides; **photo 6** shows a similar D1 class with this plate fitted.

Photograph 7 shows 31780, another of the Borsig-built engines in 1955 at Gillingham MPD, with the replacement smokebox and chimney fitted in Southern Railway days. This alters the appearance considerably as the chimney is quite different from the original and dogs instead of a central dart retain the smokebox door. This was the last survivor of the class, being withdrawn from Nine Elms in July 1961 after a working life of exactly 47 years.

It appears to be in excellent condition - a little steam from the open drain cocks and a wisp from the safety valves. The steam reverser is an obvious feature on this and all other SECR designs, something that had to be included on the model although, in my opinion, not a practical proposition as a functioning item in this scale. I wonder who, if anyone, has made a small working steam reverser?

The fact that very few alterations were made to these engines during an average service life of 45 years and well over a million miles travelled each tells us they were pretty good straight off the drawing board. Between the wars Maunsell superheaters replaced the original Schmidt or Robinson types, cylinder diameters were reduced by one inch and boiler pressures went up from 160 to 180 psi, as and when locomotives were in for overhaul, none of which would have changed the locomotive's appearance (**ref 3**). Bulleid



A D1 class in unlined grey livery with the SECR owner's plate as fitted during WW1. The D1s were Maunsell rebuilds of the earlier Wainwright D class.



31780 BR days with L1 style smokebox without snifting valves, otherwise very much as built. Photo courtesy Martin Gemmell.



31777 in the evening sun at Brighton, the combination of leaf springs on the trailing axle and coil springs on the driving axle clearly visible. Photo courtesy Geoff Bannister.

had the two snifting valves removed from the top of the smokebox during the 1940s so, from then on, the L class would not have these on view.

None of the class was ever officially named; this was not SECR policy even for express passenger locomotives. 763 (later 31763) was unofficially named *Betty Baldwin* during the general strike of 1926 and the name painted on the leading splashers by volunteer drivers. Whether this was a reference to Stanley Baldwin who was Prime Minister at the time, or a well-known artist of the same name is not clear. The thought of enthusiastic amateurs taking control of express trains at that time is quite unbelievable today. I wonder who was operating the signalling ...?

Photograph 8 shows another of the Borsig built locomotives, 31777, originally 777, near the end of its operating life, resting in the evening sun at Brighton. The later smokebox without snifting valves and Maunsell pattern chimney have replaced the original items, but the engine is substantially unchanged otherwise. BR painted them all in mixed traffic lined black livery, even though they were essentially express passenger engines.

Mechanical failures seem to have been very few and intervals between overhauls were better than average, up to 150,000 miles in some cases. Withdrawals and scrapping started after the Kent Coast electrification took away almost all their remaining work in 1959. A couple were

transferred to Nine Elms to work on the Western division, and 31768 was considered for preservation having successfully worked a rail tour in August 1960 - it was still capable of taking a 200-ton train through Hook at over 70 mph on the trip between Waterloo and Salisbury - but was eventually scrapped. Presumably the authorities at the time felt that preserving T9 class 4-4-0, No. 30120 was adequate for historical purposes.

● To be continued.

REFERENCE

3. *Maunsell Locomotives* by Brian Haresnape. Ian Allan Ltd., 1977.



Alan Mitchell from Spenborough with his L&B 2-4-2 tank heads off towards the Far Leys station.

The 7¼ Inch Gauge Society AGM

John Arrowsmith reports from the Echills Wood Railway.



The AGM of the Society was again held at the Echills Wood Railway in Kingsbury Water Park, near Tamworth, by the kind invitation of the Railway. As readers will know, this fine organisation has an excellent reputation for running large gatherings like this and, once again, they provided their usual first-class service. With over 70 locomotives booked in from Thursday 15 September until Sunday 18 September, this was going to be a very busy weekend - and so it proved to be. Locomotives ranged from a small Tich 0-4-0 to the large American K36 class 2-8-2 with almost every other conceivable

type of locomotive on show as well. The weather was excellent with bright sunshine and a warm atmosphere, so the smoke effects were very good.

The main meeting marquee had been arranged with a good number of seats and tables so that the available refreshments could be enjoyed by all. The front of the main station at Harvesters had been set up for visiting traders to display their current ranges of locomotives, track and fittings and provided a focal point for all the activities. All was set for a good AGM event.

With the track about 1¼ miles in length there is plenty of opportunity to enjoy all

the system has to offer and locomotive owners can use a variety of stock to couple to their engines. Far Leys is the station at the extremity of the track and here the four-platform layout allows plenty of viewing alternatives, with some trains passing straight through and others stopping for coal or water.

I only arrived on Saturday so those engines which were operating on both Thursday and Friday were not necessarily running during these days. The railway has a large, semi-circular steaming bay and turntable and this is certainly the place to be to watch the locomotives being



A passenger's view of the steaming bays.



Gordon Roberts starts the Darjeeling B class away from Far Leys station.

prepared for their day's work. On the opposite side of the turntable is the large storage area where both stock and engines occupy the sidings during the weekend. This also enables visitors to discuss the engines running on the railway.

The first locomotive in steam was owned by Alan Mitchell from the Spenborough club; it was his L & B 2-4-2 tank engine, *Lyn*. This engine is a much-modified Winson kit and was working well on the circuit (photo 1). The steaming bays here are always busy and, as my photo shows, have that real 'old engine shed' feel to them (photos 2 and 3). A regular attender, working hard on the track, was Gordon Roberts with his Darjeeling B class which was making short work of the loaded trains he was pulling (photo 4). One of the stalwarts of this society over recent years is John Nicholson and, with his Romulus locomotive, I actually caught

him driving! By the look on his face, he was really enjoying himself (photo 5).

Three large American locomotives were in operation



Plenty of atmosphere as the K36 of Paul Edmonds prepares to leave the shed.

during the day and all looked impressive machines. The U-3-b 4-8-4 Northern 6323 was only purchased on the Friday before the meeting and new

owner, Angus Holdsworth from Colchester told me he was very pleased with the performance on Saturday (photo 6) but he is still learning



John Nicholson on his Romulus Cegin powers through North Gate Halt.

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Angus Holdsworth with his American U 3-b4-8-4 moving through Far Leys station.



The K36 at Northgate Halt.



The 0-8-0 American Switcher with Malcolm Fuller has plenty of steam through Picnic Halt.



A B1 4-6-0 with Alan Gildersleve approaches Wren Tunnel.

the skills needed to drive a large locomotive like this. Paul Edmonds is the builder and owner of the large K-36 2-8-2 Mikado locomotive of

which the original was 3 foot gauge, so in 7¼ inch gauge it was a very large machine (photo 7). The final American locomotive of the trio was

Malcolm Fuller's Norfolk and Western 0-8-0 Switcher. In reality it is a Martin Evans up-scaled 3½ inch gauge Caribou (photo 8). Narrow gauge

locomotives dominated this event and standard gauge British outline engines were few and far between but one fine engine was the 4-6-0 LNER B1 owned by Alan Gildersleve from the Bedford club (photo 9). Another LNER locomotive in steam and going really well was the rare model of a 4-4-0 Class D40 owned by Graham Cockell (photo 10).

The main purpose of this event, of course, was the Annual General Meeting of the 7¼ Inch Gauge Society Ltd. and this was started promptly at 4.00pm in the main marquee. Chairperson, Janet T. Royston began the proceedings by asking the meeting to stand for a minute's silence in respect for HM Queen Elizabeth II, and for the previous Society chairman, Frank Cooper who passed away earlier in the year.

The formal business was progressed very well with Janet Royston firstly



The LNER 4-4-0 owned by Graham Cockell looks good as it drifts through Far Leys station.

introducing herself as the acting chairperson and all the remaining committee members then introducing themselves and their roles. Janet presented a recorded message from president, Brian Reading who apologised for not attending due his unfortunate health problems and his age but he said that he hoped everyone would enjoy the weekend and thanked EWR for allowing the meeting to go ahead. The usual apologies for absence were read out and then the election of officers and committee members took place. All the existing members of the committee were elected *en bloc*, which was agreed by the meeting. Chair, Janet Royston then offered the Annual Report for approval which, again, was approved by the meeting, as was the proposal that membership fees return to the same rates existing before the Covid pandemic. She continued

by introducing the annual awards for the Society. The Brian Reading award is decided by the host Society for the best locomotive operating during the weekend. This year the award went to John Cross for his model of a fine 0-6-0 Holmside saddle tank (**photo 11**) but John was not present at the meeting to receive his award. The Charles Simpson Award is presented in recognition of the member who has provided outstanding service to the Society over many years. The 2022 award was presented to Tony Knowles to much acclaim (**photo 12**). There were, unfortunately, no nominations for the Junior award. Bob Whitfield then outlined the activities that have been organised over the last months including the Mini Gatherings, which had been very successful. He also stated that the Society will be attending the Midlands Exhibition at

the Fosse in October. He announced that the next Mini Gathering will be at the Abbeydale railway in Sheffield. The chair then introduced the work that has been done on the Proficiency Scheme and her commitment to the Gold Level Standard which will be trialled very shortly. Members were then introduced to those who had been examined in and passed the Bronze and Silver Levels during the meeting. They were each greeted with applause (**photo 13**). As they all assembled one wag in the audience suggested that it was the new 7¼ Inch Gauge Choir ... but fortunately the meeting was saved from that experience!

Next year will be the 50th Anniversary of the Society and the AGM is to be held at the Mizens Railway in Woking; all the details will be published in due course. The dates are 22 to 24 September and Nick Deytrikh, the newsletter editor

is asking for contributions to a special edition of the News magazine.

Thanks were expressed to all the members for attending and to the Echills Wood Railway for the invitation to host the meeting for the second consecutive year. Jeff Stevens, the EWR secretary was presented with a commemorative plaque by Janet Royston for all the work he has done in organising the event (**photo 14**). She also thanked all the EWR staff for looking after everyone and providing a wide range of refreshments over the whole of the weekend. It was an excellent event which was enjoyed by all. I can only agree most sincerely; for the all the hospitality and atmosphere at Echills Wood, *thank you!* You did us all proud once again.

ME



Winner of the Brian Reading award was this Holmside, owned by John Cross.



Tony Knowles receives the Charles Simpson award from Chairperson Janet T. Royston.



The Proficiency winners are acknowledged by the meeting.



ERW organiser Jeff Stevens receives his plaque from Janet.

Geoff Theasby reports on the latest news from the Clubs.



Warning, Geoff at large! 'They' say that all good things must come to an end so, in contrast, comes Club News...

Progress on several fronts, for once. My locomotive *Deborah* is now mechanically complete, with driving trailer, and has run up and down the garage under its own power. Next - to complete the dual gauge track and run it out into the drive. I have 20 feet of track, all in. My radio station has been further improved and I finished off a power supply which has been languishing in the slough of despond (the back of a shelf) for more than a year.

Following my comments in *M.E.* 4699 on Gauge 1 North, Bakewell, Peter Vincent, Secretary of the Yorkshire group, thought my criticism was rather harsh. He pointed out that the event was signposted, within the constraints imposed by the venue and the shortage of helpers on the day. Maybe I was too severe but it was understandable, especially in view of the following day's visit to a radio rally. I also have experience of helping at MEX on several occasions, Esher and Brooklands in recent years, so I am aware of the difficulties.

W. www.gauge1north.org.uk

In this issue: spot the Oxford comma (properly used here), artworks, technical progress, a big engine and a small one, an old lathe, inland submarines, an LMS corridor tender, cheap

steam models, and Kei trucks. (sorry, this is a one-off! Ass. Ed.)

Ryedale Society of Model Engineers Newsletter August, has much to say about good weather, lots of visitors and ongoing maintenance, plus many pictures. Very much a case of 'Business as Usual'. Keep up the good work, guys.

W. www.rsme.org.uk

The Whistle, Sept/Oct, **BCSME**, contains an item by editor, Paul Ohannesian, about his visit to the colourfully-named Train Wreck Park in Whistler, near Vancouver. In 1956 a train derailed in a narrow cutting, blocking the only rail access to the town. The Park is notable for its multicoloured graffiti, which in places shows real artistic merit. The subsequent inquiry found the train crew were at fault and they were dismissed. Access involves traversing a scary pedestrian rope bridge.

W. www.bcsme.org

Inside Motion, September, from **Tyneside Society of Model & Experimental Engineers**, prints Eddie Gibbons' photograph of a 'unique' micrometer, asking if anyone else has seen one. I must confess that I still have a plastic tyre tread depth indicator, which works on similar principles, probably given away with a relevant promotion (**photo 1**). Jim Nolan visited Train Mountain Triennial 2022, and commented that the ban on coal firing meant that only LPG-powered locomotives

could run and attendance was down as a consequence. In view of the devastation wreaked by the wildfires a couple of years back, the decision to ban coal firing must be supported.

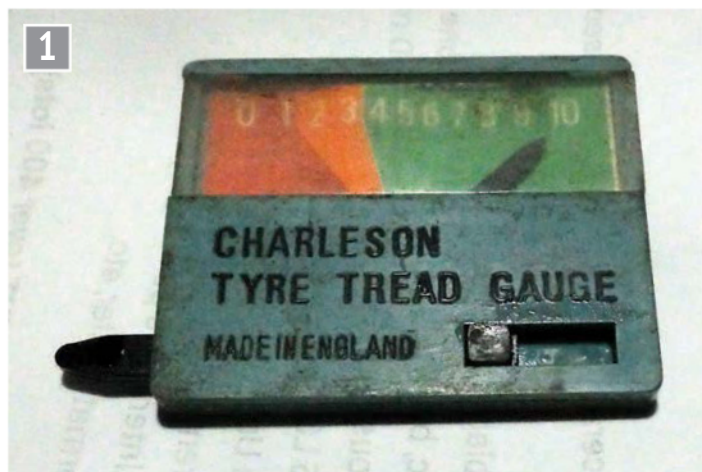
W. www.tsmee.co.uk

Clearing his house preparatory to moving ('flitting', as we say in Yorkshire), Paul (see above) found some lines written by Thomas Hardy, on the loss of the *RMS Titanic*, which he called the 'convergence of the twain'. Paul has photographed this item and made a digital image, suitably treated to give the appearance of letterpress. Who would have thought of this technique even being possible as recently as 1978 (the year director James Cameron's film was released), let alone 1912?

The Prospectus, September, from **Reading Society of Model Engineers**, contains part 4 of the story by Alec Bray, of knuckle joints in GWR locomotive coupling rods. Editor John Billard saw a Merlin engine in the workshop of a friend, who hopes to fit it into a car. The Merlin dated from 1950, its last year of manufacture. It has petrol injection and consumes 165 gallons per hour, costing £1,567 at today's prices, which translates to 7 mpg in cruising mode, and the engine contains over 14,000 components. The car is expected to consume rather more fuel, estimated to be 3 (three) mpg. For those who are drooling with desire at the Merlin, try this engine bay of the Bond Minicar, with its 122 cc Villiers engine (**photo 2**). (Seeing all that empty space reminds me of my first car, a Triumph Herald. With the huge front bodywork open, there was room to stand inside the space revealed in order to do minor servicing.)

W. www.prospectparkrailway.wordpress.com

Steam Lines, Sept/Oct, from **Northern Districts Model Engineering Society (Perth)** reports a very busy July and August, being fully booked, and requiring extra effort from drivers, filling in for people



My lever micrometer.



Bond Minicar, engine bay (photo courtesy of David Scott).

on holidays. Lyall Austin remembers his Dad's old lathe, which he has recently tidied up and repainted, although it will never work again. It is a Wade No 1, tubular bed lathe, made in Hove, Sussex circa 1921. It was originally treadle operated and was difficult to do fine work whilst pumping the treadle. See www.lathes.co.uk Bill Wall visited SASMEE in Adelaide. They have a novel method of transferring locomotives from the steaming bay to the track – a pedestrian operated, battery-powered, rail mounted, fork lift truck. July 12 was probably a record day in that they were so busy that all three 7¼ inch gauge locomotives were called upon to run. Jim Clark built a beam engine, kits for which are available from several companies, including Stuart in UK, and O.B. Bolton in Oz. The finished models are not all identical - indeed Jim altered the design to suit himself, notably using a flywheel from an Allchin traction engine and casting his own beam. Dating from about 1858, a similar model reached Percival Marshall in about 1914 and was subsequently serialised in *Model Engineer*.

W. www.ndmes.org.au

York Model Engineers Newsletter, September, begins with the incongruous story that WWII submarines were built in Yorkshire! Yes, X-craft, as in *Tirpitz*, sinking of, were built, in whole or part, by Broadbent Engineering in Huddersfield, Markham

in Chesterfield, and in Gainsborough. They were powered by Gardner engines, derived from those used in London buses, and an electric motor. Model of the Month is an Adams radial tank engine by Martyn Blackburn, who also built steam launches, one of which is moored at Bowness boat museum on Windermere. On its way to a good home is temporary workshop resident, a pantograph engraving machine, for inscribing letters on to metal, as in (editor, Roger Backhouse writes) – er - brass coffin plates. Speaking of which, currently in the news, as I'm sure all now know, is the term *catafalque*, a fascinating word, from the Etruscan, meaning a wooden siege tower. Roger also wrote a short piece about York's trolleybuses, surely unique in that the city was twice so equipped, and twice abandoned them, in 1920-29 and again in 1931-35. After the second closure, the remaining 'trackless' buses were sold to Chesterfield. In a related book review *British Trolleybus systems: Yorkshire* by Peter Waller, we learn that trolleybuses were last used in the UK by Bradford, in 1972. Published by The Trolleybus Museum at Sandtoft, Doncaster (nearer Scunthorpe – Geoff. An excellent visit, btw). It is a great pity that we British abandoned the use of such vehicles, as they were fast, caused little direct pollution, and could carry many passengers. Continental



Solaris Trollini II (Polish-made tram) in Riga, Latvia.

Europe was more eclectic (ha ha! - Yorkshire Eclecticity...) and stuck with such motive power, as in this photo from my cruise in the summer (photo 3). Another book review is of the Hornby Book of Trains, a whopping 450 pages telling the story of an iconic brand. A further book review is Christian Wolmar's history of BR. (I noted this to buy some months ago but never got round to it. I have now rectified this gross error, as CW is an expert and very readable author, whose work I always enjoy – Geoff.) In a report of recent meetings, we hear that Martin Lummas is building an LMS corridor tender. You didn't know? Join the club! It was used in conjunction with their dynamometer car. Roger Enzor writes up the forthcoming auction, for which there are already 130 entries. One of which is Lot 114, a train in a tin. This reminds me of my visit to Jodrell Bank, where, in the shop, I bought a moon rover, satellite, and rocket in a tin, to build from Lego. The rover is now on our bookshelves and the satellite suspended from the ceiling. Due to a fit of enthusiasm on the part of the paper buyer, the three final pages are blank. Use them to create your own newsletter contributions and send them to Roger. Waste not, want not! Roger also notes that Channel 4 *Hobby Man* series on 9 September features York model engineers.

W. www.yorkmodelengineers.co.uk

A sale of collectable toys was held at Sheffield Auction Galleries on 15 September, which included several steam engines, mostly scratch built, plant, and vehicles. A Stuart grasshopper beam engine (estimated £500-£700), a large horizontal mill engine (£120-£180), Meccano No. 6 boxed set (£60-£90) amongst others, most of which did not meet the estimate, or did not sell. A brief wander around the items for the next sale revealed a laboratory balance in a glazed cabinet (£30-£50) which would make an unusual decoration for the home (my wife's cousin has one so displayed), a 1 meter long, wooden model of the Cutty Sark (£20-£40, also in a glazed cabinet), which would look fine if similarly situated. This knife is not from an identified manufacturer but note the Damascus steel blade (photo 4) - see Wikipedia.

Our eagle-eyed transport enthusiast briefly spotted a Haflinger in Sheffield recently. An Austrian, lightweight, 4x4 all-terrain vehicle by Steyr Puch, it was named after a small horse, bred in Austria for use in mountainous areas. (A larger vehicle is the Pinzgauer, from the same



Damascus steel knife at auction.

company. I recall the exciting motorised point to point contest between the British Army and the London Motor Club, on Saturday afternoon TV in the 1960/70s.) Other small pickups (Kei trucks) are, or were, the Honda n600 and Acty, and by several other Japanese manufacturers. On another day, whilst out and about, he observed an electric, child-carrying, miniature Land Rover in a family group. They were going the other way, so I couldn't get a photograph, or speak to the group about it.

The Workbench, September, from **Durban Society of Model Engineers**, reports that the Avonside is not steaming well, despite a thorough cleaning of the smokebox. Alf suggested that a good clean of the petticoat pipe would be in order and, indeed, was found to be encrusted with ash. We await results in the next issue.

W. www.dsme.co.za

Squeezed out from last time, here are Jeff Ainsworth's J72 (photo 5) and Jim Clement's 'corrugated end' van (photo 6).

Halesworth & District Model Engineering Society's autumn *Newsletter* features a 4-4-0 by Dave Kinsella of RSME, a 5 inch gauge, part-built L&Y model found in a chicken coop. Although it began life in the 1930s, it wasn't freed from its unusual accommodation until



Jeff Ainsworth's G3 J72 (photo courtesy of Jeff Ainsworth).

the 1970s and Dave acquired it 18 months ago. It was photographed by editor Julie Williams whilst on holiday. The chairman, Philip Hall, holidaying in Norfolk, visited the North Norfolk Railway, riding behind a BR Standard 4, 76084, in a beautifully restored vintage train. LOWMEX, at the end of October, promises

to be bigger than ever, last held in 2019. 'Profile' this time is of Clive Randlesham, who was hooked on steam after attending a steam rally aged 9. A tug of war had been arranged between a Showman's engine and about 80 volunteers. A tweak of the regulator, the engine moved about 18 inches and the

assembled company all fell over... Another profiled member is Vic Churchill, who was apprenticed as a watchmaker and jeweller. Once, at the town hall, he saw the mayoral chains of office, which he thought looked dirty. As he examined them, a hand fell on his shoulder - it was the long arm of the law! He established his *bona fides* and was released. Moving later to Lowestoft, he noticed a neighbour's garage occasionally emitting steam and smoke. And that, children, is how he joined H&DMES! Julie also visited Scarborough Fair, a vintage event, with all the usual excitements.

W. www.hdmes.co.uk

And finally, is an engineer's workshop full of blunt instruments?

(And we'll have no more of your Oxford commas in future, if you don't mind! – Ed.)

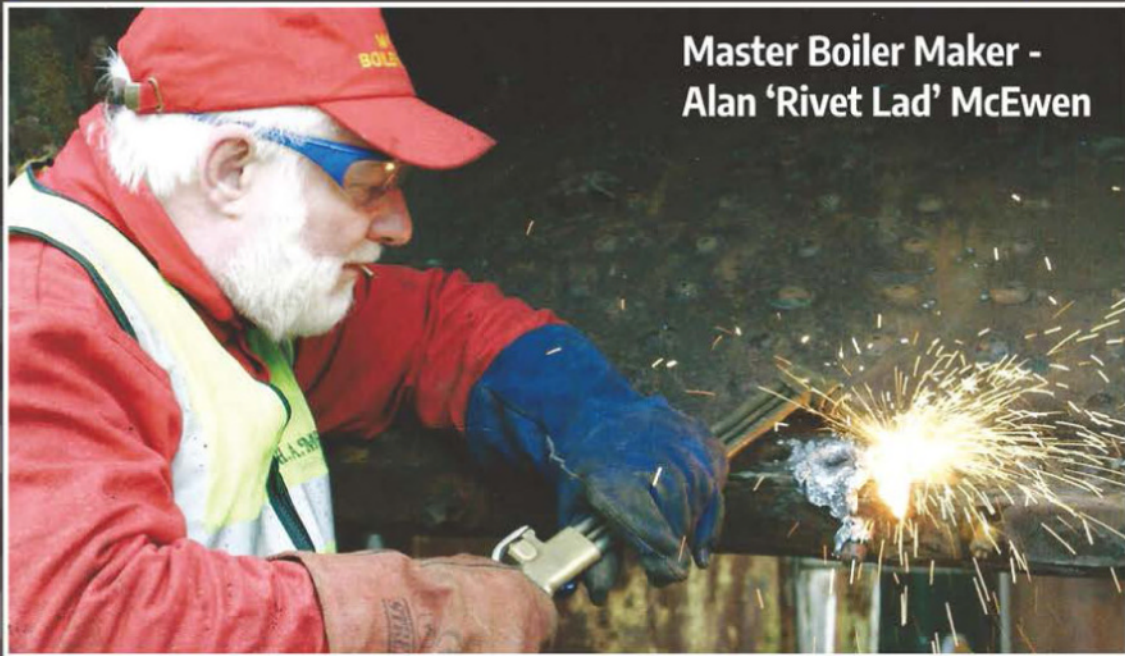


G3 corrugated end van by Jim Clement (photo courtesy of Jim Clement).

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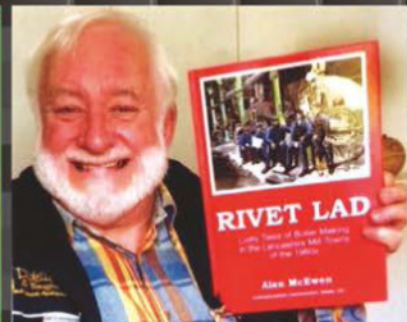
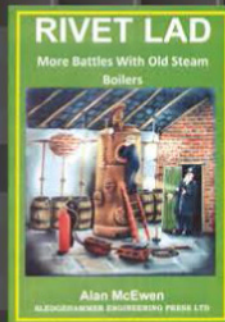


Master Boiler Maker -
Alan 'Rivet Lad' McEwen

When Master Boiler Maker and author, Alan McEwen was a young sprog, he loved banging and hammering on rusty old boilers; now that he is an old hog, he just prefers others to bang and hammer!

Alan McEwen's Boiler Making adventures and also 'potted histories'

of several Lancashire and Yorkshire Boiler Making firms, can be read in **RIVET LAD - Lusty Tales of Boiler Making in the Lancashire Mill Towns of the 1960s**. The book is crammed with 'hands on' technical information of how Lancashire, Locomotive, Economic, and Cochran Vertical boilers were repaired over 50 years ago. The book's larger-than-life characters, the hard as nails, ale-sipping, chain-smoking Boiler Makers: Carrot Cramphorn, Reuben 'Iron Man' Ramsbottom, Teddy Tulip, genial Irishman Paddy O'Boyle, and not least Alan himself, are, to a man, throw-backs to times gone by when British industry was the envy of the world.



Alan McEwen's first RIVET LAD book: **RIVET LAD - Lusty Tales of Boiler Making in the Lancashire Mill Towns of the Sixties** published September 2017 is now priced at £25 plus £3.00 postage and packing to UK addresses.

Alan's second RIVET LAD book: **RIVET LAD - More Battles With Old Steam Boilers** was published in September 2018. Now priced at £25 including postage and packing to UK addresses.

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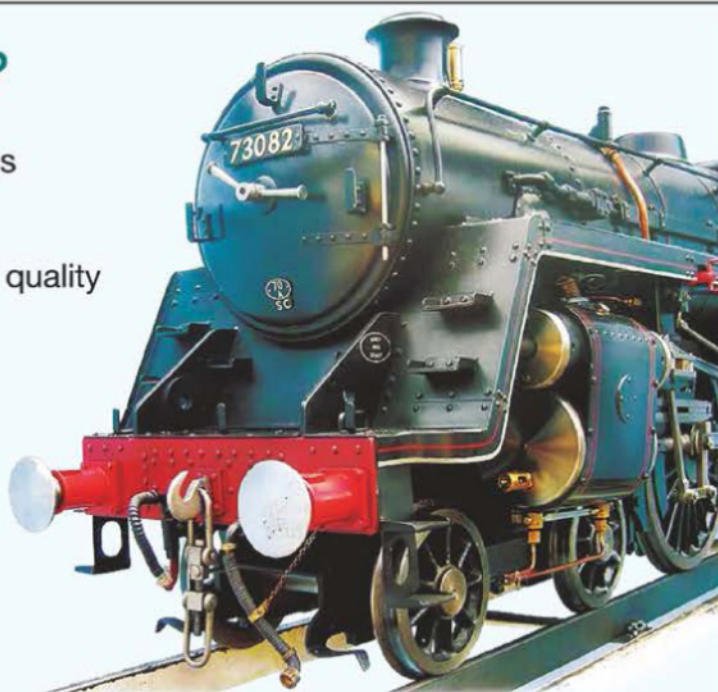
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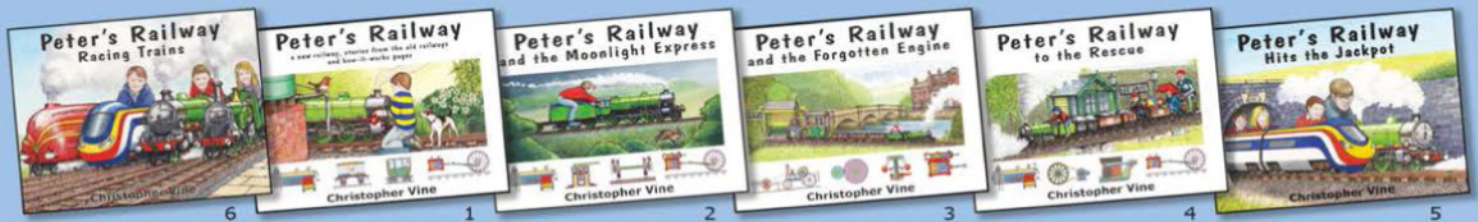


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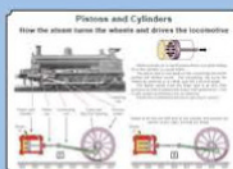
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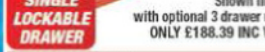
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