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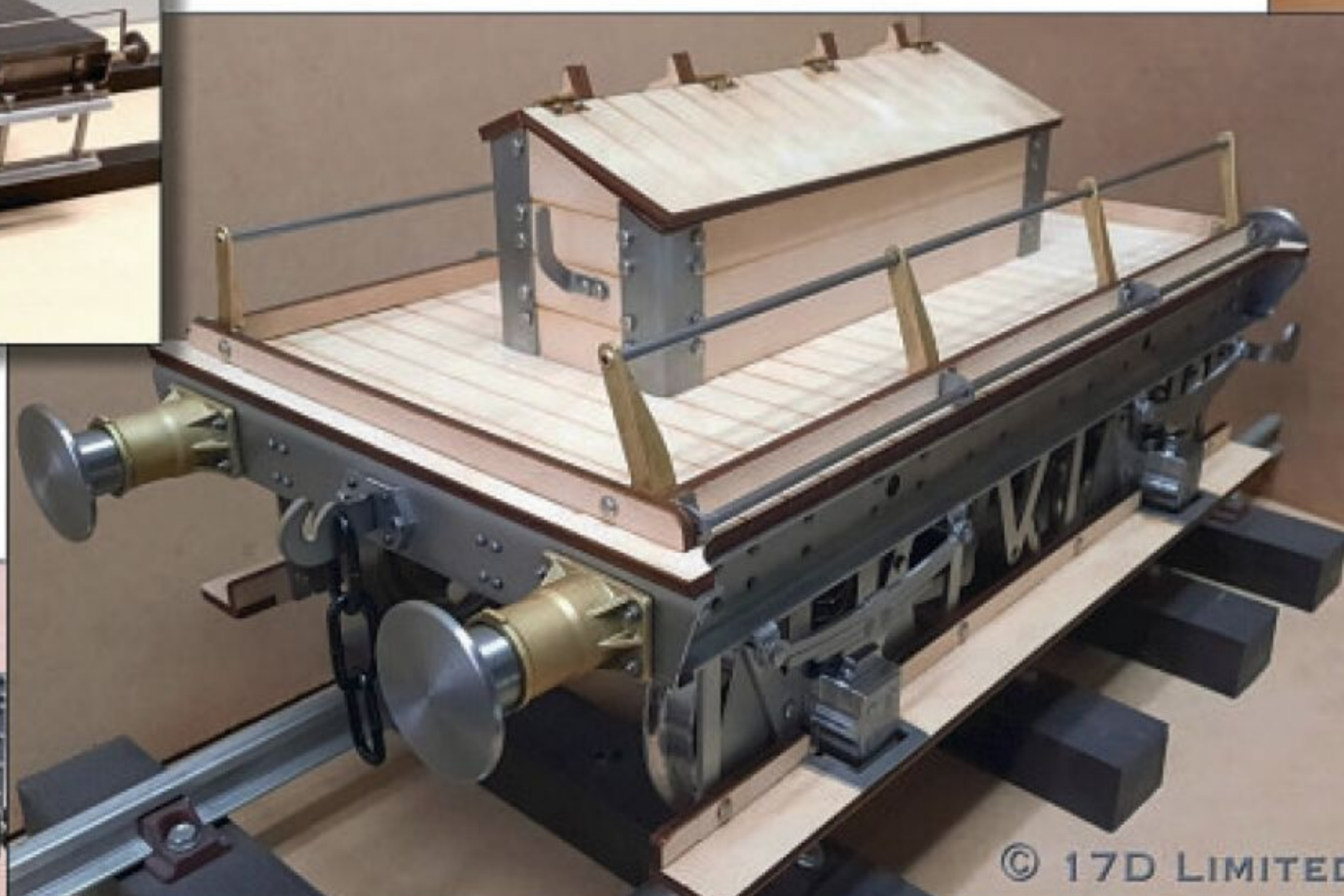
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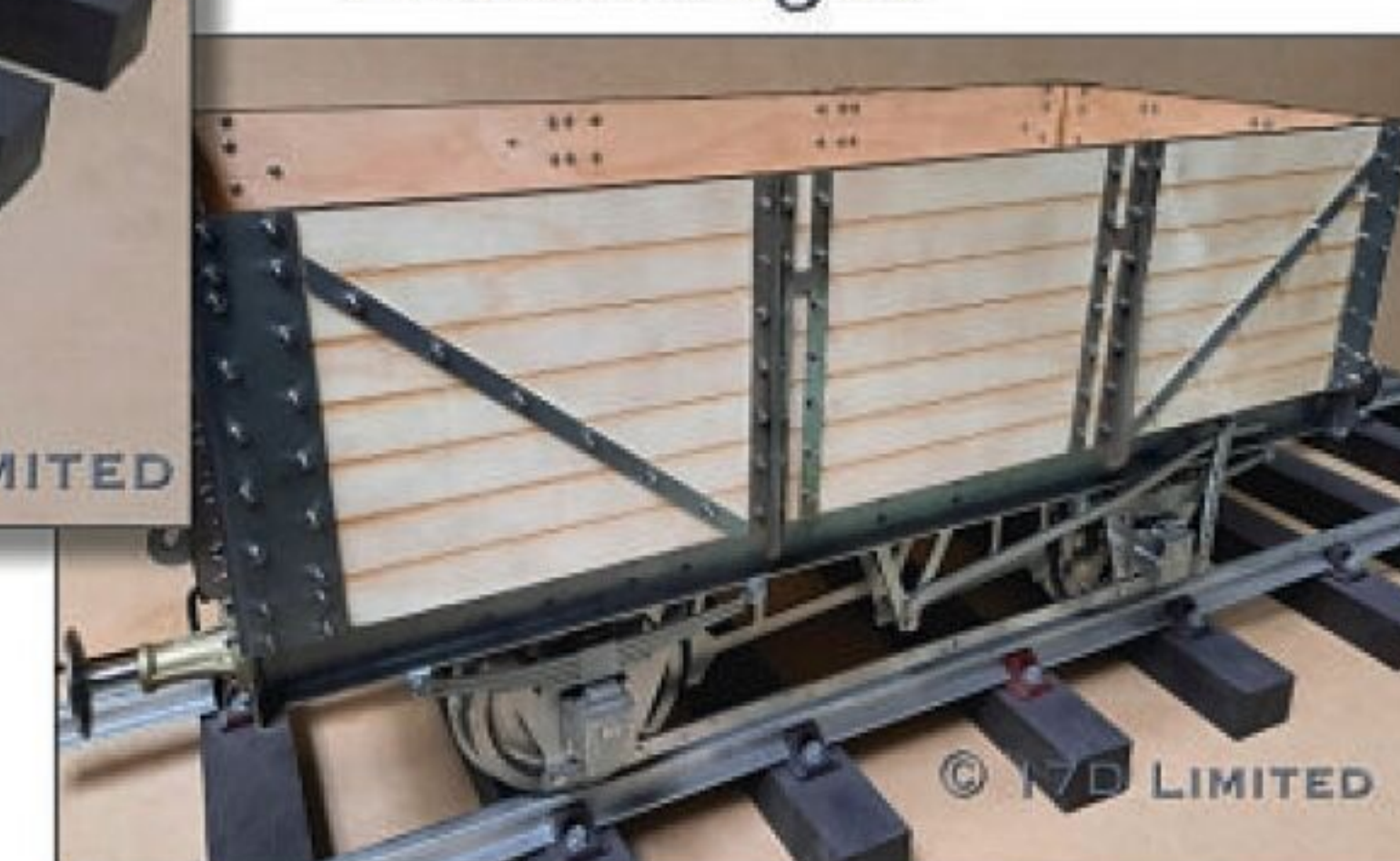


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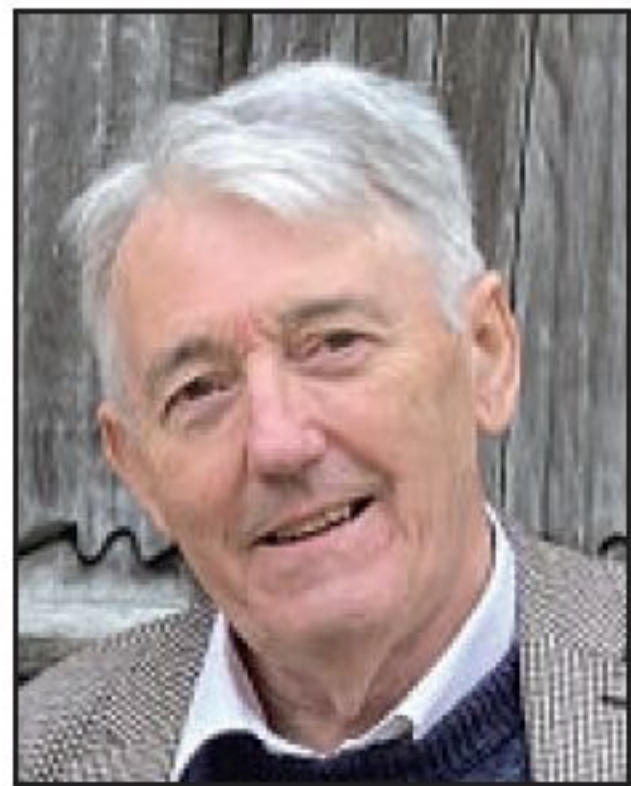
ON THE COVER...

A model of a 1962 Raleigh Trent Tourist bicycle made to a scale of roughly 1:5 by Bill Godfrey of Brighthorne, Isle of Wight (photo: Mandy Meadows).

This issue was published on November 1, 2024.
The next will be on sale on November 15, 2024.



www.model-engineer.co.uk



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National Museum of Computing

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IMLEC 2025

A note for your diaries. IMLEC 2025 will be held at the Fareham and District SME over the weekend of the 20th, 21st and 22nd June 2025. The full contact and web details will be published in the January edition of *Model Engineer*. In the meantime you can start practising!

Extra Curriculars

Have you ever wondered what your hard-working editor does with the vast expanse of free time that comes with his job? Amongst the many activities that occupy his idle hours is working on the EDSAC Replica Project at Bletchley Park (photos 1 and 2). The original Electronic Delay Storage Automatic Calculator (EDSAC) was built at Cambridge University between 1947 and 1949 and came about when the director of the Mathematical Laboratory, Maurice Wilkes, attended a conference on early computers in the USA. Inspired to produce his own improved machine, he sketched out the design on his voyage back across the Atlantic.

Many computer designs, at the time, claimed to be first but the truth is that they were all the first to display certain features. EDSAC claims to be the world's first practical electronic stored program computer. Once completed, it became the basis of the university's computing service, the first in the country. In that role, its computing power was instrumental in helping to win three Nobel prizes – for John Kendrew and Max Perutz (structure of haemoglobin), Andrew Huxley (mechanisms

of nerve conduction) and Martin Ryle (aperture synthesis in radio astronomy).

The computer was constructed of thermionic valves (transistors were not available then), of which there were about 3,000 dissipating 11kW. The machine filled about 140 19 inch chassis in a dozen racks and occupied an entire room. It was capable of about 600 instructions per second and the store contained 512 18 bit words.

From analysing proteins to counting buns – the EDSAC design was the basis of the first commercial computer in the country, the Leo 1, commissioned by J. Lyons and Co. and used for payroll and stock control.

The EDSAC Replica Project aims to rebuild EDSAC in its original form and is manned by a (mostly) aged team of retired electronics engineers, one or two of whom (incredibly) had actually used the original machine as students. The project is run by Andrew Herbert, formerly director of Microsoft Research in Cambridge, and himself a former student of Maurice Wilkes.

The EDSAC replica shares a large room with the Harwell WITCH, the world's oldest original working computer, at the National Museum of Computing at Bletchley Park. This is next door to the codebreaking museum and a visit to both makes a grand day out. See www.tnmoc.org

Sinister

I happened to visit St Paul's Cathedral a few days ago and descended to the crypt to visit the loo (as you do). Down there, I came across this sign



Relief for the left-handed.

(photo 3). Unisex (err - good), Accessible (very good), Left handed (what??). Since when has being left-handed been a handicap in the context of personal hygiene? How does a left-handed person cope if no left-handed loo is available? Answers on a postcard please (written left-handedly, of course).

Cockup Corner

We suffered a little photographic mix-up in our article on the GWR pannier tank in issue M.E.4753 (October 4th). Photographs 4 and 5 are the wrong way round. I regret this was not spotted at the proof reading stage. Congratulations to anyone who did spot it!



The Electronic Delay Storage Automatic Calculator (EDSAC).



Your editor wrestles with the machine.

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Part 23: The Wonders of Technology - Part 2

Details Matter

Steve Goodbody

takes a random walk through model engineering.



Continued from p.599
M.E.4754 October 18



In Part 1, the author expounded his view that, while the benefits of a technology are often arguable and difficult to quantify even in hindsight, the results of our model engineering activities represent a clearly beneficial and complementary technology to their prototypes because, thanks to their more manageable size and accessibility, they are often better able to demonstrate the workings of their full-size brethren; especially if the latter are confined, coldly and inanimately, to a museum.

Phew, what a mouthful.

The drama of big

Having planted the *small is beautiful* banner upon Butterside Down's grassy plain, in the interest of balance and counterpoint it's time to contradict myself entirely and those who recall my earlier medical self-diagnosis with respect to technology are likely shaking their heads in pity and I thank them for their concern. You see, while it is indeed "... *hard to beat the sensory appeal and majesty of a full-size engine thundering along the main line...*", to shamelessly quote

myself from Part 1, I can think of one example which, in my opinion, does indeed sit above that lofty technological treat. Let me explain.

It's 11:50am on 12 April, 1981; I'm in my first year at the Crowborough Beacon secondary school in East Sussex and the bell has just rung to mark the end of the morning's final lesson and the start of our one-hour lunch break. Stuffing books, pens and ruler roughly into my bag, I rapidly head for the classroom door; not exactly running (I don't want to be admonished by the teacher, for that would cause a delay), but certainly at a brisker-than-normal pace. Once in the corridor I do break into a run, bounding down the stairs three at a time and, five minutes later, burst into another classroom already half full of teachers and students. The room is darkened because the curtains are drawn and a bulky television projector sits at the front in the centre, its other-worldly red, green and blue lenses focused on the large screen above.

"Has it started?" I call frantically to a friend, still unable to see the projected

image for the heads of the people in front, and thankfully he shakes his own head as I work my way around to the far side of the room for a clearer view. A teacher calls for order and we dutifully sit down on the provided chairs as more people arrive. We shush them as they enter.

The view on the screen since I arrived has remained largely unchanged, but then, a few seconds after our high-technology digital watches register midday, a large plume of smoke appears, space shuttle *Columbia* rises from launch pad 39-A atop a dazzling ball of fire and the first mission of the Space Transportation System program - STS-1 - begins. I, twelve years old and mesmerised by this historic spectacle, watch in awe as the booster rockets detach and fall symmetrically away from the main tank, silently vowing to witness a shuttle launch myself, one day.

Setting our watches forward nearly thirty years to 4:53 pm on the afternoon of 24 February 2011, having boarded an official bus from Orlando at five o'clock that morning with my four-year-old daughter, we, and several thousand other ticket-holding spectators who had arrived on similar buses, cheer in unison as space shuttle *Discovery* repeats the same feat as her sadly departed sister, from the same launchpad, on STS-133: the space shuttle program's penultimate journey and *Discovery's* final mission. And let me tell you, despite being



Taken with a long lens from our viewpoint several miles distant, Space Shuttle Discovery departs on STS-133, her final mission.

a steam enthusiast, and with neither a shadow of doubt nor a pang of guilt, even a well-found steam locomotive rushing through the British countryside cannot beat the truly jaw-dropping sensation when, twenty-eight seconds after its main engines ignited, and with the rocket already in the air, that wall of noise finally hits us from across the six-mile gap to Kennedy Space Centre's viewing area and our bodies begin to shake from the inside out as the distant fireball ascends. Then, just two minutes later, at an altitude of roughly twenty-six miles, we watch spellbound as the booster rockets again detach and the glow of the three main engines slowly disappears into space.

It is without doubt the most spectacular thing I have ever seen or heard, and I urge you all to witness a Florida rocket launch if you possibly can: I promise you won't regret it (photo 122).

With the scene thus set, let us return to earth and continue where we left off from Part 1.

Four factors for success

In my experience, all model engineers love to ponder a good mechanism, whether it be a clock, a tram, a locomotive or a water mill (all of which have appeared in our magazine in recent times, incidentally) and especially if it's historically significant and well presented. It's true, isn't it? And knowing this to be the case, and despite my personal disappointment in many technological museums, I can say without reservation that the museums at the Kennedy Space Centre in



The business end of a Saturn V first-stage booster, superbly manufactured yet with an expected lifespan of less than three minutes and with each engine – the largest liquid-fuelled rocket engine ever produced – generating the same thrust as the latter-day shuttle's three main engines combined.

Florida are simply extraordinary – by far the best I have ever seen on any subject, anywhere in the world – and despite several visits to date I would return time and time again if I could because there is always more to take in.

Now, to be fair, Kennedy's museums do cover a popular subject – space travel is beloved by many – but then so are Britain's railways and you know my feelings about one railway museum in particular which should be great and yet misses the mark by a mile (see *Butterside Down* Part 10 – *Privilege and Joy* – if you wish to refer). So, what makes Kennedy's museums so special? Well, in my view it's

the curator's careful attention to four critical factors which, I believe, represent the key to the successful presentation of a technological subject to the public.

Firstly, of course, there's the engaging nature of the technology itself – in this case a unique combination of mechanical, electrical, electronic, chemical, structural and software engineering, the dramatic result of which is, even when viewed on a dim projector in a darkened room in an East Sussex secondary school, spectacular. While it helps that the underlying engineering is interesting, the importance of the engineering is not overlooked by the museum, it is highlighted and well explained, and that makes a big difference.

The size of the hardware is also important to convey, and yes, I know I said that smaller-scale models often make large-scale technology easier to appreciate, but the prototype's size is still important, no matter how big or small, for it was made that size for a reason. For example, my imagination was insufficient for me to appreciate the enormity of a Saturn V rocket no matter how many double-decker buses or Statues of Liberty it was unimaginatively compared to. No, I only appreciated its sheer size when I stood beneath one, looked up and gawped.

Next, there's the social and political context underpinning

the history of the time; in this case Kennedy and the cold war driving the Space Race in the 1960s; Nixon and the Vietnam conflict triggering its demise and stagnation in the 1970s. It's important to know *why* something was built and the Kennedy museums (sadly, unlike the aforementioned railway museum) cover that side of things extremely well.

And last, and by no means least, there's the manner in which the artefacts are displayed and the depths to which they are explained, which, in the case of Kennedy's museums, in addition to being both visually stunning and intellectually stimulating, often allow visitors an unexpectedly close-up and detailed view of the exhibit's inner workings so they can explore further for themselves if their interest is drawn, for the opportunity is there.

So, with that all said, let's look at just a couple of the Kennedy Space Centre's superbly curated exhibits which I think reinforce the importance of thoughtful presentation and the four key factors – purpose, size, historical context and function and detail – if a technological museum is to fascinate its visitors regardless of their age, interests and level of knowledge. And finally, I promise to avoid that dire buzzword 'interpretation' which seems to plague so many museums these days and which (in my view) is simply



A magnificent cutaway model of the Saturn V launch stack, a work of art in its own right, with the original artefact's second stage dominating the scene beyond.



Interactive displays in front, an instructive model in the middle and the prototype behind all layer and combine to provide a wealth of interesting, clear and informative information to the visiting public. In the author's opinion, this is a gold-standard example of a technological presentation in the twenty-first century.



Apollo 14's command module Kitty Hawk, beautifully lit and cleverly displayed.



The author, fascinated, examined Kitty Hawk's intricate door mechanisms for fully fifteen minutes.

efficient shorthand for 'dumbed down to the lowest common denominator: don't bother coming in if you are over eight years old and have any actual interest in or knowledge of the subject'. But perhaps I'm being jaded.

The grandest scale

Let's face it, museum exhibits don't come much bigger than a Saturn V rocket, built to fly but ultimately rendered redundant by the Apollo Program's cancellation, lying on its side, separated into its multiple stages and cradled by a substantial but unobtrusive framework above the heads of the museum's visitors. With this absolute monster towering dramatically above, the orderly masses, wandering beneath the disassembled rocket and gawping at its size and complexity just like me (**photo 123**) will eventually spot a superb model of the beast, beautifully sectioned and supplemented by a bank of computerised information screens, to aid in understanding the arrangement, inner details, function and use of the prototype and neatly proving my point about our hobby's unique technological capacity to help explain a full-size original. And while I realise that supporting the author's Part 1 argument was not the museum's primary reason for the model's inclusion, it was nice of them to help me out with a perfect example to seal the deal (**photos 124 and 125**).

Now, in the preceding paragraph, I made a point of

stating that the Saturn V stack was separated into its distinct stages, and that's an important factor for, while I am sure it was more difficult for the museum to accomplish this feat, and there was probably much soul-searching in the conservation process as a result, in my view it was a brilliant and crucial decision for, in so doing, important and fascinating details are revealed which would otherwise have been hidden from view. Furthermore, had the rocket remained whole, its stage-by-stage functionality would be far more difficult to visualise and appreciate for those less familiar with its workings. To summarise, even though the museum did not have to separate the stages in order to achieve an impressive exhibit, in going to this trouble they (quite literally) opened up an additional level of interest which, let's face it, should be every museum's goal.

Yet this was just one, albeit writ-large, example of an underlying feature which pervades the Space Centre's museums and really sets them above their peers in my opinion: for despite the historical significance and priceless nature of literally everything on display within their walls, the exhibits at the Kennedy Space Centre Visitor Complex are so thoughtfully and informatively presented, so accessible and so well-lit, that the interested visitor can examine the amazingly intricate and beautifully engineered details of each exhibit with relative ease and to their heart's content.

The little things

By way of example, in one of the darkened exhibit halls sits Apollo 14's command module *Kitty Hawk*, its ablative heatshield bruised and scarred as the result of a fiery re-entry through earth's atmosphere on 9 February 1971 (**photo 126**). There are some interesting displays and explanations surrounding the exhibit, the capsule's door is open and the inside is well lit and easy to examine from behind the viewing barrier.

On entering the room and spying the capsule, I, like every other visitor I saw over the next thirty minutes or so, wandered over, peered through the door, was amazed at the lack of space and the dizzying array of instruments surrounding the astronauts and, feeling that this behind-the-scenes opportunity was somehow special, had another and closer look before moving aside to examine the capsule's exterior while another visitor peered through the door.

After my own inspection of the inside of the capsule, a family entered the room; the father lifted his young daughter into his arms so that she could take a look and she, after a quick glance at the dials and switches within, pointed at the door, exclaimed in her excited six-year-old voice "dad, look at the door, it's just like the one in the Harry Potter bank!", carefully examined the intricate locking mechanism for at least thirty seconds – a lifetime for a six-year-old – and departed to inspect the moon-rock sample that her mother was peering at nearby.

But she was absolutely right, for just look at that door! While I academically knew that the capsule's doors had been redesigned to open outwards after the tragic Apollo 1 fire, this beautifully presented exhibit allows the interested and keen-eyed visitor to examine, in detail and close-up, what that redesign meant in practice (**photo 127**). Put simply, the quality of engineering evident in that door's locking mechanism is exquisite and I must have examined it for fifteen minutes in total, in-between other visitors, because the more I looked the more I saw. And to think that I would have overlooked it completely were it not for that young child's keen eye! Thank you, young lady, whoever you were.

My point is that, while the Apollo capsule's instant recognisability attracted even the most casual visitor's attention, by choosing to present the exhibit with the door fully open and with an array of explanatory information to explain the capsule's significance, each visitor was given an unexpectedly behind-the-scenes and close-up opportunity to examine some of the underlying mechanisms and unsung technology behind the moon landings. Furthermore, during my extended sojourn with that capsule and its door, I noticed that every one of the visitors who looked at the exhibit, including that little girl, commented on at least one thing which caught their interest, sometimes a large-scale feature but more often a smaller-scale detail - several of which I had also missed - and appeared to genuinely enjoy seeking and deciphering the normally hidden details. It was, in my view, a superbly presented exhibit in a truly exceptional museum and you can rest assured that plenty more awaits should you pay a visit: I have covered only the merest fraction of the treasures cleverly displayed within.

●To be continued.

A BR Standard Class 4 Tender Engine

PART 6

Doug Hewson describes a 5 inch gauge version of the BR Standard 2-6-0 tender engine.



Now that we have got the frame stretchers out of the way I thought we may as well get on with the motion brackets (**fig 19**). These are very complex and will need some careful attention. I am hoping that Mike Jack in New Zealand will come up with some lost wax casings for these two. However, just in case the worst comes to the worst, I am hoping that there will be enough dimensions etc., for you to make a decent job

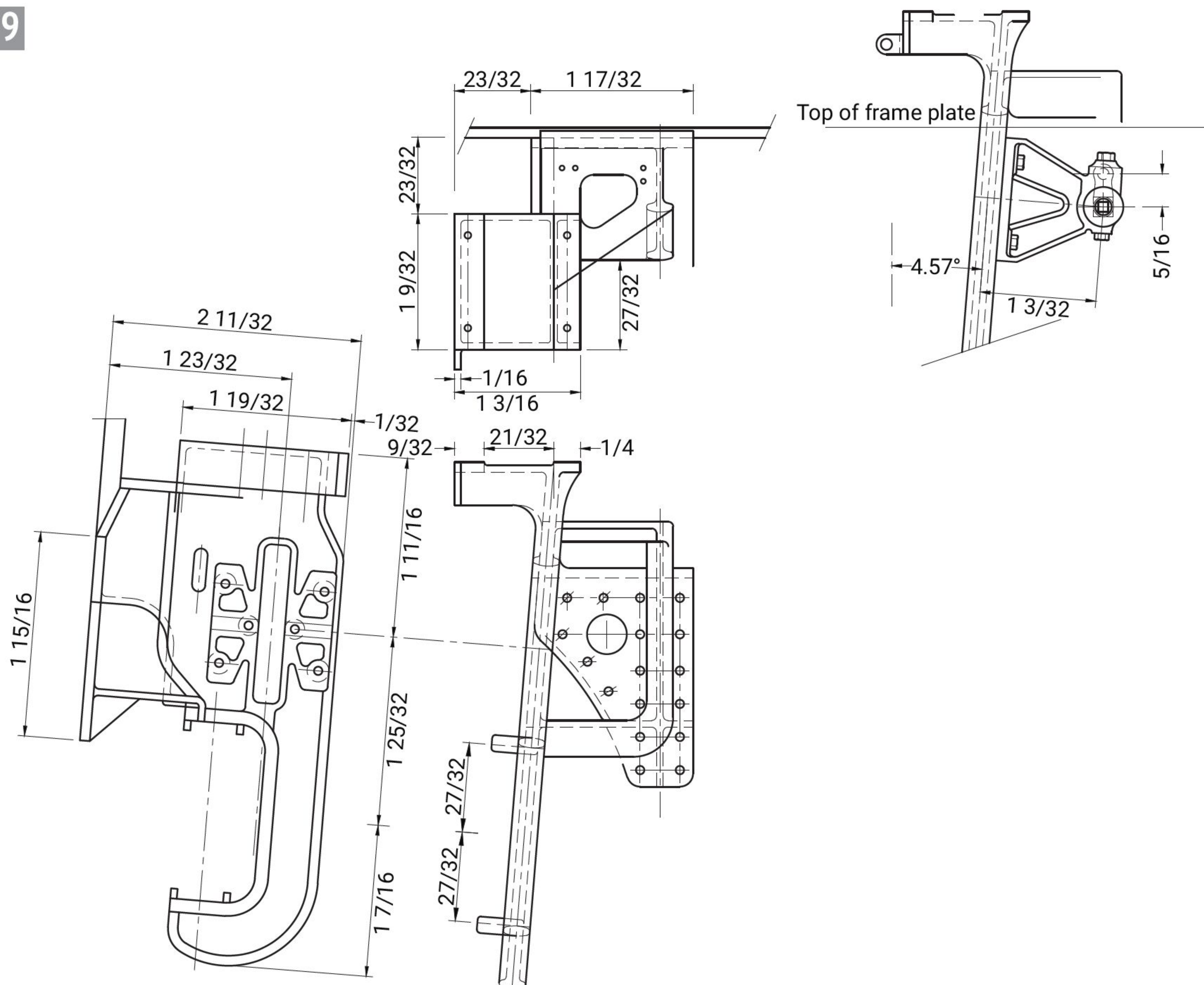
of them as they are very visible items, especially the left-hand one which has the reversing screw built into it. The whole of the valve gear depends on these brackets. There are four small castings which you will need with your motion brackets and these are the ones which support the expansion links. They should have a location keys on the back of them but I omitted these off my 4MT as I didn't think anyone would notice! They need to be bushed

with bronze and the bushes will need replacing from time to time.

I have shown the drawing for the motion bracket and the brackets for the slide bars are set at 4.57 degrees. Once again this is a very important dimension. On top of the motion bracket is perched the platform for the lubricator. As you will see, the lubricator drive rod is shown just above where it says 'top of frame plate' but I am not showing any part of

Continued from p.595
M.E.4754 October 18

Fig 19



The motion brackets.



The left-hand motion bracket (photo: Toddington Standard Loco Ltd.).



A view of the keyways for the expansion links.

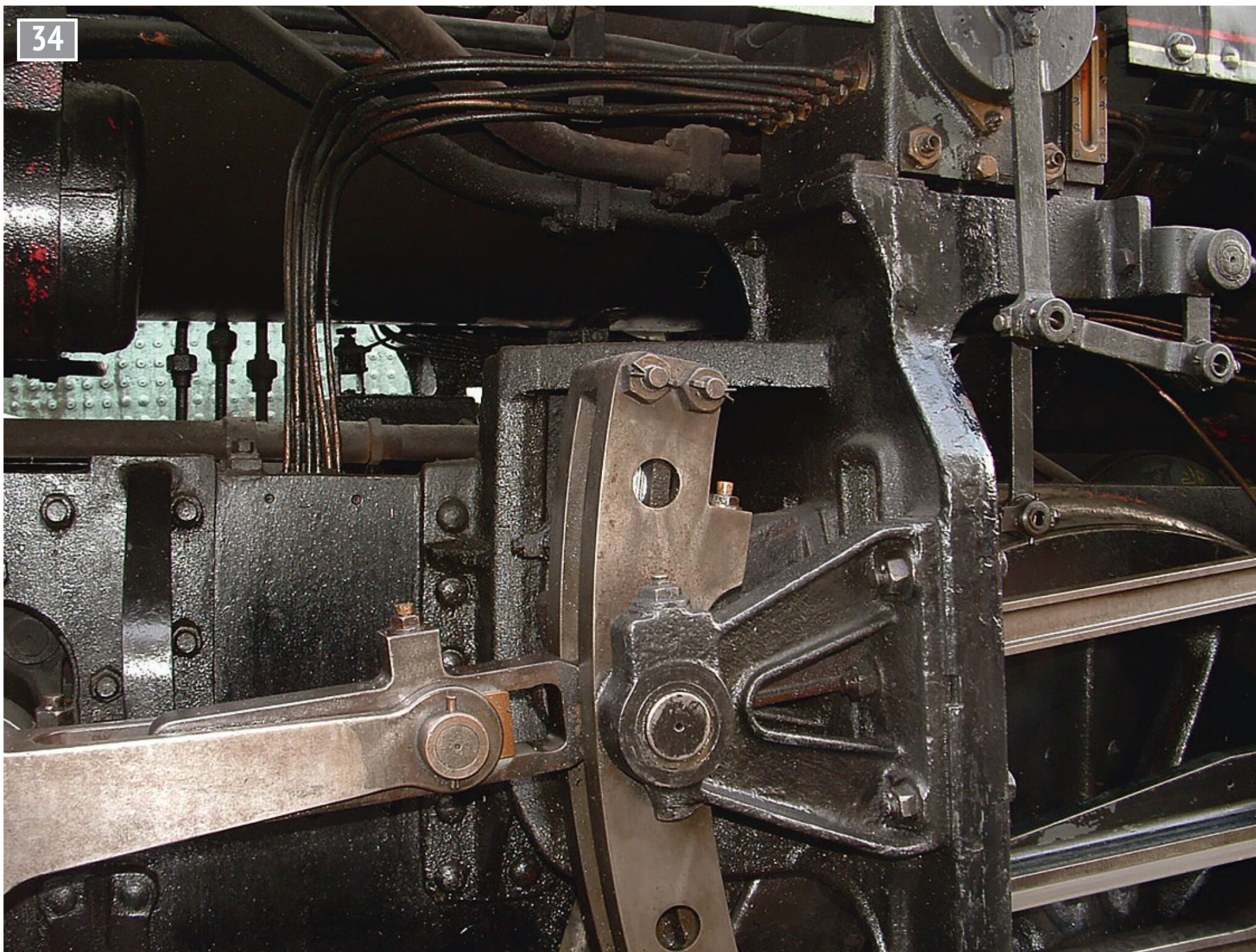


The right-hand expansion link uncluttered.

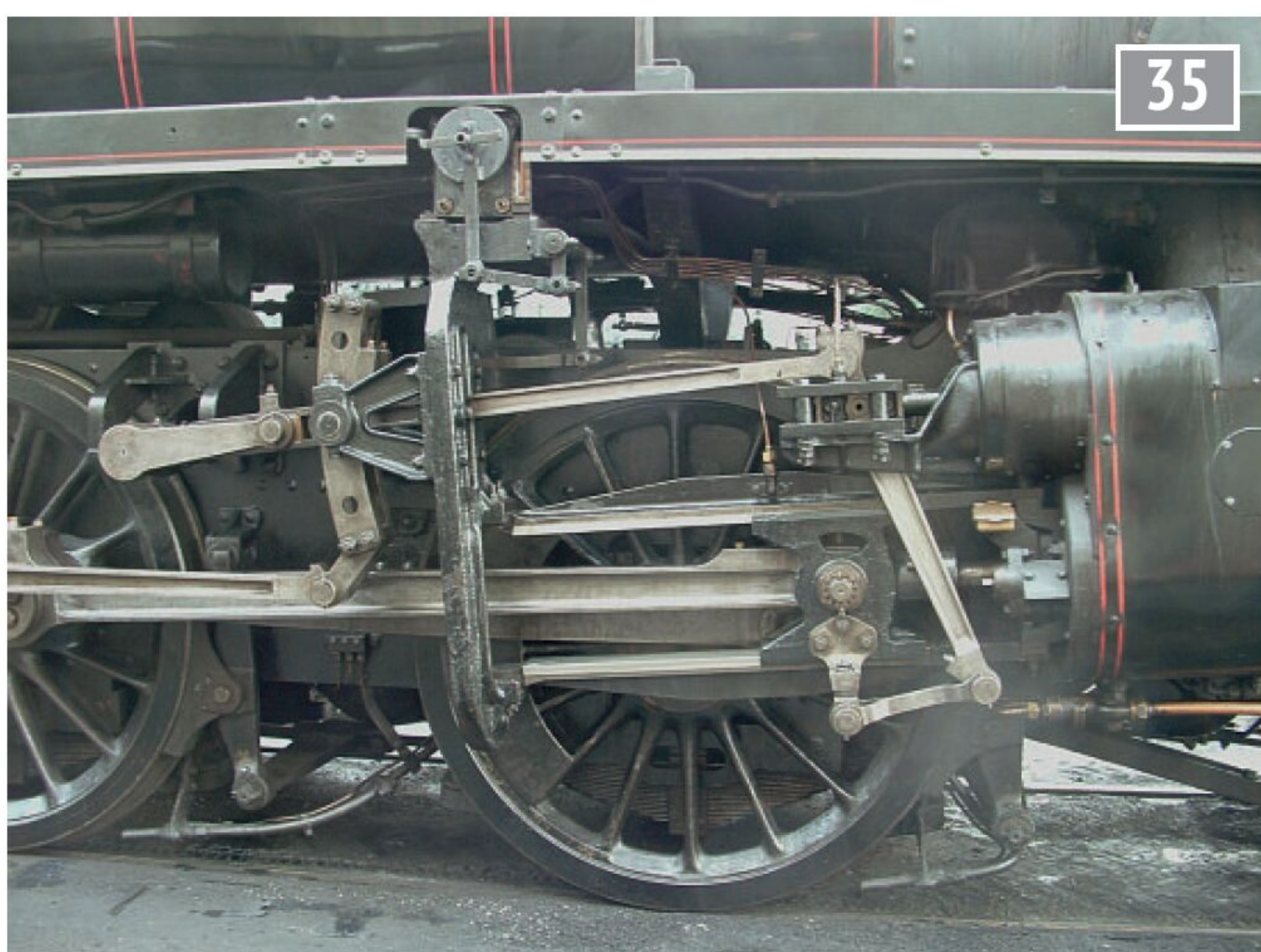
the lubricator until much later in the series. I will have quite a lot to say about the lubrication, especially as my 4MT is running very efficiently. It would be very nice if you could follow my instructions for this. The back of the motion is shown in one of Andrew's photographs (**photo 31**). **Photograph 32** is one of my ancient photographs and it shows the keyways across where the expansion links fit. Also in the photograph, there are the brake hanger brackets which you may as well fit while you are down there. Note that they are fixed to the frames with the 2mm or 5/64 inch oval head rivets. **Photograph 33** is just a picture of the right-hand motion bracket completely uncluttered. My **photo 34** is to show you some of the detail around the expansion link and to draw your

attention to the split pins in the bolts which secure the link together. I included these on my 4MT and I think it looks so much better for it.

Whilst on the subject of split pins through small nuts, it makes life so much easier with a 10BA nut, if you just drill a No. 54 hole centrally through one of the flats, you can then screw a nut on to the bolt to where you need the hole and drill the hole through nut and bolt, easy-peasy. A gentleman once came to stay with us one evening and he taught me how to make split pins for 12BA bolts. He said just to use the wire ties which come with freezer bags. He said, if I were to scribe a deep line across a bit of round bar, he could then lay the wire in the groove and scrape it down the half its thickness. You can then just wrap it round ➤



Expansion link details.



General view of the valve gear.

a No. 60 drill, there are your split pins. Anyway, that aside - also, on photo 34 are the six oil pipes and I have included a bracket for these on the rear of one of the sand box filler pipes to clamp them together.

Photograph 35 is just a general view of the valve gear centred around the motion bracket.

One thing I try to do is to always show one of the 76s to show the engines off.

Photograph 36 is a lovely



76076 seen at Sutton Oak.

picture of 76076 (the one before our adopted loco) which was photographed at Sutton Oak in June 1957. It has the BR2A tender as it has the wing plates on the tender! However, I am not sure where Sutton Oak

is as it must be a shed which swapped numbers in the 50s. It was 8G previously and was one of the Edge Hill group of loco sheds.

● To be continued.

The Stationary Steam Engine

PART 63 – BUILDERS I: COALBROOKDALE, KETLEY AND BRIDGNORTH FOUNDRY

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

Continued from p.521,
M.E. 4753, October 4

Unlike Boulton and Watt and Matthew Murray, Richard Trevithick did not establish his own engineering works to manufacture his patent engine. Although he had married Joanna Harvey, he had no financial interest in the Hayle Foundry, the first builders of the engine, and whilst Hayle continued to supply machines of this type to their locality it is difficult to see how they could have extended to meet a Trevithick's ambition for a nationwide market in view of their geographical isolation. This factor may have influenced Trevithick but it is equally probable that he was temperamentally unsuited to the long-term commitment involved in being tied to a single establishment or even to a single project. Instead, he began to establish connections with a number of engineering concerns spread across the country who could act as regional manufacturing centres.

After the initial Hayle-built engines, Trevithick turned to the Coalbrookdale Ironworks. By this time the Dale incorporated several other iron-making concerns including the Horsehay and Ketley works. These separated establishments operated as specialised but interdependent organisations, feeding each other with semi-manufactured products. Horsehay was primarily a forge and a rolling mill producing, amongst other products, wrought-iron boiler plates and boilers.

Ketley made pig iron from its furnaces which, after primary rolling, went to Horsehay but in addition it had a machine shop. Both Ketley and the main works at Coalbrookdale produced engine parts.

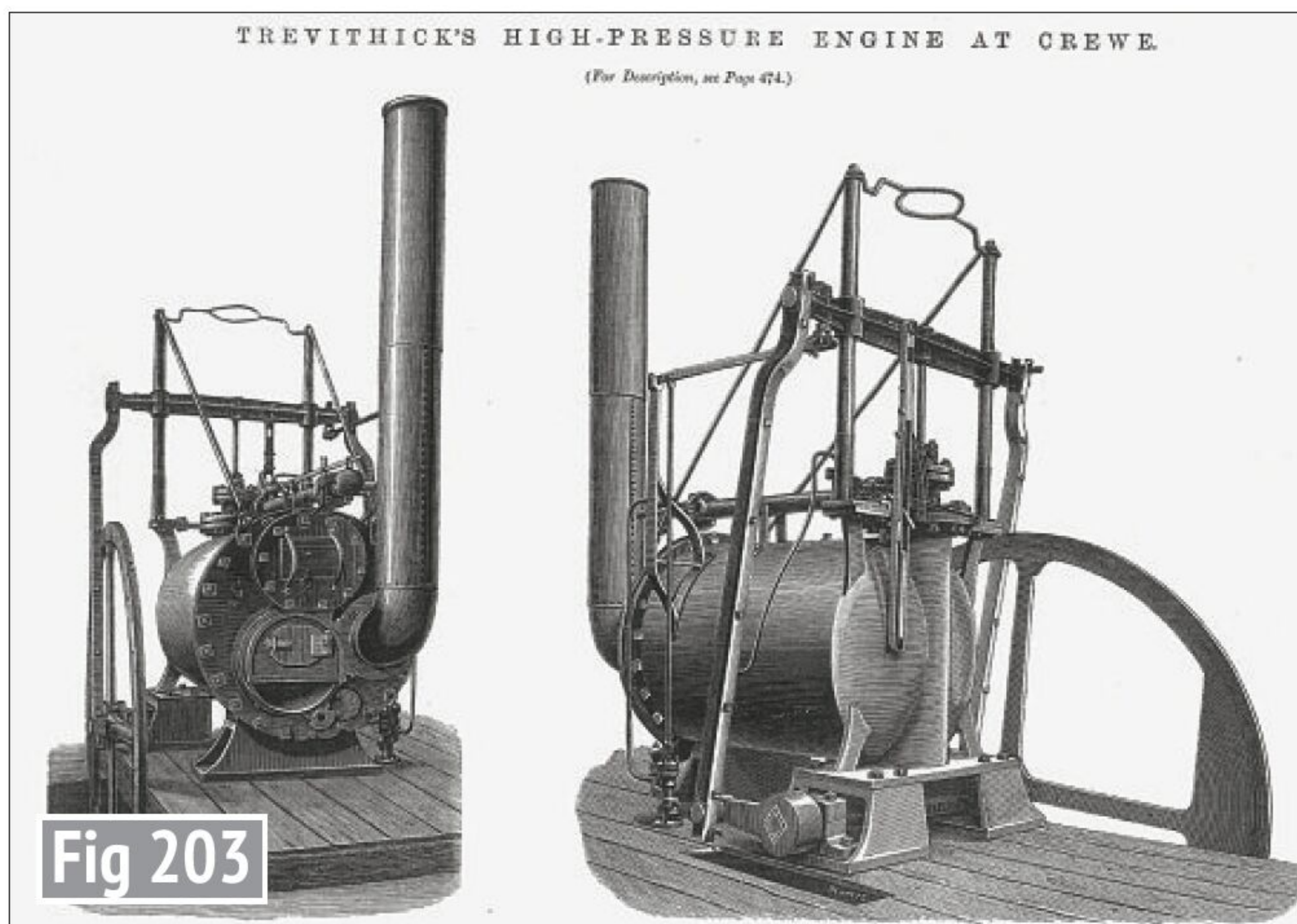
The relationship between Ketley and Coalbrookdale largely revolved around the family connection between the Reynolds and the Darbys. The Ketley furnaces had been built by Abraham Darby II in 1755 and, when Richard Reynolds married Darby's daughter Hannah, he acquired half the Ketley stockholding and became responsible for the management of the site. In 1789 control passed to his sons William and Joseph, to whom he transferred his shares.

The active and inventive brother was William who, judged alongside contemporary ironmasters, was amongst the most erudite, with a wide knowledge of both French and English scientific literature. Thirty manuscript volumes of his notebooks were preserved until the eighteenthies ... *beautifully written and containing suggestions, inventions and drawings but chiefly copies from the Transactions of the Royal Society and other sources* ... (ref 345). Today only a single sketch book is known to survive. At his home, 'The Tuckies' in Broseley, Reynolds had a well-equipped laboratory where he exercised considerable experimental skill but his talents were not purely

academic. He had trained at all of the Coalbrookdale works and, after Abraham Darby III died in 1789, he became the overall engineering manager, responsible for most of Coalbrookdale's technical developments.

Reynolds was keenly interested in the steam engine and was instrumental in introducing Boulton and Watt's engines into the Coalbrookdale works, at the same time promoting Heslop and Sadler's engines. It is likely that William Reynolds formed Trevithick's point of contact with Coalbrookdale particularly as Ketley was more concerned with engineering than the main works and Horsehay. He would have been in charge when the trial engine was built in 1802 and oversaw the first commercial productions. Unfortunately, he died aged 42 in June 1803 and, although his brother Joseph carried on for two years, he had not the same engineering acumen that William possessed. Increasingly Joseph's interests were diverted away from industry into banking and a manager was installed at the works.

Production at Coalbrookdale does not appear to have been unduly dampened by the publicity that the Greenwich explosion received. In 1804, of the twelve engines that the Coalbrookdale engineer reported on as being at work in London, the majority seem to have been built by his employer and another nine were standing ➤



Engraving that appeared in *The Engineer*, November 21st 1884, based upon a photograph taken in the Crewe Works Paint Shop. The photograph is now in the Science Museum's collection.

complete at the works, awaiting delivery. Three of these were high-pressure engines working with a condenser as they were intended for a destination where coal was scarce. The Dale was also proposing to build a two-cylinder engine. From these two references it is apparent that Coalbrookdale had assumed a degree of design independence particularly as Trevithick expressed a view that he would have preferred a single cylinder worked expansively rather than the two-cylinder engines (**ref 346**). On the other hand he had confidence in Coalbrookdale's standard of workmanship, insisting that the first engines to be sent into Cornwall by an outside builder should be by them as they would be well executed; from Wales he considered that it would not be so (**ref 347**). This latter comment also indicates that the un-named Welsh builder, almost certainly Samuel Homfray, was now manufacturing for customers in addition to making the engines used within his own works at Penyarden and Dowlais.

Coalbrookdale was also building larger engines. Amongst the earliest recorded, a winding engine with a 26 inch cylinder, was built for Rowley & Emery in 1803 costing £440 with extras at £36.5.11. In 1805 John Burlingham of Worcester was charged for ... a steam engine on Trevithick's plan 18

ins cylinder complete £688.6.8 ... Wm Heath for a horizontal engine on Trevithick's plan £266.0.0 ...

Another builder who was subsequently to assume great importance also appears at this time, William Hazledine's Bridgnorth Foundry. When and how Bridgnorth became involved with Trevithick's engines is obscure. The connection had possibly made been by 1803 but it was definitely in existence by September 1804, when seven engines were being built there (**ref 348**). In discussing the two dredgers, *Blazer* and the *Plymouth Barge*, it was noted that in 1806, engine parts and presumably the boiler came from Bridgnorth. Although not stated, the builder must have been John Hazledine of the Bridgnorth Foundry.

Hazledine was a millwright who established a foundry on the west bank of the River Severn near the bridge at Bridgnorth in 1792, eight miles downstream from Coalbrookdale (**ref 349**). The venture failed and was rescued by Thomas Davies who bought the property from the liquidators. Subsequent events are unclear but Hazledine was re-instated as at least part-owner of the works which, by 1810, had transferred site to Bridgnorth, Low Town, on the opposite side of the river. John was joined by his brothers Robert, Thomas and Charles



The Hazledine engine currently displayed in the Science Museum.

Naylor, the firm continuing trading as John Hazledine & Co. Davies remained a partner (**ref 350**) and one source has him as works manager (**ref 351**). A share in the company was also owned by the Manchester ironfounder Alexander Brodie (1732-1811). Brodie was a man of substance who manufactured iron and armaments at Calcutts and Broseley in Shropshire and was accused of being a pirate builder of their engines by Boulton and Watt. He also had premises in Carey Street (later famed as the street of the Bankruptcy Court, hence ... *in Carey Street* ...), Lincoln's Inn Fields, London, so possibly he was also a scientific instrument maker. The fact that he was financially involved in the Bridgnorth Foundry implies that it aspired to be something of greater moment than a locally important millwrighting and foundry business.

The only Trevithick high-pressure steam engine to survive today in substantially original condition was built by Hazledine & Co. It is preserved by the Science Museum in

London but was rescued in 1883 from a scrap heap at the railway goods yard in Hereford by Francis W. Webb (**ref 352**). Webb retrieved the remains and sought out several of the missing parts from the scrap dealer before transferring the engine to the LNWR's Crewe works. There, a careful restoration was carried out and the engine continued to be housed in the Crewe Paint Shop until it was transferred to the Science Museum in February 1926 (**figs 203** and **204**).

H. W. Dickinson, Keeper of Engineering, prepared a technical description:

The boiler shell is of cast-iron, 56 in. long, 45 in. diam. and 1 in. thick, supported on two cast-iron stools. The back end is dished, while the front end is flanged to allow the wrought-iron (should be cast-iron?) front to be bolted on. To this front is riveted the return horseshoe flue, one leg of which is 18 in. inside diam. and accommodates a grate, 5 sq. ft. in area; while the other leg is tapered from 12.6 in. to 11.25 in. inside diam. and joins the chimney. There is

a manhole with cover on the boiler front, but the whole front can be removed, so as to gain access to the interior. On top of the boiler is a safety valve, the area of which is 3 sq. in: figures marked on the lever, with the weight shown, indicate that the pressure was 52 lb per sq. in. The steam generated is led to a hand adjusted throttle valve situated on the valve chest of the steam cylinder which is sunk vertically into the boiler and secured by an upper flange. The steam is admitted to the cylinder by a four-way cock, worked by tappet from the crosshead; from the latter two connecting rods return to the cast-iron crankshaft below the boiler. The cylinder is 6.37 in. diam. by 30.5 in. stroke. The exhaust steam passes through a Trevithick pipe feed-heater. The flywheel is 9 ft. diam. with a balance weight cast in.

At the pressure of 50 lb per sq. in. and say 50 rpm, the engine would develop about 7.5 hp. The restored parts comprise the fire door and flue ring; grate bars; stools to boiler; connecting rods; cranks; tappet gear, parts of feed water piping; and the feed pump cistern. (ref 353)

The preservation of this engine allows two features in the construction to be observed which might otherwise have remained unknown (fig 205). The first is the seam that occurs in the boiler barrel towards the cylinder end. Whilst it has not been possible to examine this in detail it is assumed to be a joint with a lead or leather gasket between the facets, suggesting internal flanges bolted together inside the boiler. This being the case, the cylinder end of the boiler with its steam cylinder casing and brackets has been cast as a separate unit from the rest of the boiler shell. This is plausible as casting this section integrally would pose formidable foundry problems. The second feature is less easily explained, the dishing of the right hand side of the backplate. John Liffen, retired Science Museum Keeper, has suggested that when Webb came to reassemble the parts

the crosshead was reversed and valve gear tappet rods were wrongly hung on the left hand side.

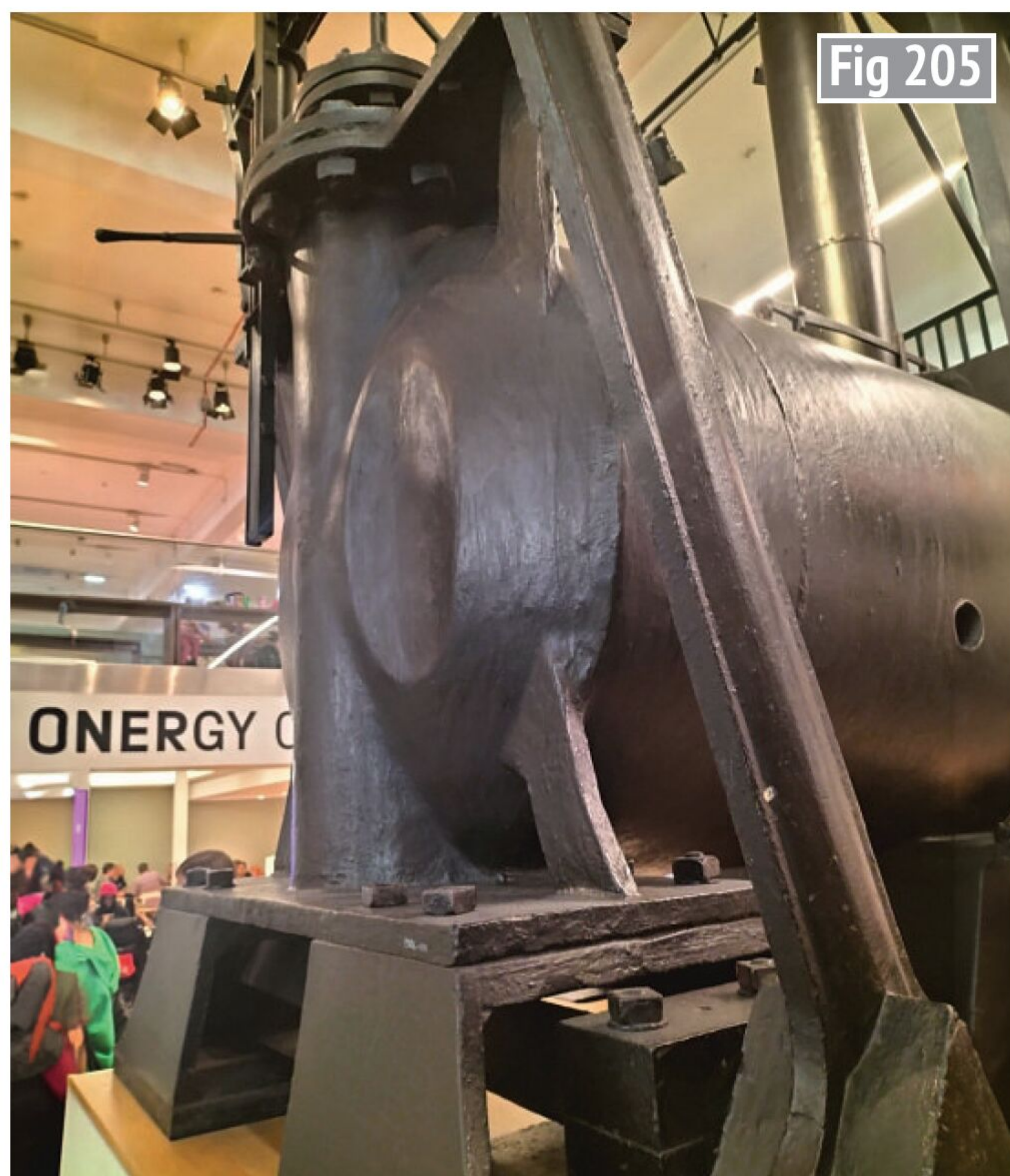
The manhole cover mounted on the front-plate of the boiler carries the inscription No. 14 Hazledine & Co Bridgnorth. In view of the number of engines known to have passed through the Bridgnorth shops by 1806 No. 14 must be of comparable date to these. Notably the name given is that of Hazledine & Co., which pre-dates the re-titling of the firm, Hazledine and Rastrick & Co., following John Urpeth Rastrick forming a partnership with Hazledine.

It has been suggested on several occasions that the missing link between Trevithick and Bridgnorth was John Urpeth Rastrick but this proposition needs to be examined more closely. Rastrick's later professional activities warranted an extensive obituary in the *Minutes of the Proceedings of the Institution of Mechanical Engineers* (ref 354) but the record of his teenage years and his early twenties is only briefly dealt with.

Born in January 1780 at Morpeth in Northumberland, his father, also called John, was a millwright who developed the treadmill for prisons and a threshing machine that was later the subject of a patent dispute. John Urpeth was apprenticed to his father at the age of 15 after which he moved south from Morpeth: ... at about the age of 21 ... to gain experience as a machinist and millwright, particularly in the introduction of cast iron for machinery, then almost in its infancy ... (ref 355).

Dickinson and Lee maintain that his father had moved to London in 1798 where he was advertising himself from 15 Charing Cross Road but there is no mention of an ... and son ... in his publicity (ref 356).

Although John Urpeth was born in Morpeth, the Rastrick family had connections with Leeds and ancestrally with the village of Rastrick near Brighouse. In April 1797, the Middleton Colliery bought



The cylinder end of the Hazledine engine currently displayed in the Science Museum. Beyond the sloping flywheel arm the joint in the boiler barrel is visible. The unexplained dishing in the end plate can also be seen.

oak and ash wood from a Mr. Rastrick's Spring Wood near Oliver's Mill for £1200 (ref 357). In December 1801, the Middleton Colliery accounts (made up annually in December for the previous year) contain the first entry recording sales of old metal to Humble and Rastrick's Westgate Common Foundry. Rastrick's partner in the Westgate Foundry was Joseph Humble, the youngest son of Richard Humble, the manager of the Middleton Colliery. Joseph was 34 years old in 1800. The firm of Humble and Rastrick recurs in the Colliery records until 1805 but subsequently the name is confined to Humble & Co. Joseph Humble died suddenly in Newcastle in September 1808 and in 1809 Crawshaw & Co., occupied the Westgate Foundry.

The full name ... Mr. John Raistrick ... (spelt indiscriminately as Rastrick and Raistrick) is mentioned specifically on two occasions in the accounts but only the circumstantial evidence is at present available to confirm

that the Rastrick was John Urpeth. If Dickinson and Lee are correct in moving his father to London by 1798 then Rastrick senior can be discounted and the possibility increases that it was the son, John Urpeth.

Assuming Rastrick left Leeds in 1805, then the commonly held view that he had moved to Ketley in 1801 (ref 358) or by 1802 (ref 359) is questionable. His obituary gives no dates merely saying that: ... he remained for some time at the Ketley Iron Works in Shropshire and soon after entered into partnership with Mr. Hazeldine (sic) of Bridgnorth, as a mechanical engineer, taking special charge of the iron foundry ...

Dickinson and Lee (ref 360) elaborate this: ... he made the wise decision to leave home in order to gain experience; he went south and for a few years worked at Ketley Ironworks ... at that time under the enlightened management of William Reynolds Here Rastrick made himself familiar with the properties and moulding of cast iron ...

Again the statement is unsupported by any source and lacks positive dates. It may also be purely surmised that Rastrick was at Ketley when William Reynolds was alive, that is before June 1803. Whatever the case may be, whilst he was at Ketley there is a probability that he would have known Trevithick. Francis Trevithick however felt that Trevithick did not meet Rastrick until 1808. In a single reference on page 87, Vol. II, he confines himself to the sentence: ... *Rastrick, whom he (Trevithick) had known at the Thames driftway had become the managing engineer at the Bridgnorth Foundry ...*

The official obituary makes no mention of Rastrick's association with the Thames Tunnel or *driftway* as it was under during Trevithick's superintendence.

The venture was projected by a private company which proposed to connect the north and south sides of the Thames at Limehouse by a tunnel under the river. The Thames Archway Company obtained its Act in July 1805 and appointed its first engineer, Robert Vazie, a Cornish mining captain. After twelve months of slow progress John Rennie and William Chapman were called in as consultants. Their recommendations were considered unacceptable by the board and it is thought that Vaize then sought Giddy's advice. Apparently, on Giddy's recommendation Trevithick was appointed as engineer but Vaize remained with the company. By August 1807 Trevithick had begun to drive a drift at the bottom of the south bank engine shaft but on January 26th 1808, an inrush of water and quicksand took place that stopped the works. The collapse had caused the bed of the river to subside into a depression and Trevithick proposed to recover the situation by building two coffer dams, one around the sink hole in the river bed and another around the engine shaft. The experienced north-eastern mining engineers

William Stobart and John Buddle were called in to assess Trevithick's plan and were favourably impressed but little progress was made although some exploratory boring and piling continued to take place away from the flooded area, on the north side of the river. Vaizie left the project at the end of 1807 and at some point thereafter John Rastrick was appointed Resident Engineer. On the 21st April 1808, Rastrick was instructed by the directors to cease boring on the north side of the river (**ref 361**). He submitted further monthly reports up to November 1808 (**ref 362**) but progress had effectively ceased by that time.

The point at which Rastrick first became associated with Hazledine's Bridgnorth Foundry and hence with manufacturing the Trevithick engine has never been satisfactorily established. The earliest statement to identify his presence at Bridgnorth seems to be that of Richard Preen who was working in the foundry in 1809. He recalled that the firm was building what were called Trevithick's engines. At that time: ... *Mr. Rastrick was considered the engineer ...* (**ref 363**).

Nothing has so far come to light which might antedate Preen's statement and the title of the firm is invariably Hazledine & Co., up until about 1810 when it becomes Hazledine, Rastrick & Co. By Preen's time Bridgnorth had been supplying Trevithick engines for at least five and possibly six years and they had been responsible for the dredger engines. That Rastrick was not connected with these vessels is suggested by a comment made later in life when he says that he ... *had never had anything to do with boats* Equally equivocal in dating Rastrick's connection with Bridgnorth is his well-known reply during cross examination in the course of the first Liverpool and Manchester Railway Bill of 1825. He was asked: *Q. From any experience you have had ... can you speak as to*

the application of that principle (high pressure steam) to moving engines.

A. About ten or twelve years ago I made one for Mr. Trevithick, the person who had the original patent for making it; this was exhibited in London; I did not see it myself.

This was an allusion to the London demonstration locomotive *Catch-Me-Who-Can* which finally ran in September 1808. Rastrick's ... *ten or twelve years ...* would place the event five to seven years after it actually happened. The words ... *I made one for Mr. Trevithick ...* have also been taken as confirming that the locomotive was built by Rastrick whilst he was working from Bridgnorth but another account made by Albinus Martin calls this into question. Martin, as a boy was given privileged access to the enclosure where the engine ran by: ... *resident engineer on the*

works of the driftway under the Thames ... William Rastrick ...

Martin confuses matters further by calling the engineer William Rastrick but in this he is almost certainly mistaking the first name and the Resident Engineer was undoubtedly John Urpeth Rastrick. The question remains, could John Urpeth Rastrick have been both Resident Engineer to the Thames Archway Company and engineer at the Bridgnorth Foundry simultaneously or did he join Hazledine after the Thames Archway Company project was abandoned?

●To be continued.

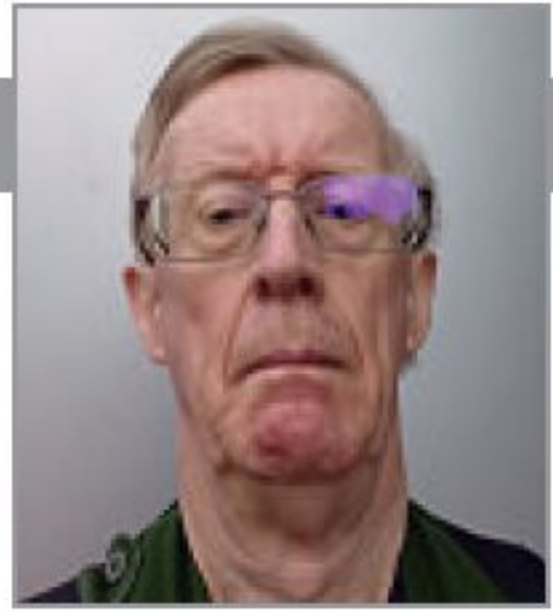
NEXT TIME
We continue with the builders – in Manchester Liverpool and Newcastle.

REFERENCES
Ref 345 Quoted from John Randall of Madeley by H. W. Dickinson in *An 18th Century Engineer's Sketch Book*. T.N.S. Vol. II, 1921-22 P. 132.
Ref 346 Letter to Giddy from Stourbridge July 5th 1804.
Ref 347 Trevithick to Giddy 23rd Sept. 1804.
Ref 348 Trevithick to Giddy from Coalbrookdale, Sept. 23rd 1804.
Ref 349 *Trevithick, Rastrick and the Hazledine Foundry, Bridgnorth*. S. Morley Tonkin. T. N.S. XXVI, 1947-1949
Ref 350 *Trevithick, Rastrick and Hazledine* op. cit p. 175
Ref 351 *Trevithick and Rastrick and the Single-Acting Expansive Engine*. Arthur Titley T.N.S. Vol VIII 1926-7. P. 49
Ref 352 Webb's record as a preservationist is far more creditable than Churchward's or Stanier's, both of whom deserve to be consigned to Dante's sixth circle of hell.
Ref 353 Reproduced in *Was Hazledine's & Co's High-Pressure Engine and Boiler No. 14 Part of Trevithick's Catch Me Who Can?* John Liffen. Occasional Paper 237. Railway and Canal Historical Society, Early Railway Group. John's contribution to this section has been invaluable. He has my grateful thanks.
Ref 354 *M.P.I. Mech. E.*, V, p. 16, 1857 128-33
Ref 355 Obituary *M.P.I. Mech. E.*
Ref 356 *The Rastricks—Civil Engineers*. H. W. Dickinson and Arthur Lee. T.N.S. Vol. Iv 1923-4 P. 48 This reference is not substantiated.
Ref 357 Middleton Colliery Records. Journals 1800 -1830.
Ref 358 Obituaries.
Ref 359 Grace's Guide but the date is not supported by any source
Ref 360 Op. cit. Dickinson and Lee p. 50.
Ref 361 *Trevithick, Rastrick and Hazledine*. S. Morley Tonkin op. cit p. 175.
Ref 362 *Searching for Trevithick's London Railway of 1808*. P. 10. John Liffen
Ref 363 Life... Vol I p.366.

Kinematics

PART 4

Rhys Owen
presents
a readers'
guide to the laws of
motion.



Continued from p.586
M.E.4754 October 18

Last time we took a quick glance at the powerful tool called differentiation or the differential calculus. Now let us look at reversing the process.

Integration

If we know that a body is accelerating at a certain constant rate then, as we have seen from our examination of the equations of motion, we can – provided we know certain information – work out, for any given time, the velocity of that body and its displacement from a given point.

For example, if we know that a body is accelerating at a rate of 3 ms^{-2} then we can deduce that after 5 seconds it will have increased its velocity by ($5 \times 3 =$) 15 ms^{-1} .

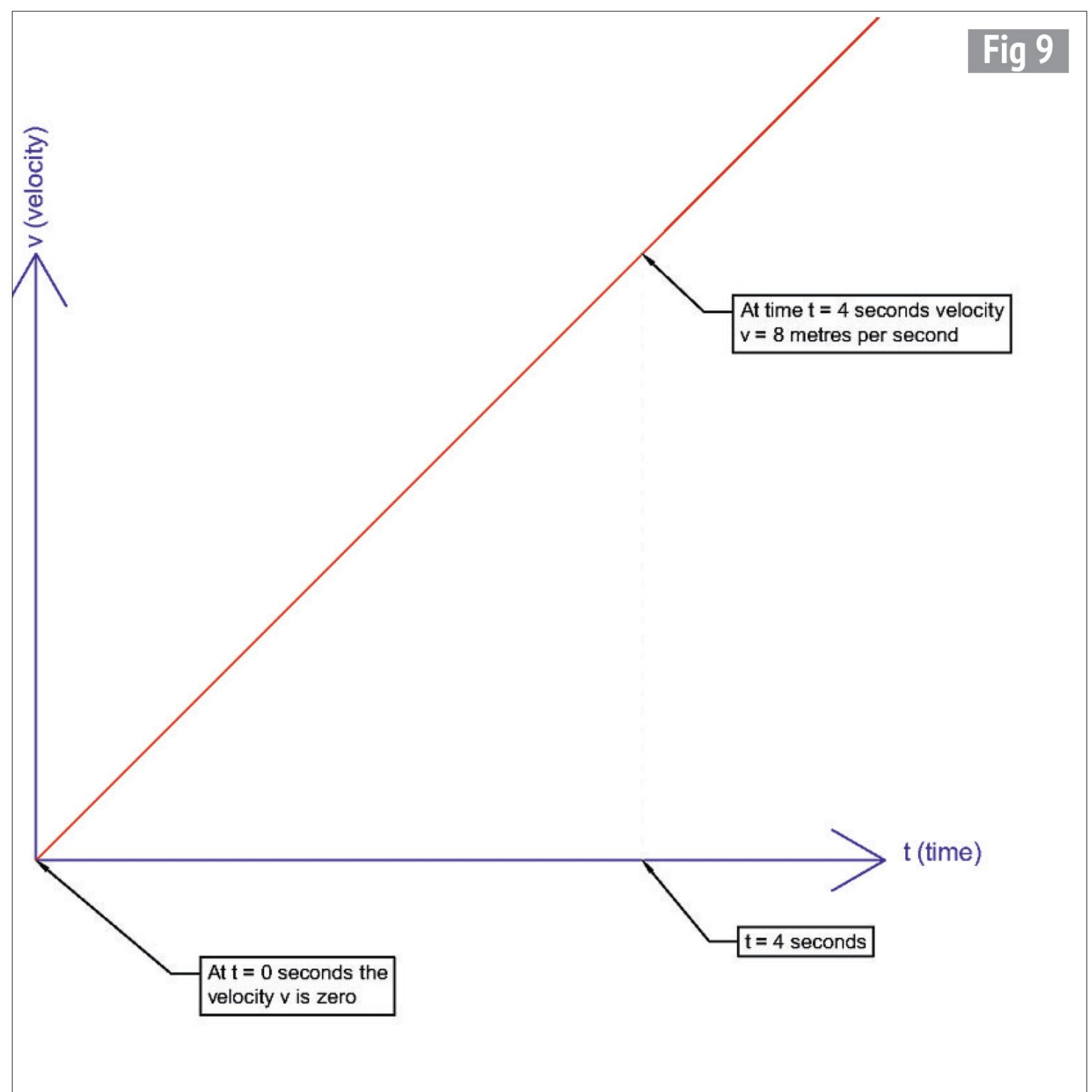
If the acceleration is not constant, but can be defined by a suitable function, then can we determine the body's velocity in some way? In fact we can, effectively by reversing the differentiation process.

To return to the example above, we can only determine the body's velocity at a given moment if we know what its velocity is at another moment.

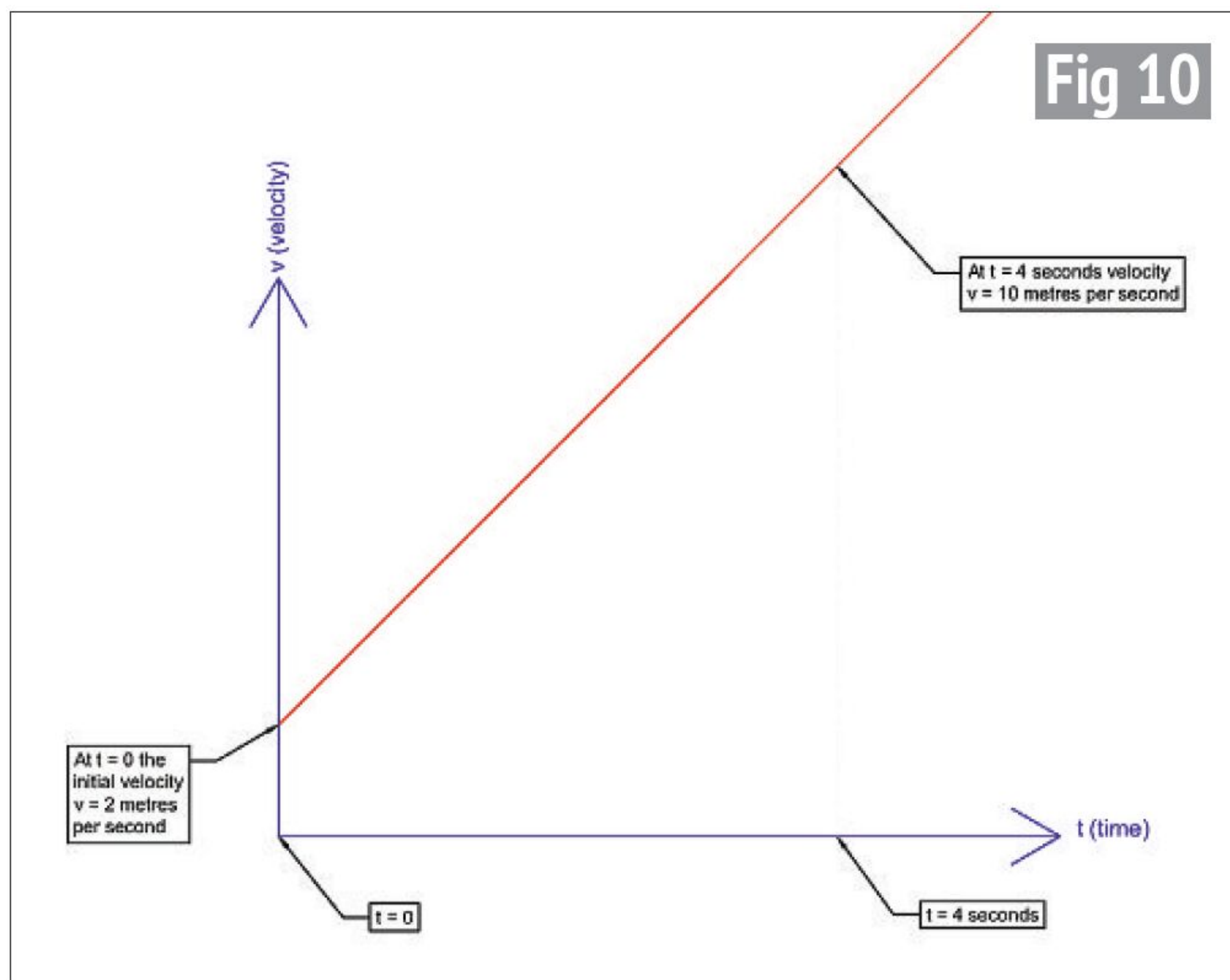
For example, if we knew that the body mentioned above was already travelling at a velocity of 10 ms^{-1} and then accelerated in the same direction at 3 ms^{-2} for 5 seconds then we would know that at the end of those 5 seconds its new velocity would be ($10 + 15 =$) 25 ms^{-1} .

Note that, when differentiated, different functions may have the same derivative. We can see this by looking at the following examples:

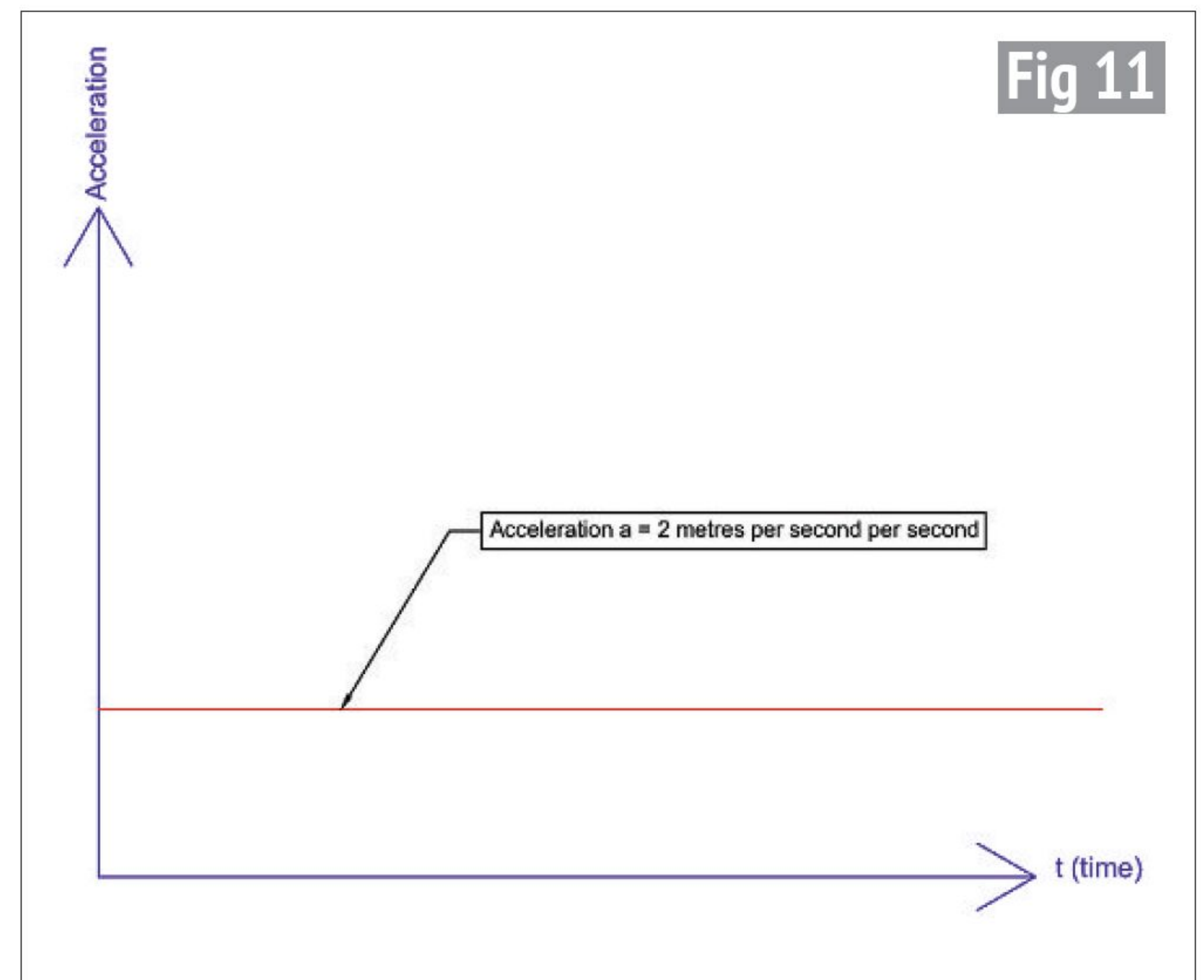
Figure 9 shows the graph of a body accelerating from rest



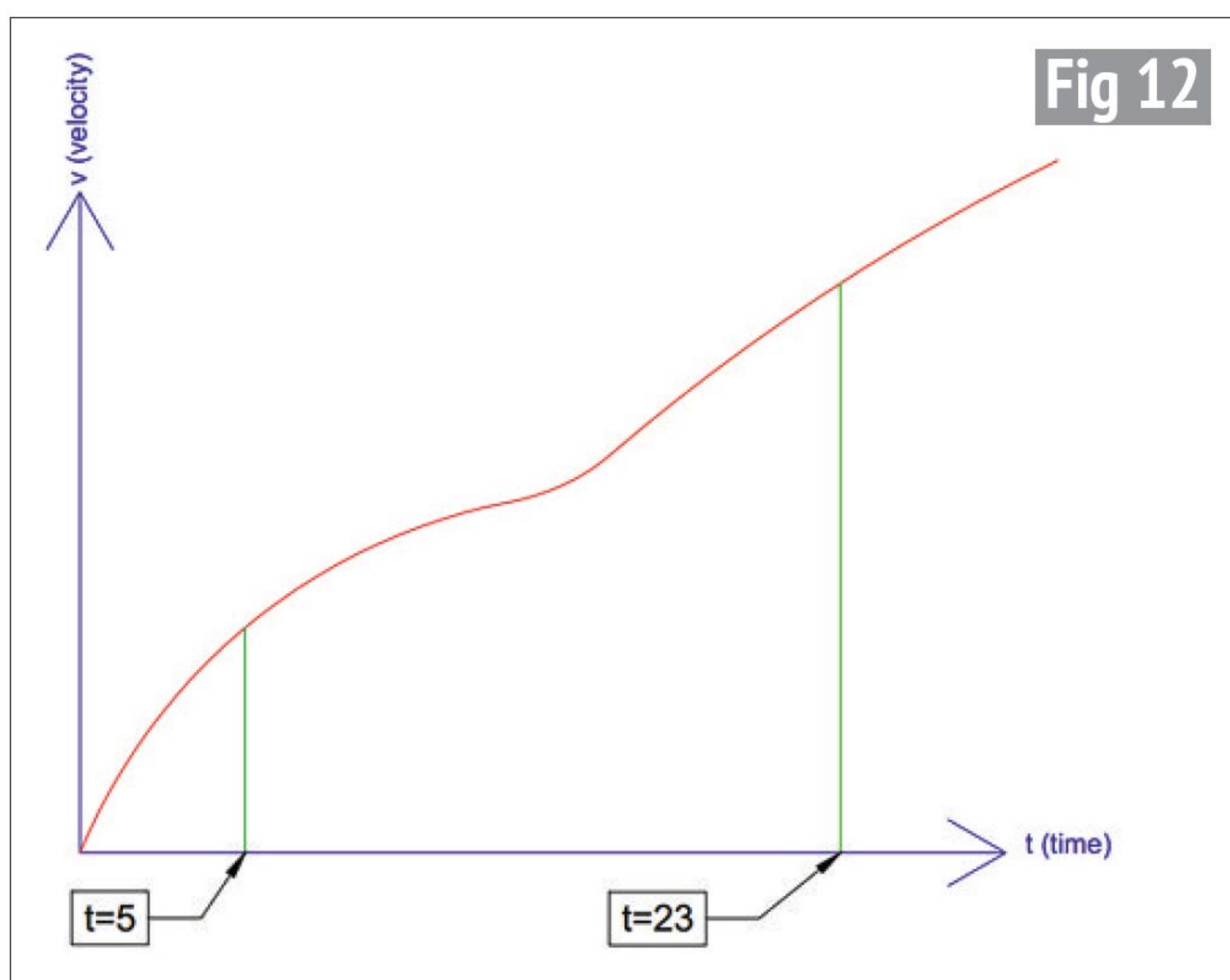
Body accelerating from rest at time $t = 0$ to a velocity of 8 ms^{-1} after 4 seconds.



Body accelerating from a velocity of 2 ms^{-1} at time $t = 0$ to a velocity of 10 ms^{-1} after 4 seconds.



In both cases the acceleration is 2 ms^{-2}



Plot of function.

at time $t = 0$ to a velocity of 8 ms^{-1} after 4 seconds.

Figure 10 shows the graph of a body accelerating from a velocity of 2 ms^{-1} at time $t = 0$ to a velocity of 10 ms^{-1} after 4 seconds:

In both cases the acceleration is 2 ms^{-2} giving the graph of the derivative function (i.e. the acceleration) in **fig 11**. Remember that 2 metres per second per second is usually written 2 ms^{-2} .

We can see that, for a given function, the level on the vertical axis of that function's derivative function corresponds to the gradient (i.e. the rate of increase of the vertical component relative to

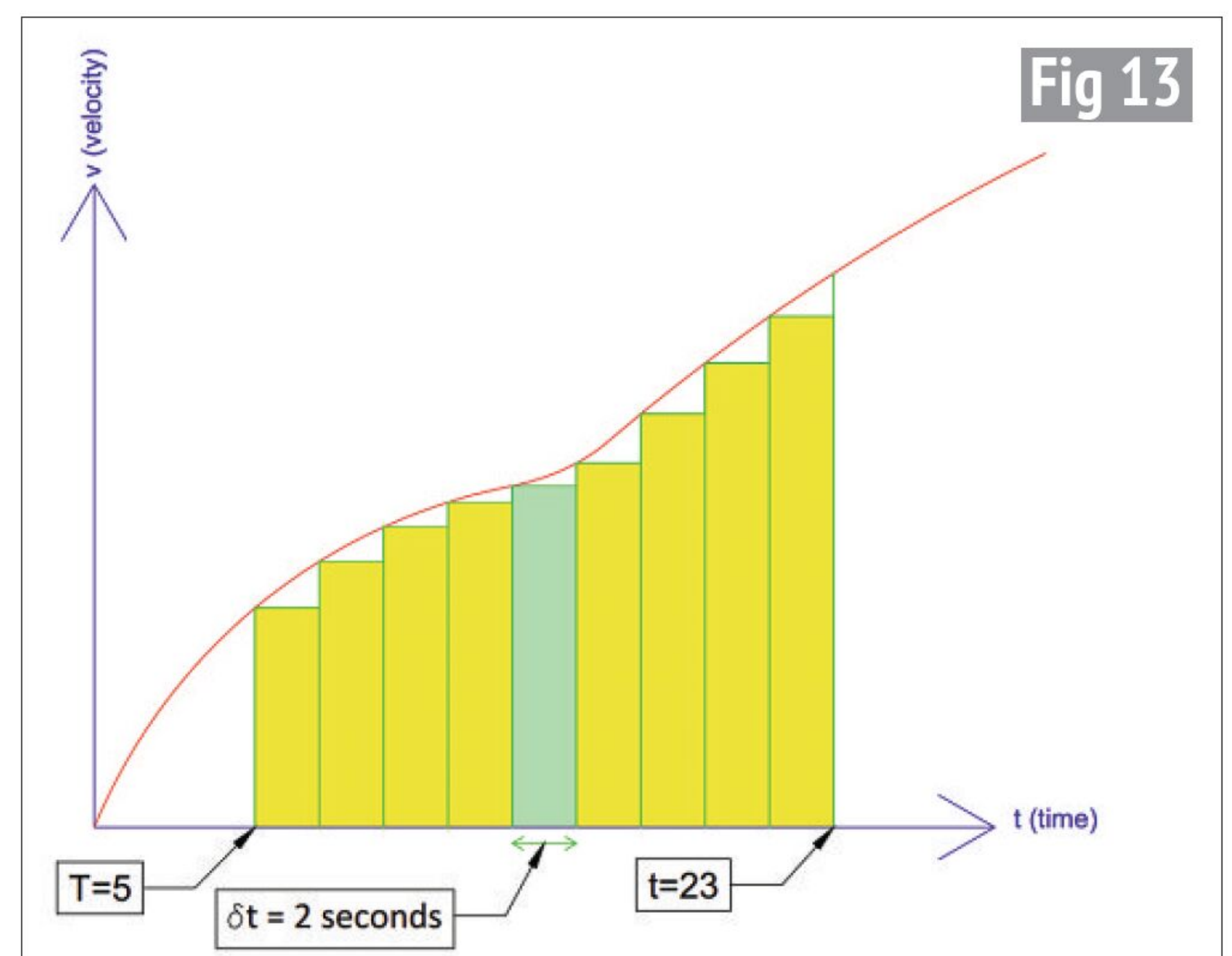
The process of determining the area between the curve of

the function and the horizontal axis is known as integration.

Note! When a function curve falls below the horizontal axis the area between it and that axis is negative.

Summa = sum – a historical interlude

Differentiation and integration are two aspects of the infinitesimal calculus and the subject as we know it was developed more or less independently by Isaac Newton (1643-1727) and Gottfried Leibnitz (1646 -1716). Previous pioneers included Archimedes, who used infinitesimal methods to determine such things as the surface area of the sphere. Newton and Leibnitz used different



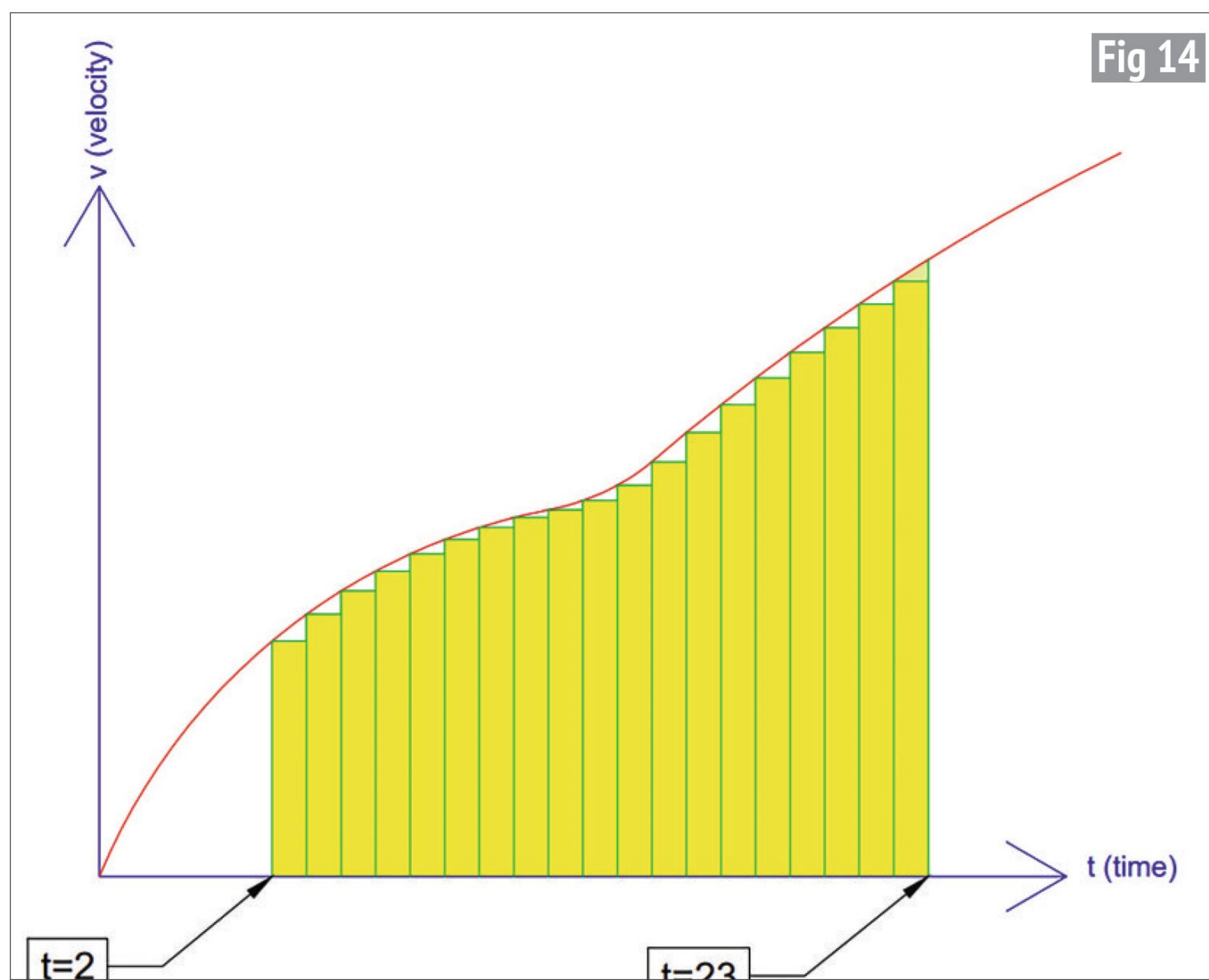
First evaluation of area under function.

notations and, although Newton's system is still occasionally used, Leibnitz's notation now predominates (although in the rarified world of pure mathematics a third notation is used). In the 17th century academic work was largely carried out in Latin and to indicate integration Leibnitz used the long s ($\int$) from *summa*, the Latin word for 'sum'.

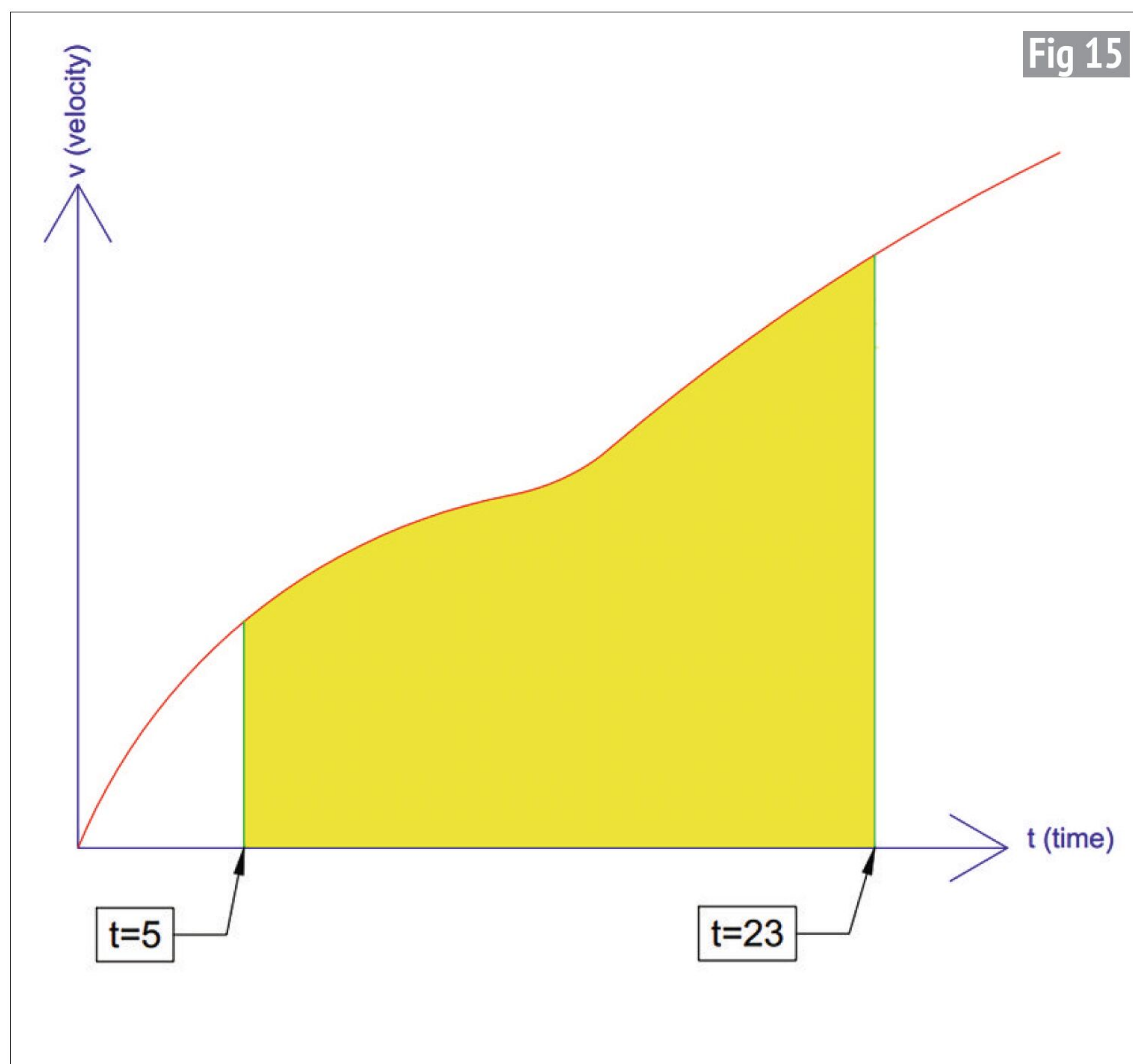
Essentially, we start off with a function that is the derivative of the function that we wish to evaluate. For example, we could have the plot of an object's velocity. How can we find the displacement that has occurred if this derivative function can be given in the form of a formula such as we have been using? **Figure 12**

shows an example. The red line in the figure is a plot of the velocity of a body against time. Suppose we are interested in finding the displacement of the body between $t = 5$ seconds and $t = 23$ seconds.

We can get an approximate answer by dividing up the time period into small, equal, periods and multiplying the time interval of each period by the velocity at the start of that period. This is shown in **fig 13**. Here the area under the curve in the original diagram is approximated by nine rectangular strips, the area of each representing the velocity at the start of a two-second period multiplied by the time elapsed during that period. In this case $\delta t = 2$ seconds.



Second evaluation of area under function.



Evaluation at limit of area under function.

Fig 14

Fig 15

We can decrease the time elapsed so that $\delta t = 1$ second, thereby doubling the number of rectangular strips, as in **fig 14**. In this case $\delta t = 1$ second. Inspection of the two figures above shows that the 18 rectangular strips above cover more of the area under the original curve.

As δt gets smaller, more and more of the area is covered. Once again, however, we encounter the problem that, when δt becomes zero, the area of the strips will be zero (because a length multiplied by a zero breadth gives a zero area). However, we can say that, as δt tends to zero, the sum of the strips will tend to fill the area under the curve, as shown in **fig 15**.

In mathematical symbols:

As δt tends to 0,

$$\sum \frac{ds}{dt} \delta t \text{ tends to } \int \frac{ds}{dt} dt$$

The Greek letter Σ (sigma) is used in mathematics to denote a sum.

We remember that ds/dt is the velocity, so that:

$$\int \frac{ds}{dt} dt = \int v dt = s + K$$

where K is a constant.

As discussed earlier, when integrating we should bear in mind that functions of a similar profile have the same derivative so that we should add a constant when integrating. However, in the above example we are really evaluating the integral in the following way:

$$\begin{aligned} \int_5^{23} v dt &= \int_0^{23} v dt - \int_0^5 v dt \\ &= ([s]_0^{23} + K) - ([s]_0^5 + K) \\ &= [s]_5^{23} \end{aligned}$$

In other words, when integrating between limits, the constant is cancelled out. To put it another way, the increase in distance between $t = 5$ seconds and $t = 23$ seconds will be the same no matter how far the body has already travelled at time $t = 5$ seconds.

● To be continued.

The Sheer Beauty of Vintage Model Trains

Henk-Jan de Ruiter

looks at the beginnings of the train set.



Locomotives, giant machines steaming and puffing ahead exploring new boundaries and discovering new territories.

Following on from medieval times, the industrial revolution, which broadly speaking started in England in around 1760, had driven huge advancements in many areas of activity, particularly in mining, in the textile industry and, of course, in agriculture. Things were moving fast and the interaction between inventions worldwide inspired many industrialists to change - to optimise their production methods and invest in new machinery.

The first steam locomotive was invented in 1804 by Mr. R. Trevithick and, before too long, railway tracks were built across the length and breadth of the United Kingdom.

In order to sell their products

to a railway company, the manufacturer of a steam locomotive often used a scale model of its 1:1 sibling to demonstrate their machine to a prospective customer.

As trains became more popular, and with automobiles still in their infancy, it is no wonder that everyone, adult or child, was impressed by this new means of transport and wanted to be part of this adventure, either as a passenger or as a hobbyist at home. As a consequence and realising the potential, toy companies adapted, widened their product portfolio and became involved in model trains. Novice toy manufacturers also came into the market, leading to a whole new industry producing model trains, recognising as they did the financial potential of these new kinds of 'toys'.

The history and sequence of

development of model trains can be tracked by looking at the different types of power used to make the little locomotives move.

In the beginning model locomotives were pushed ahead or pulled along; there was no track involved.

Following on they typically became battery driven, to be superseded by the so-called 'spirit dribblers' and, after that, the wind-up or clockwork motor and electrically driven locomotives appeared and soon they all ran on metal rail tracks. Some more exotic designs made use of live steam or internal combustion.

The American NMRA (National Model Railway Association USA) and the European MOROP (**ref 1**), which publishes the NEM (Normen Europäischer Modelbahnen) set out guidelines for standardisation and they came



JEP O-Gauge tinplate model locomotive, 1938.



Vintage mechanical handmade railway crossing 1910.

up with a range of scales, of which the most important are: Z-Scale, N-Scale, OO-Scale, HO-Scale, O-Scale, Gauge 1 and Gauge G, the last one often being used for outdoor garden railways.

Track dimensions were also laid down and measured by the distance between the inside of the left and the inside of the right hand rail, although there was for a long time a debate about this subject - how to measure such a thing.

The most popular model railway track gauge in the UK is OO and on the continent it is HO (the same gauge but a slightly different scale is used), made popular by Märklin, although Gauge One has also been making a comeback in recent years.

It all started with model locomotives made of brass designed and built by companies such as J. Bateman (Est. 1774 in London), famous for its Thunderer locomotive; Clyde Model Dockyard (Est. 1789 in Glasgow), famous for its spirit fired live steam locomotives and Stevens' Model Dockyard (Est. 1843 in London), famous for its Birmingham Dribbler 'floor' locomotives (no track!). These were all fabricated in the period 1820-1925. Companies employed very talented craftsmen, often instrument makers already experienced in making complicated mechanical and scientific objects, for example telescopes

and specialist tools.

On the other side was the progress made by the toy companies themselves who were exploring this new territory. No other country had such a strong following in the model train hobby than the United Kingdom where companies such as Bassett-Lowke, Bowman, Hornby and Wrenn became popular names. This magazine, *Model Engineer* helped enormously to introduce model trains to the public where, for example, Bassett-Lowke products were already being advertised in 1899.

A man who played a significant role in this, besides Mr. Wenman and J. Bassett-Lowke, was Mr. Henry Greenly who not only designed most of Bassett-Lowke's locomotives but also laid down the basics for the definition of gauge standards. They contracted third party manufacturers such as Twining Models and Winteringham Ltd. in England. Mr. Greenly was also a contributor to *Model Engineer* magazine.

Hornby, already famous for its Meccano metal construction system, entered the model train market around 1920. Other firms who were sometimes simply a trading company, such as Gamages - a big retail store in the UK, with a huge (mail order) toy department - didn't always produce model trains themselves but imported them from manufacturers on the continent of Europe or



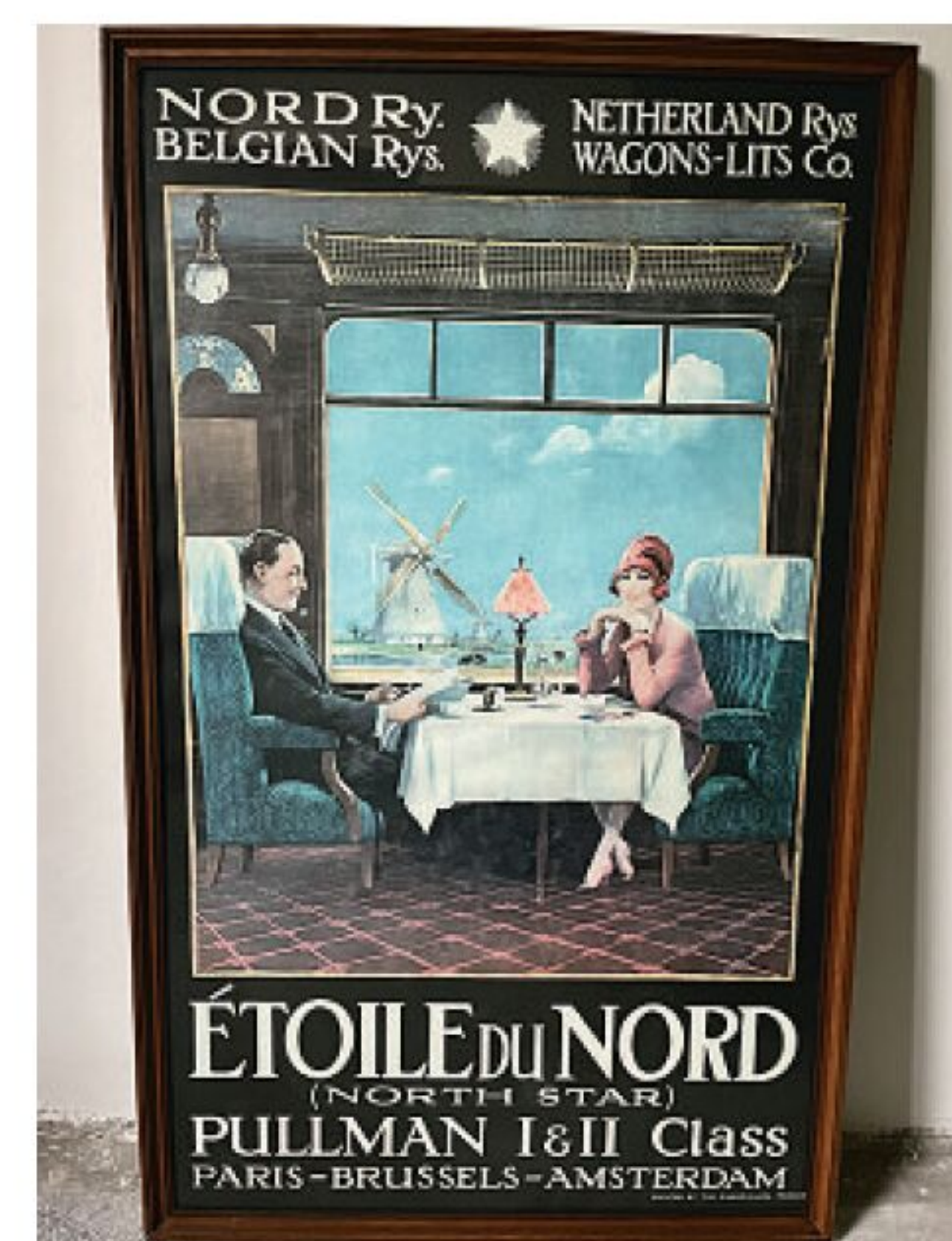
Märklin Gauge 1 Gotthard Locomotive 1925.

perhaps commissioned an order to such a company for a product tailored to their own requirements.

Around 1900 - 1910 their main suppliers were the German Bing and Märklin toy companies, who especially adapted the looks of their locomotives for the English market.

Märklin, established in 1859 by Theodor Märklin in Germany was, in the beginning, producing dolls' houses, furniture, kitchen and household appliances for children to play with. Although this was a very successful business, largely built on the personal interest of Mrs. Märklin, two of her three sons who had taken the helm in the company in 1888, shifted the firm's interest into model trains. This was speeded up by their take-over of the Lutz toy company, which was already into manufacturing a wide array of toys, especially steam driven engines and clockwork locomotives. Their biggest success came, however, when they introduced for the first time a model train track system with a X-rail crossing and a rail 'switch' in order to make a 'figure of 8' track, a novelty which was immediately a smash hit at the Toy Fair of 1891 in Leipzig.

During this important period between 1850 - 1900, many other German companies like Carette, Plank, Schöner, Bub and Fleischmann were starting in business and, interestingly, most of them were founded in Nuremberg as this city was



Poster Wagons-Lits.

surrounded by tin mines.

In other parts of Europe, the popularity of model trains became significant; in France, where JEP (Jouets de Paris) became famous for (wind-up) locomotives made of tinplate. Their main competitors were Rossignol and Favre.

In Spain the factory Paya began making toys and model trains in 1902 and in Italy the company Ingap was founded in 1919. The production of model trains in Switzerland only started a bit later, around the 1950s. The Asian markets had developed a love for brass model trains, a phenomenon which was later brought, by American military GI's and Veterans, to the USA.

Electricity was certainly not a common commodity for households in those early days and where there was electric power, there were differences across countries and even across cities between the types of current - AC or DC - and variances in voltage. Frequencies could vary between 25 and 100Hz and voltage between 100 - 250V.

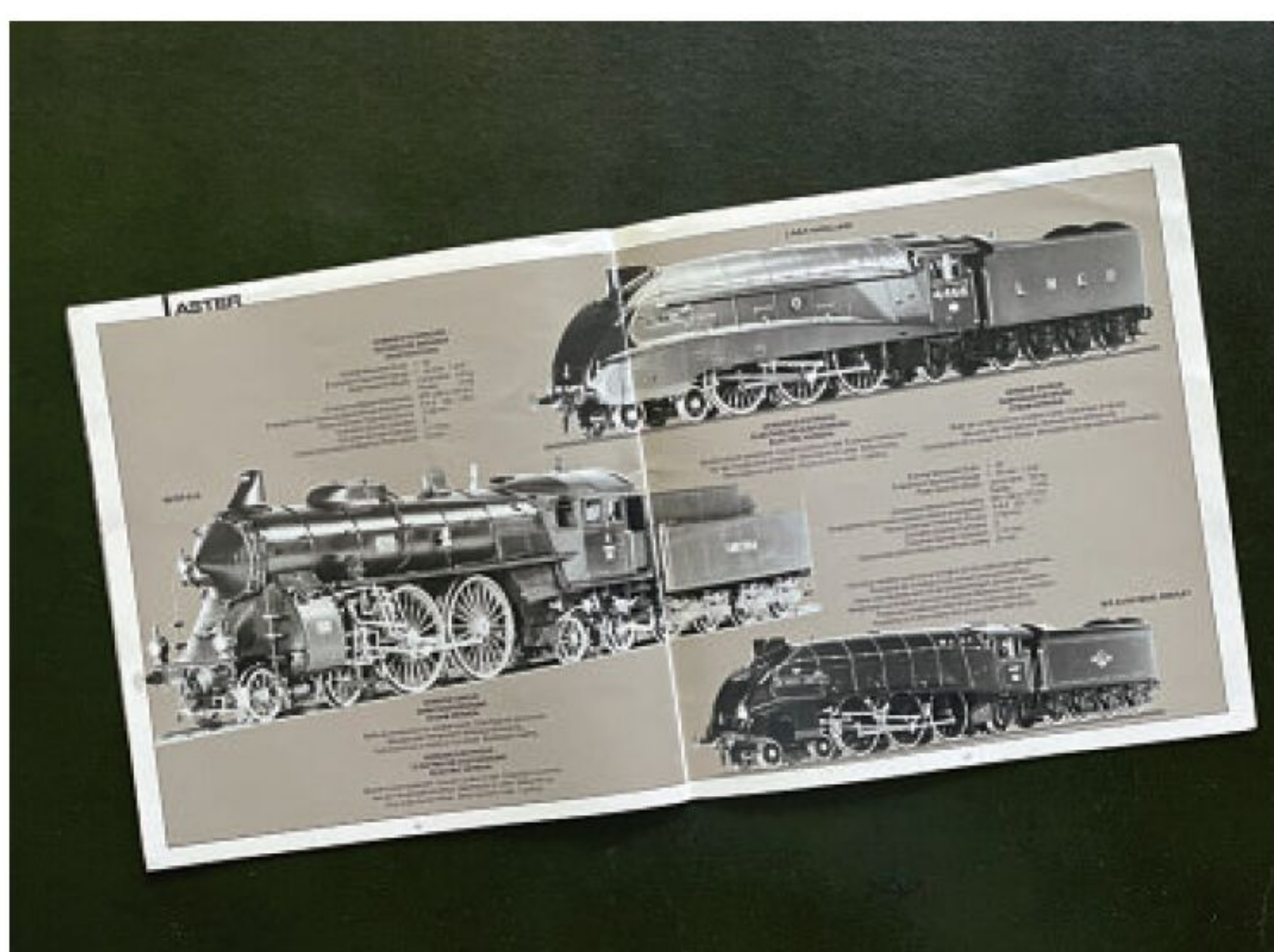
In the UK in the 1930s, about 40 percent had a mains connection and 60 percent was unwired. When electricity was not available, accumulators (**ref 2**) were needed. They were also used for radios at home.

Around those early times (electric) model trains were aimed at the more affluent households as they could be quite expensive to buy but also to operate.

In the USA, toy companies had a somewhat different



Books about model trains for collectors.



Excerpt from a Fulgurex Brochure showing Aster locomotives.



Hornby clockwork train set.



Tinplate signal box.

approach as they were more into model trains made from cast iron as this was a raw material in plentiful supply, although predecessors had been made as a wooden carriage with a metal base.

One of the oldest companies was Carlisle and Finch, later followed by others like Hubley, Marx and Lionel. The latter still exists as a company by the name of MTH Lionel.

Until the 1950s one could describe the designs of model trains as toy-like, however when later on, with the invention of plastic, the technique of injection moulding was further developed and more detailed model trains came to the market.

Slowly but surely the 'toy' industry has grown and has reached the high standards of today's realistic model trains - and model locomotives in particular - with lots of detail and computerised digital functions and controls.

No story about model trains would be complete without a mention of Count Giansanti Coluzzi of Switzerland, collector and founder of the highly regarded Swiss model train company Fulgurex in 1948. He was one of the first people to notice and realise the complex building techniques

and high quality components required to produce model locomotives and made them to a standard seen nowhere else in the world of toys. Indeed his model locomotives are sometimes compared with (vintage) mechanical watches and clocks.

To conclude this article a couple of interesting facts:

The oldest model train set in England can be found in the Bowes Museum, Barnard Castle, in Durham, which was made for a Mr. J. Pease somewhere around 1868.

A less known fact is that several hospitals in the world were encouraging model building for ex-servicemen and veterans as a method of regaining sensory feel and of practising hand-eye coordination and healing during recovery from (mental) wounds and PTSS traumas (ref 3).

Another fact is that quite a few famous people in the past were model train collectors, such as Frank Sinatra and Winston Churchill to name but two. Contemporary artists and singers such as Rod Stewart,

Roger Daltrey, Neil Young, Elton John and sportsmen like Michael Jordan, actors like Tom Hanks and business people like Warren Buffett are model railway fans and avid collectors.

WEBSITES

www.thebowesmuseum.org.uk
www.brightontoymuseum.co.uk
www.g1mra.com
www.hrca.com Hornby Railways Collectors Association
www.miniature-wunderland.com
www.modelrailwayclub.org
www.nmra.org
www.sncf231e.nl
www.spurweiten.de
www.tcawestern.org

MUSEUMS

Australia: www.nswrailmuseum.com.au
 Canada: www.exporail.org

New-Zealand: www.nationalrailwaymuseum.nz
 The Netherlands: www.spoorwegmuseum.nl
 United Kingdom www.railwaymuseum.org.uk
 USA: www.historictrains.org

BOOKS

Hornby Companion Series, Volume 1 by P. Randall.
Ritter Restaurierungen by G. Ritter.
Spielzeug und Modelleisenbahnen by P. Carlson.
The Trains on Avenue Rumine by Count G. Coluzzi.
The World of Model Trains by Guy R. Williams.

MAGAZINES

Constructor Quarterly Magazine No. 135/136: articles about Meccano/ Bassett-Lowke transformers by Mr. G. Rahn and Mr. S. Niewiadomski.

ME

SCALE TYPES:

Z-Scale 1:220
 N-Scale 1:160 (UK 1:148)
 HO-Scale 1:87
 OO-Scale 1:76
 O-Scale 1:48
 Gauge 1 1:32
 G-Gauge 1:22,5
 Gauge IV 1:15

TRACK WIDTH

Old measurement/ New measurement

Gauge IV 95mm/ 90mm
 Gauge III 75mm/ 72mm
 Gauge II 54mm/ 51mm
 Gauge G 45mm
 Gauge O 35mm/ 32mm
 Gauge OO/ HO 16,5mm
 N-Gauge 9mm
 Z-Scale 6,5mm

REFERENCES

- Ref 1** MOROP The European federation of national model railway associations. www.morop.eu
Ref 2 Accumulator is a rechargeable battery.
Ref 3 PTSS - Post Traumatic Stress Syndrome.

Newton Tesla (Electric Drives) Ltd have been trading since 1987 supplying high power variable speed drives and electric motors to industry up to 500KW so you can be confident in buying from a well established and competent variable speed drive specialist.



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Si (Système international d'unités) Newton, unit of mechanical force, Tesla, unit of magnetic field strength

Please mention Model Engineer when replying.

We Visit the Vale of Aylesbury Model Engineering Society

John Arrowsmith visits a club at the end of the Metropolitan line.



Continuing my visits to this part of the UK, I arrived at a club site located within the boundaries of the Buckinghamshire Railway Society at Quainton, but the construction of the new HS2 Railway project actually reaching Quainton has made it quite a tortuous journey compared to previously.

Perhaps a history of the Vale of Aylesbury MES would now be a good place to start.

The Society was first formed in 1972 when four model engineers got together in a pub and thought about gathering information about the potential for founding a club in the area. In May of that year nine modellers formed what they called the Vale of Aylesbury Society of Model Engineers (VAMES) - and they haven't looked back since! Like many clubs at that time, however, they had no track site or permanent home, just some enthusiasm and a will to succeed. A portable track was built both to raise awareness of the club and to raise much needed funds. In 1975 they were offered a permanent site within the confines of the Quainton Railway Centre - now the Buckinghamshire Railway Centre. It was quite a rough piece of ground and it proved to be a real test to construct anything in this location. It took until 1982 to finally have enough track to construct a small circuit.



The main clubhouse looking from the picnic area.



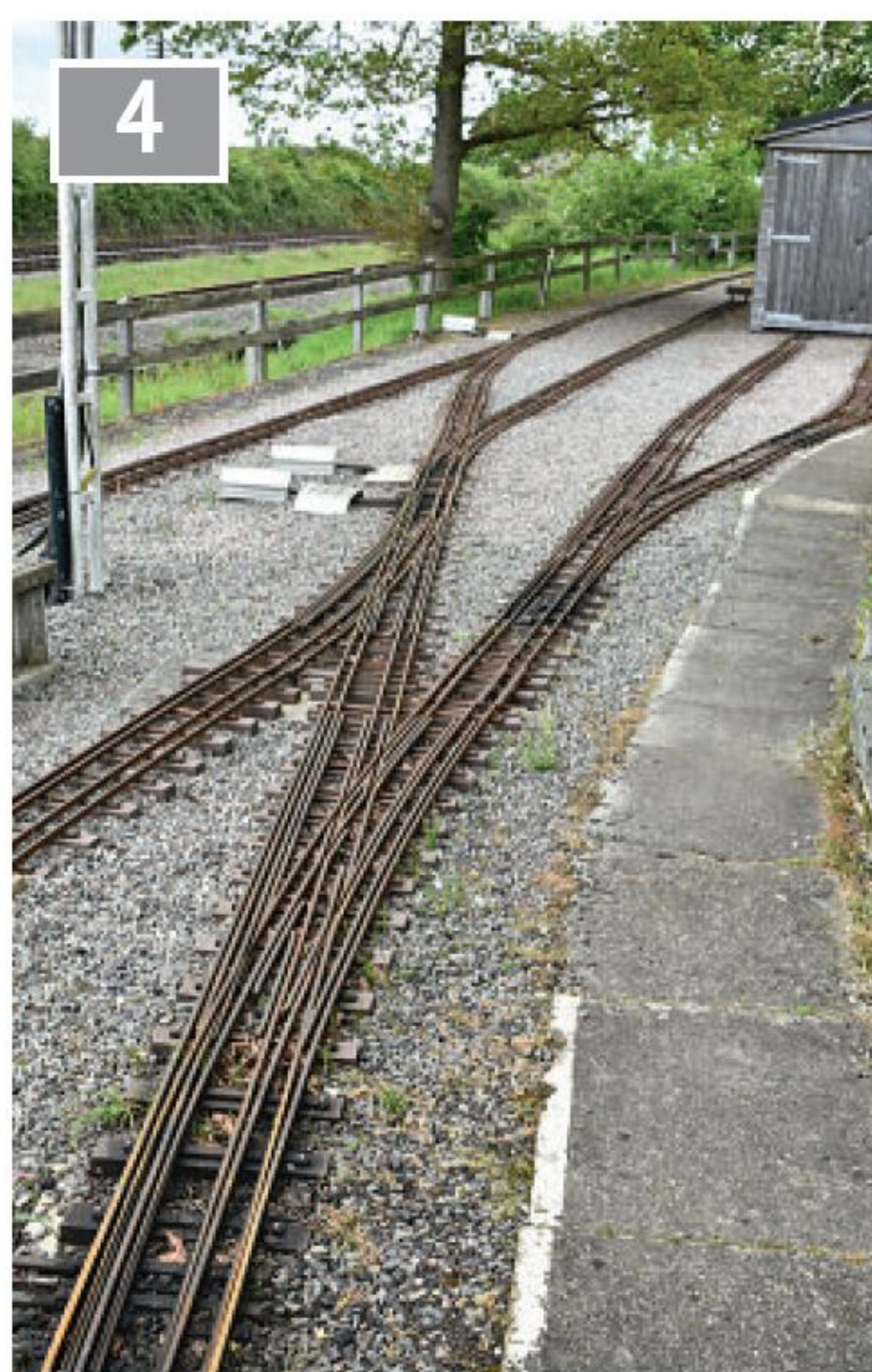
An outside view of the clubhouse.

Progress continued with a track extension and a small wooden club house eventually being built, followed by all the normal domestic facilities. In 2012 they opened their new brick built club house for members to enjoy (**photos 1 and 2**) and I was fortunate enough to attend

when Sir William McAlpine carried out the official opening. The building has some interesting features such as the large platform facing window which shows a display of models and a small circuit of operating track. This gives the visiting public some idea of



The shop window display and layout in the main building.



Departure track work to the main line and storage sheds.

what the club can do (**photo 3**). A completely separate toilet block provides the public with another necessary facility.

Since those days, progress has continued so that today they have a superb ground level 3½, 5 and 7¼ inch multi-gauge track which is quite a demanding circuit for drivers. With these three gauges at ground level it does make for some interesting track details, particularly the point work (**photo 4**)! It is fully signalled and has a fine tunnel which adds to the railway's interest. Next to the exit portal is a small but interesting display of a mountain cable car system as well as a short funicular railway; all working models, they really do entertain visitors on open days (**photo 5**). Whilst all the larger gauge tracks were being built, a garden railway layout was also being

constructed and today the 32 and 45mm gauge tracks are quite a complicated set-up with lots of scenery and buildings (**photo 6**). In the interest of visitors they have built a good viewing area so that when it is in operation, visitors can stand and watch the trains go by in a safe and dedicated way. The inside line is the O-gauge system, the middle two are G-scale and the outside circuits are Gauge 1. Member, Mike Clements was working on the layout while I was there (**photo 7**).

My host, Andy Rapley explained that the club operates within the Railway Centre; this basically means that they provide a service whenever the Centre operates, which is virtually every Sunday in the year and every Wednesday during school holidays. That is quite a big undertaking for a model engineering club and takes a lot of organising to ensure there is always the right number of members on site to cover all the necessary operations. In addition to that, of course, are the larger events like the popular Thomas the Tank Engine weekend which all makes for a very busy schedule for the club. Like many clubs these days, recruiting new members is becoming a problem as the existing members age and cannot take on the jobs they used to do - but operate they do and the upside of all this work is the healthy condition of the bank balance! Current membership



An imposing tunnel portal with working miniature attractions alongside.



A eight track section of the garden railway.



The large area of the garden railway with an impressive viaduct in the background.

is around 130 including some junior members and younger family members so they are progressing steadily but, as Andy said, it is a difficult task to recruit new members. So many clubs are experiencing similar difficulties. Having a large site to maintain is, again as with many clubs, becoming more difficult but the current project of refurbishing one of their

workshops is making good progress. It is currently being re-wired and a new insulated ceiling is to be installed as well. This will certainly improve the working conditions for members, especially during the winter months. In this workshop is a good selection of useful machine tools like the trusty Colchester Bantam lathe along with a milling



The well-built staging, supporting the track to the storage area. Gregg.



The raised maintenance and storage shed.



Dave Andrews with his BR Std. Class 4 tank locomotive waits for departure from the station.



Dave Andrews has the BR Class 4 tank going well.

machine, drills and bench tools. The club have a dedicated paint shop which has large windows and a translucent roof providing plenty of natural light to the inside. This must be a very useful shop as there is nothing worse than trying to protect newly painted stock

from the elements and curious onlookers! There is also another maintenance facility at the other end of the site which has a large percentage of the workshop equipment which belonged to Brian Thompson, the ex-Chairman of the Southern Federation.

There is an interesting selection of club locomotives on site and one under construction that I have never come across before - a 'Romubag'. My reaction, too, was *what is a 'Romubag'?* Apparently it is a Romulus chassis with a Bagnal boiler

- but no photos, I'm sorry. No doubt it will be a powerful locomotive when completed.

I mentioned another maintenance depot at the other end of the site. Because the ground slopes quite a lot from one end to the other, this shed has been built up to compensate. The connecting track-work is on a steel scaffolding type structure (**photo 8**) which gives a good, wide working platform outside the workshop (**photo 9**). While I was there, member Dave Andrews steamed his 5 inch gauge BR Std Class 4 tank locomotive and took me for a trip around the track (**photo 10**). I was particularly interested in how this locomotive performed as I am almost at the steaming stage of the one I am building (**photo 11**). It was an excellent trip and the locomotive steamed well and had no trouble at all. If mine steams half as well as this one I will



The main running line adjacent to the sheds.



Denham Green station out in the country.



North Junction Signal Box.



The departure side of Golden Spring Station with the main line running tracks of the QRS in close proximity.



The splendid picnic area for visitors.



The arrival track work and lines to the storage sidings and the maintenance shed. Full size tracks on the right.

be well pleased. The track itself rides very well and is made more interesting for passengers with small dioramas of buildings and figures randomly located around the circuit (**photo 12**). A model of Denham Green station and signal box also adds to the railway atmosphere (**photo 13**) as does the North Junction signal box (**photo 14**). The exit from the steaming bays onto the main line is an unusual feature in the shape of a large signal arm across the track which is raised by drivers wishing to go out on the main line. The well laid out main station, Golden Springs Central provides good views over the adjacent standard gauge lines of the Quanton Railway Centre and over the club's picnic area and garden railway (**photos 15, 16 and 17**).

I hope my pictures convey how this impressive club operates in what seemed to me a very happy environment. There's certainly a desire to enjoy model engineering in all its forms.

It only remains for me to thank the chairman, Bob Jones for his invitation and to Andy Rapley for his time and patience in showing me around together with all the other members who were present on the day of my visit. I enjoyed my time there and hope that they continue to progress and enjoy the model engineering environment they have created.

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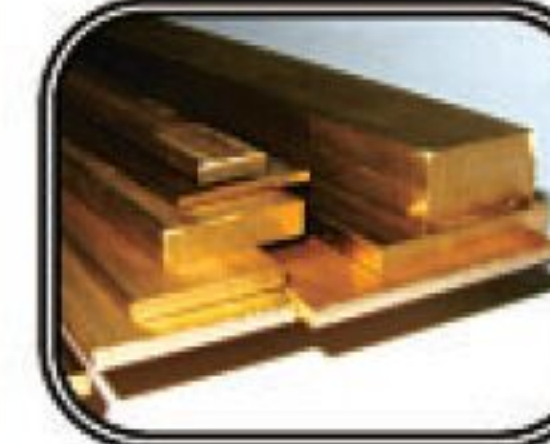
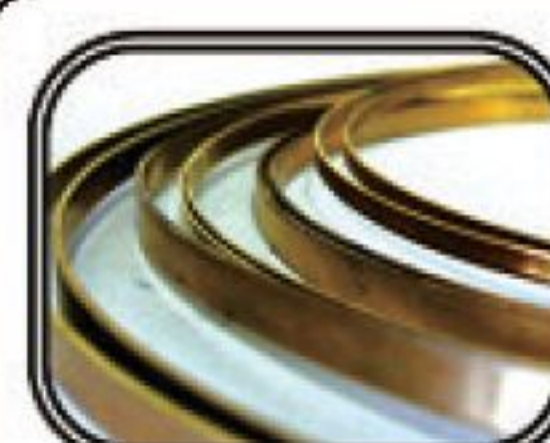
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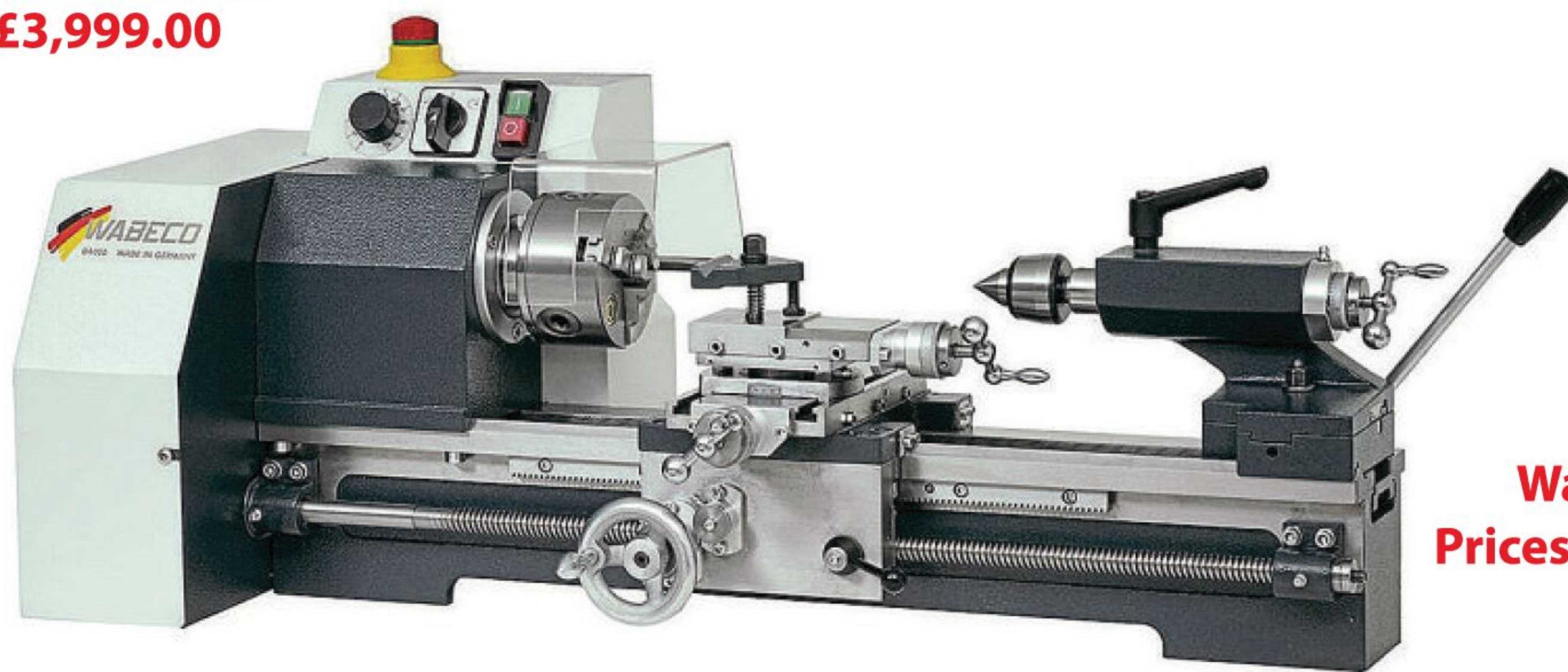
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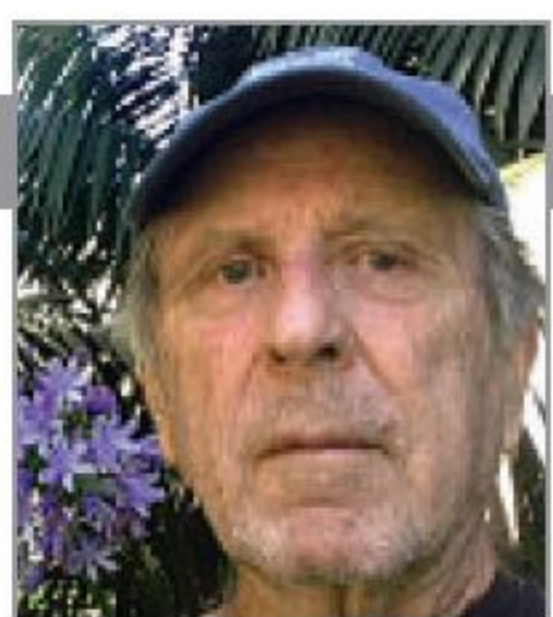
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An LED model of a Locomotive Kerosene Headlight

Douglas Pitney achieves realism in a locomotive headlamp using LEDs.



My model of the legendary Canadian Pacific Railway 4-4-0 locomotive *Countess of Dufferin* is based on LBSC's famous 3½ inch *Virginia*. This article describes a realistic LED version of dim, flickering kerosene headlights, common on late 19th century Canadian locomotives.

The *Countess of Dufferin* was built by Baldwin Locomotive Works (Philadelphia USA) in 1872. The 4-4-0 wood fired locomotive, tender and several boxcars were transported on a barge by the steam powered sternwheeler *Selkirk*, north along the Red River from Fargo North Dakota, arriving in Winnipeg, Canada in 1877 (**photo 1**). The first steam locomotive west of Ontario, it was named *Countess of Dufferin* after the wife of the then Governor General of Canada the Earl of Dufferin.



Countess of Dufferin arrives by barge (Winnipeg 1877).



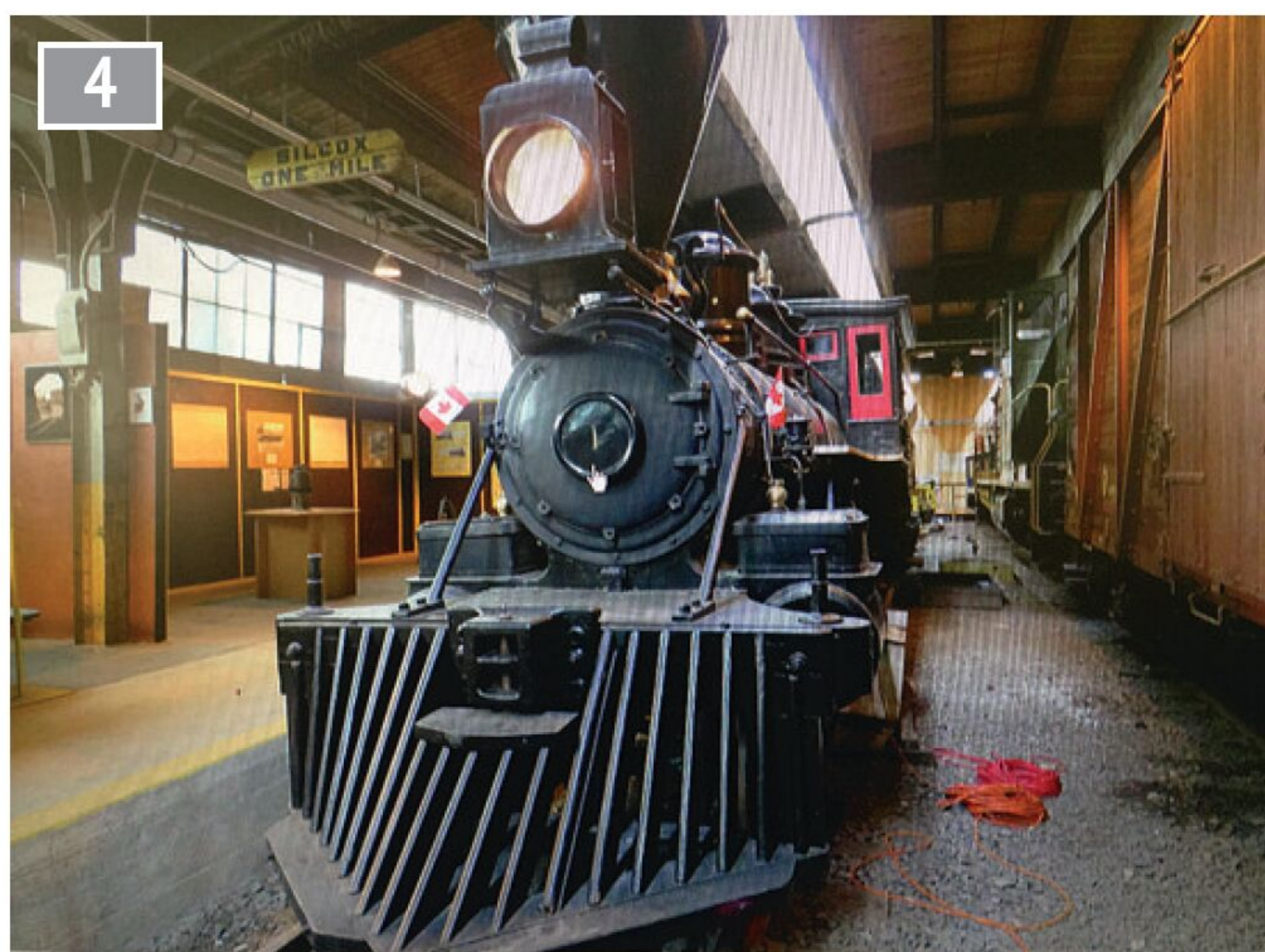
CPR No. 1 Countess of Dufferin Winnipeg 1877-1897.

In the late 19th century, as the Canadian Pacific Railway moved westward, it acquired the *Countess of Dufferin* which was owned by a small independent company in southern Manitoba. She was renumbered CPR No. 1

(**photo 2**) and worked in the Winnipeg area until 1897 when she was sold to a logging company in western Canada. Finally in 1911, the *Countess* was rescued as scrap by Manitoba historical enthusiasts and returned to Winnipeg



Homecoming (Winnipeg 1911).



Countess of Dufferin: Winnipeg Railway Museum.



Warm yellow LED tea lights.



Tea light details.



The LED model of a kerosene locomotive headlight (Baldwin USA 1872).

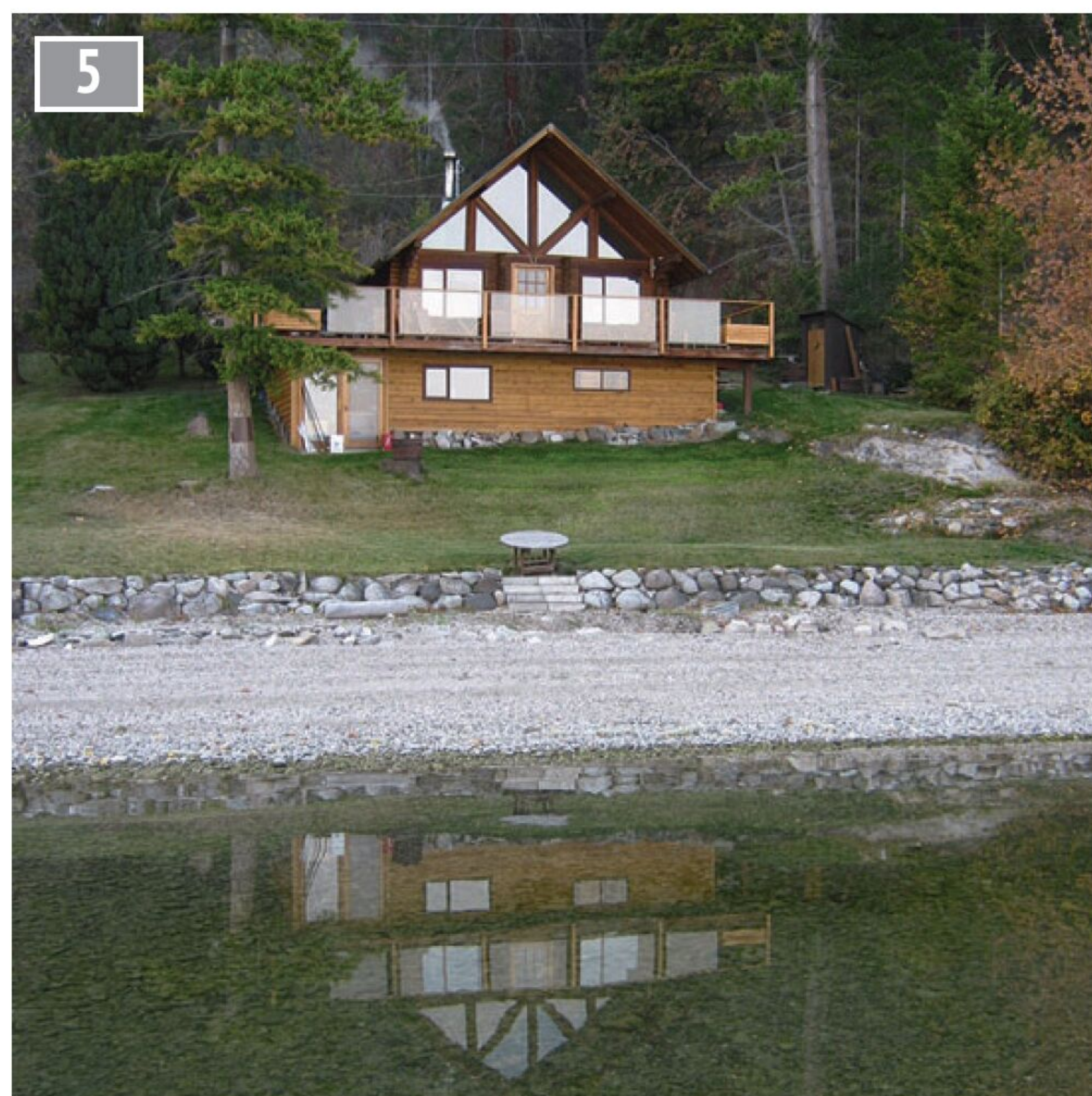
(photo 3). The distinctive profile of the kerosene headlight (photo 4), huge smokestack and three boiler domes became part of western Canadian folklore. She remains on permanent display at the Winnipeg Railway Museum.

In this article I describe my model of the kerosene headlight in 3½ inch scale.

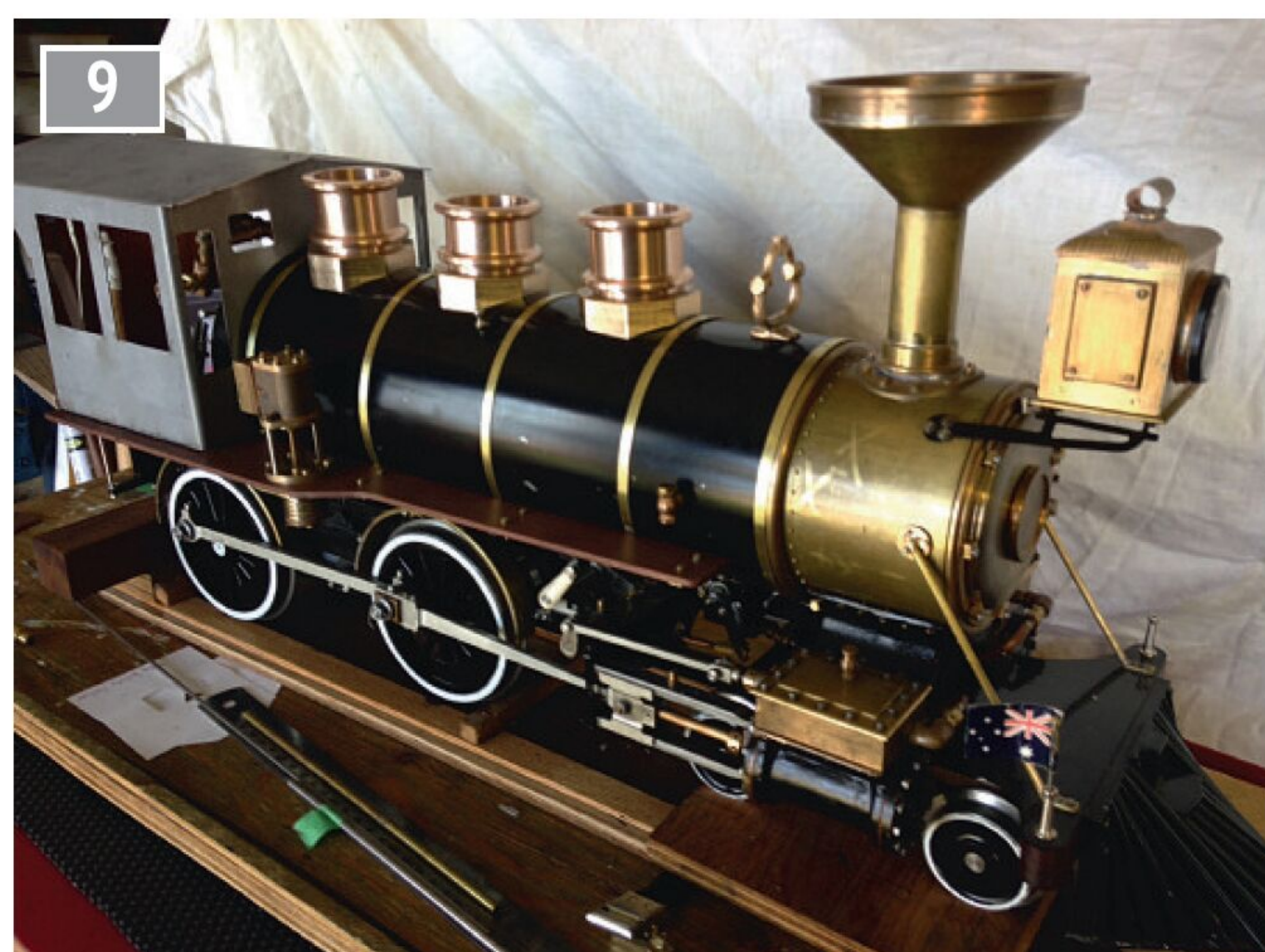
Based on LBSC plans, I started my project in Perth, Western Australia with the

much appreciated expertise of Phil Gibbons and Clive Chapman of the Northern Districts Model Engineering Society. I used photographs to design the distinctive three dome boiler, headlight and smokestack profile of the original locomotive. In 2018, working in my very basic workshop on the shore of Okanagan Lake (British Columbia, Canada) (photo 5) my model ran on compressed air.

Headlights are usually very bright LEDs that look out of place on a model of a 19th century locomotive. Following a long search for an alternative, I discovered flickering, warm yellow 'Tea Light Candles' (photos 6 and 7) in a local hardware store. They are battery operated (~200 hrs continuous use), operated remotely or by sliding switch, the correct size (~38mm diameter, 40mm High) and colour (warm yellow) but - most importantly... FLICKERING. 'Tea Lights' are inexpensive (~\$2



Workshop under cabin on Okanagan Lake (BC Canada).



Countess of Dufferin (3½ inch gauge).

AUD) and are readily available on-line or in budget dollar stores. I immediately realized they are perfect for my unusual application.

I built a scale brass headlight using dimensions from photographs (40mm W x 48mm D x 62mm H). The removable sides, secured by 10BA brass screws, provide easy access to the tea light for maintenance. The brackets to secure the brass headlight to the smokebox are laser cut mild steel. I dismantled an old torch (flash light) and fit the bezel, reflector and tea light into my brass headlight (photo 8). The on/off switch

on the base of the tea light is accessed through a hole in the base of the headlight. Eventually I will use a remote control, now available for most tea light products. The colour, brightness and dim, flickering warm yellow light is an impressive feature. It nicely resembles the kerosene headlight on the Countess of Dufferin (photo 9).

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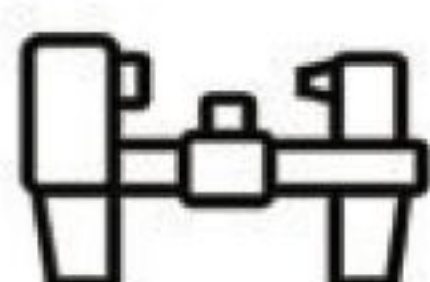
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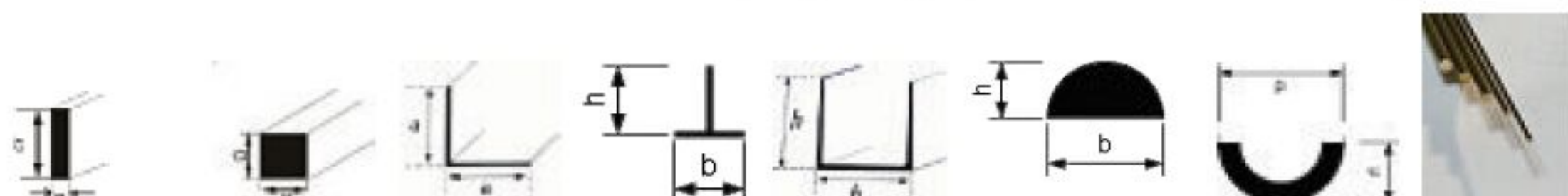
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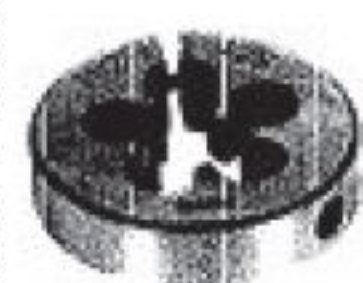


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Boiler Inspector's Seminar

Bob Hayter,
reports
from a
gathering of boiler
inspectors at Echills
Wood.



A boiler Inspector's seminar was held at the Echills Wood Railway site in Kingsbury water park on Saturday 19th September. Aimed at prospective new boiler inspectors and as a refresher for existing boiler inspectors, the day was organised and staffed by the Federation of Model Engineering Societies and Northern Association of Model Engineers. Peter Squire opened the proceedings with the history and background of boiler testing (**photo 1**).

A session of the design of copper boilers was presented by Bob Hayter of the Northern Association and the morning rounded off with the differing considerations for steel boilers.

Following a buffet lunch delegates transferred to the steaming bays where Ben Pavier from Southport Model Engineering Club took the group through a practical demonstration of hydraulic testing (**photo 2**).

There was much discussion focussing on the issues of hydraulic testing, the equipment, calibration and situations that may lead to the model being failed. Transferring along the



Peter Squires opens the seminar.

steaming bays the Echills Wood members had a locomotive in steam ready to demonstrate a steam test (**photo 3**).

Transferring back to the lecture room Bob Hayter described the process of certification, that was until there was a flash of lightning and all the lights went out. Model engineers being resourceful as ever, the group transferred their attention from the blank projector screen to the copy certificates in the delegate's pack making it possible to complete the session. Following a further period of questions and discussion everyone headed off home clutching their certificates of attendance.

Our thanks to the members of Echills Wood Railway for supporting this event and providing the facilities and refreshments. Anyone wanting to support their club by becoming a club boiler inspector should get their club secretary to nominate them for a seminar by contacting the secretary of the model engineering association to which they are affiliated. Seminars are organised from time to time in various areas of the country. There is always a waiting list for the next seminar, so if your club would consider hosting a seminar please get in touch with your association.

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Ben Pavier demonstrates hydraulic testing.

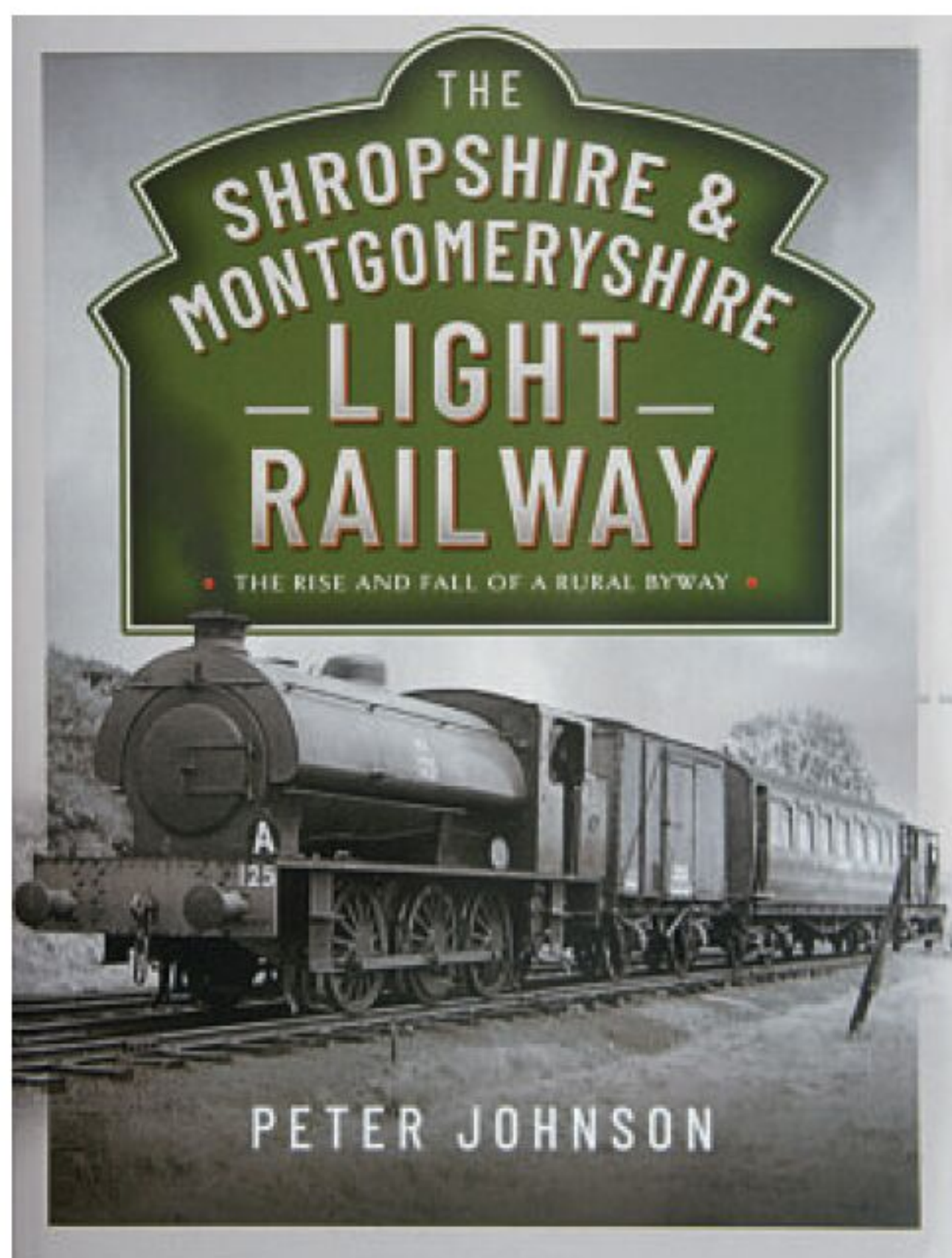


Undergoing a steam test.

Book Review

The Shropshire and Montgomeryshire Light Railway: the rise and fall of a rural byway

Peter Tuffrey



If ever a railway should have never been built it was the Shropshire and Montgomeryshire. Whether or not Victorians and Edwardians understood modern connotations of S&M it became a line inflicting massive financial pain on lenders and shareholders.

The railway was conceived to run through a sparsely populated area surrounded by lines run by major companies of the GWR, LNWR and Cambrian who were mostly hostile to the newcomer. If connections with Montgomeryshire were tenuous the chief promoter, landowner and Llanymynech quarry operator R.S. France, imagined it as part of a through route from the Midlands and Potteries to North Wales. Built to a good standard at an inordinate cost of £60,000 per mile with double track it was grossly excessive for the area. R.S. France secured a large rebate for his stone traffic on the new line, probably absorbing any profit the railway might have made.

Although intended as the first stage in a major through route it developed a branch to the stone quarries at Criggion (also known as Breidden). That quarry traffic proved important later.

For a 17 mile long line the S&M's history was complex. Twelve Acts of Parliament were involved with different company names, so lawyers did well out of the railway, if no-one else. The author has done a good job of untangling the story with detailed research in National Archives and newspapers.

Later, impractical plans

to link to the Potteries were processed at the instigation of Sir Richard Green-Price, 'the man who brought the railways to Radnorshire', losing investors even more money. He had links to the contractor Charles Chambers who was responsible for other Welsh Borders lines like the Kington to New Radnor extension where his entrepreneurial spirit saw the potential of quarries at Burlingjobb. Chambers later built the Southwold Railway and would be an interesting subject for a biographical study if any archives survive.

Opened in 1866 the line was soon seized by bailiffs. Operating again soon after, a dangerous bridge over the River Severn on the Criggion branch then forced closure in 1880 and after the line's refurbishment by Charles Chambers the S&M went into receivership in 1891. Accidents, some fatal, occurred due to locals using the neglected line and bridges as a footpath. Other accidents are well covered in the book - there were some dangerous working practices.

Thanks to Colonel Holman Stephens it reopened in 1911 but finances remained precarious despite the Colonel's use of second hand locomotives and rolling stock including a former royal saloon. They were serviced at Kinnerley, a station that could have been twinned with Buggleskelly. The S&M staggered on until the Second World War when the rural location was ideal for a large ammunition depot with the line worked by the army until final closure in 1960. The army rebuilt the railway to a good standard, sometimes using

Dean Goods locomotives and then Hunslet 'Austerity' tank engines.

Numerous appendices show the parlous state of railway finances, lists of railway staff, station plans, estimates of construction expenses and lists of locomotives. It's good to have financial information in a railway history, an aspect not usually dealt with well. Oddly, the book lacks a gradient diagram but perhaps there isn't one extant.

This being a Peter Johnson book we have many photographs of gravestones and a mausoleum, surely of peripheral interest? An interior photograph of the former Royal saloon is printed the wrong way round. A porter-guard is described as having been an 'assistant gamekeeper' on the line, a perhaps unique occupation on a British railway. During periods of dereliction there was interest in shooting rights over the line but it seems more likely he was an assistant gatekeeper!

Such minor points apart, this is a well researched history and arguably the author's best yet. Production is a credit to both author and publishers. On the strength of this volume we can look forward to Peter Johnson's forthcoming book on the Tanat Valley Light Railway.

Roger Backhouse

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LBSC

Dear Martin,

I note that a new book on LBSC has been published but at an eye watering price!

This has put me off trying to find out an answer to a fundamental question on how did LBSC, a fireman and steam engine driver, learn the technical drawing, machining, and a myriad of the many other skills and knowledge needed, to go on to design and make the many models he made, and then go on to write about it in *Model Engineer* magazine for so many years?

Whether this is in the new book, I don't know, but if there is anyone out there who can answer this question, I would be grateful to know!

David R. Machin
(Rotherham, South Yorkshire)

Boilers

Dear Martin,

Having read the recent comments from *Luker* regarding copper boilers, it makes me wonder how all the 100s of model engineers have succeeded in building and running model locomotives with these items, quite successfully over the decades past.

Copper may be expensive but you get what you pay for. It is an ideal material for a number of reasons. It is inherently ductile, which is important, and as a result of its higher thermal conductivity it transfers more heat for a given area resulting in more steam generation. This is why the older types of main line locomotives incorporated copper fireboxes. Some of these were changed to steel alternatives when maintenance costs became significant, only to be changed back to copper as they steamed far better.

Scale formation on the heating surfaces will occur with any materials, including stainless steel, if the water hardness is high. Rainwater is soft and thus an ideal choice.

Luker quotes steam jacketing. The correct

terminology is film boiling but this is not an issue with firetube boilers as the heat flux through the firebox is not high enough to create this problem. It is certainly an item that requires consideration in the design of modern watertube boilers designed for power generation and operating under very high pressure and temperature.

I have spent the majority of my occupation in the boiler industry and also been a member of both UK and EU Boiler Standards Committees, so I do have some knowledge of the subject.

For all internally fired shell and tube boilers, which includes locomotive boilers, flexibility is a main consideration. Furnaces and fireboxes and smoke tubes all operate at a higher temperatures than the outer casing, and thus differential temperatures exist under operation, and thus differential expansion. This is transferred to the boiler endplates creating displacements. When this occurs, the boiler is said to breathe and design codes incorporate breathing spaces.

So, it's easy to see that the boiler end/tube plates must be flexible and the use of copper is perfect. Stainless steel is not an acceptable boiler material for internally fired boilers. It is not flexible and when I compare a typical design with 3mm copper endplates with a *Luker* design with 6mm stainless, joined together with copious amounts of welding, then anyone would agree that it's far too rigid and thus totally unacceptable.

If there were requirements for official approval of these designs, then I know that *Luker's* would fail, and that makes it rather surprising that *Model Engineer* should publish it. Thank goodness that copper alternatives were added later.

Mike Willerton (Lincoln)

Luker replies:

Mike's letter makes me question the qualifications and expertise required to sit on a boiler standards committee. Other than the incorrect extrapolation of large

scale boiler application (to model size), I would question his understanding of heat transfer fundamentals. It's a very common 'mistake' equating thermal conductivity to overall steam generation; nothing like ignoring a few heat transfer terms in the middle to push a narrative! Mike is of course correct; film boiling is the correct term and when lecturing HT I would have used that phrase. When writing for a model magazine, steam jacketing is a lovely descriptive term to picture the phenomenon. As to this phenomenon occurring in boilers I refer Mike to my colourful FEA comparative results; practically the improvement of steaming using stainless was evident when testing these two different materials.

Everything I write has been built, tried and tested - it's not academic, nor derived from some poorly extrapolated industrial experience. The research, calculations (including FEA) and methods have been exhaustive and ultimately the results around a good loco model track are the final proof of concept. Fortunately I have built a few copper boilers so there is a solid basis for comparison, which is where I draw my conclusions from (including scale formation and performance). Making these stainless boilers is not where the challenges are, it's designing them. Unfortunately, the maths are not first order calculations and require special knowledge of heat transfer and strength of materials.

I don't have any issue with copper boilers *per se*, but I do believe that if the hobby is to be accessible to everyone, not only those with deep pockets, we need to start considering cheaper alternatives to copper boilers, specifically for the smaller scale builds. The resistance to this notion makes me think of the science academy of old; an old boys' club dedicated to keeping the *status quo* rather than encouraging innovation!

Moving a Workshop

Dear Martin,

Having recently moved house (and workshop) again after 30 years at the previous house, I can understand Andrew's concerns (Postbag, M.E.4751, September 6th). My hobbies mainly revolve around model steam, vintage tractors/generators, repairing/making stuff for myself and those around me and whilst I cannot directly answer your main question regarding who to engage to do it, some of my experiences nonetheless may be of interest.

My workshop was in a double garage and contained amongst other things: a Boxford and a Myford lathe, Dore-Westbury mill, two heavy duty benches, anvil, welding equipment, electrical test equipment, electrical machinery etc. and was 'full' to put it mildly! I also had several sheds used to store miscellaneous spares, useful materials etc. (i.e. assorted 'junk' that I didn't feel the need to throw away in the past!). I too was dreading the upheaval!

I was fortunate in that we only moved about a mile from the old to the new house and I was able to move the workshop separately to the house move, but the new house does not have any sheds yet, so I had to get a temporary tent-shed for weather protection for some stuff. It took a lot of preparation work before the final move and some of the key things that I learnt were:

1 Start clearing out/sorting out stuff as soon as you can - it will make the final rush at the end less stressful (I could definitely have done more of this than I did).

2 Get a big general waste skip to fill with all the things that you have kept for years, never used and probably never will - be as honest/ruthless as possible when deciding what you REALLY need to keep/move! (I filled a 4 yard and then another 8 yard skip with general 'tat', in addition to the scrap metal skip.)

3 Get a scrap metal skip for all the metal bits/come in handy spares etc. and again, be honest and ruthless with your decisions! (I had a very large pile of scrap by the time I had gone through it all.)

4 Give stuff away if you can find a suitable victim to donate it to - this is easier to accept than deciding to scrap it as it means that it will (hopefully) have a new life after all. Trying to sell it is probably not worth the effort (unless it is of significant true value to others, not just to you) - I decided that finding it a new home was more important - especially for vintage or rare stuff. Regardless of what we may think, stuff is only worth what someone else will pay us for it on the day.

5 Think about what you plan to store/keep and then decide how best to store/access your stuff in the new workshop - as part of this consider which things will be wanted frequently or require easy access (heavy/awkward shaped perhaps?) and what things can be placed in less accessible areas, safely stored, but only wanted occasionally maybe. This time I chose to use commercial racking/shelving as supplied by Big Dug, Tufferman, Machine Mart etc. (previously I had mainly used donated 'scrap' shelving and racking, which prevented any consistent approach and tended towards things being randomly heaped up wherever they would fit). Think about the shelf loading (always get heavier duty than the bare minimum that calculations suggest would do) and bay sizes that will work best for your things (unlikely that you will want it all the same). In my view this is better than wall mounted shelving as you can move it around later if necessary and does not rely on wall fixing strength to support it - but do secure racking to the wall so it cannot fall over and mark safe design shelf loadings on each rack as a reminder not to overload it.

6 Create a scale floor plan of the new workshop, including marking where doorways, windows, electrical supplies are positioned and scale templates for all the significant items that you intend to fit in it (lathes, welders, anvils, storage racks, benches, machinery etc.). You can then spend several happy evenings shuffling the templates around on the floor plan in an attempt to establish the 'best-fit' for all these things in the space available, whilst still being able to get into the workshop and having clear work areas to do things in. I chose to do this with graph paper and cut-out paper templates but you may prefer to use CAD techniques if you are familiar with using CAD (which I am not). I have used this method ever since I had my first shed workshop and it is useful - definitely much easier than playing musical chairs with the real items later! Once you have a likely layout, take a photograph of it, then you can try altering it until you are sure of the final plan, taking photographs of each version, then print out the selected final arrangement and use it when you start installing into the new workshop. What you end up with is very unlikely to exactly match your plans but the plans will help get you a workable solution.

7 Having developed a concept for the shelving/racking, I decided that rather than continue with my previous system of using cheap and random sized DIY plastic storage bins, boxes, biscuit tins and other assorted containers collected over time, I would opt for the significantly more expensive euro-crate type boxes. I chose to use ones made from recycled plastic and got a lot, in a range of sizes. Advantages are that they are much stronger, stackable and available in many sizes - most of which can be selectively stacked in assorted combinations. These I label using white duck-tape and felt tip pen, so I (mostly) know what is in each one - label at least one side and one end, or

you will stack them and then discover another box obscures the label!

8 Get the boxes well before the move so that you can empty your existing workshop smaller items into them and label them. These can then be easily moved/stored and are quick to put onto the new racking/shelving. Re-arranging is also much easier if you later realise that you need easier access to something than first thought.

9 Another advantage of the boxes is that you can get one or more of the simple wheeled dolly platforms (bit of plywood with a castor wheel at each corner, various weight ratings and sizes available) to suit your larger euro-crates and create mobile stacks of crates that can be carefully rolled around in the workshop if shelf space is limited. This allows you to move them to a spare area depending upon which bit of the workshop you are using at any one time and get to the ones at the back easily too - just don't build skyscraper towers that could topple over onto unsuspecting visitors.

10 Before you move into the new workshop decide if it needs any work doing whilst empty e.g. floor painting, wall painting (I painted my block walls white, which made it feel much more cheerful on dark days in winter), electrical/lighting work, false ceiling, boarding out any loft space, adding insulation. Where possible do these before installing stuff, otherwise you will have to move stuff around to do the work in stages which is a pain.

11 Think about the security of the new workshop - do the doors and windows or any part of the building structure need improving (strengthening, better locks, hinges/hinge bolts, blinds or grills/bars inside windows for instance), again best done before filling the entire space with stuff if you can.

12 As far as your original question goes (who can help), I tried some local removal firms for quotes for the house and

workshop – only one bothered to follow up a visit with an actual quote and although we used them to move the house, we were not that impressed with them so did not use them for the workshop in the end. I was lucky in that there is a very good local engineering firm in my area, who I have used for a few things and who I tend to buy my steel stock from. They also have a heavy haulage depot and are used to industrial machinery moves, so I asked them and they were happy to quote. The quote was very reasonable and I ended up with two men, lorry and tele-handler on-site for two days and they shifted everything that I could not do myself - no bother at all! The only other experience that I have is of a couple of previous workshop moves many years ago over significant distances, which I did whilst employed and done through the relocation package offered at the time by my employer (with a somewhat smaller inventory, but including a vintage tractor and implements). These were both done by White & Co. and they were able to provide competent staff and a range of vehicles such as HIAB lorries and even a low-loader for the tractor and implements! I think they were quite expensive but they were good – I didn't try them this time as it seemed a bit over the top to use such a big firm just to move a mile (but they probably could have done it)! Probably the lesson here is that the bigger international/business removal firms are more likely to be able to do it, but at a price, or you need to find a smaller local firm with the right skill-set who are willing to take on something a bit unusual.

In the end it was all worth it and hopefully my new workshop will be much better organised(!), with more free space to work in once my new storage shed arrives. I wish Andrew good luck with his move and hope his new workshop is a success.

Regards,

Julian

Model Engineering Future

Dear Martin,

I refer to an excellent article in M.E.4752 (September 20th) titled *The Changing Face Of Model Engineering*. I agree with everything which Tom had to say but I would like to add what I feel is a very important point. Model engineering in a great many clubs seems to be heavily biased towards model locomotives. To a beginner, building a locomotive might well seem to be a daunting task. So to a youngster who seems to be interested in model engineering I would advise starting with something very simple, for example a Stuart Turner V10 or H10 steam engine. Or even simpler such as an oscillating engine. Seeing ones first model actually work can be a great encouragement towards considering something a bit more ambitious. A boiler is not needed as the above examples will run from a blown up car tyre inner tube. Initial costs for a lathe, a set of BA taps and dies, drills and a few hand tools would be difficult to find for some but a simple oscillator can be built on say a Cowells lathe.

Regards,

Roger Castle-Smith
(Milton Keynes)

Deionised Water

Dear Martin,

I refer to Mike Joseph's letter regarding deionised water (M.E.4751, September 6th).

In the letter he refers to suitable equipment being purchased from RO-MAN and this is so, but the RO stands for Reverse Osmosis and you do not need special equipment in order to obtain this.

RO water can be purchased from aquarium shops which sell marine i.e. salt-water fish. I have two outlets near where I live and currently pay £3.50 for 25 Litres. You can usually obtain a container for a one-off payment.

I have no experience of using this in a steam engine boiler but if you want to give it a try

might I suggest this is the way to go.

Regards,

Stuart Merton

GWR Pannier Tank

Dear Martin,

Part one of Gerald Martin's GWR Pannier Tank series (M.E.4752, September 20th) is evocative for me, with its photograph of work on Weymouth Quay. (For local sensitivities, that side of the Harbour is really Melcombe Regis - Weymouth is on the other side - 'Regis' after King George III's visits - one of us, as His Majesty's hobbies included ornamental turning.)

Spot the very unusual among No. 1370's 'other sticky-out bits and rivets', and not shown on the drawing!

A bit of background. At the time of the photograph Weymouth & Melcombe Regis Harbour handled much Channel Islands traffic, notably horticultural produce from there, and the scene is alongside the cargo stage equipped with I think four, Stoddard & Pitt travelling cranes. Those also handled cars, in the years before Ro-Ro ships.

Passenger trains from London (Waterloo) served the ferry terminal beyond this point. They did not pass through Weymouth Station because that is the wrong place, so the branch, about a mile long, diverged from the main line north of it. For most of the years of the service the main-line locomotive was detached and 1370 or a sister would take the train to the harbour. A Diesel shunting locomotive replaced steam in 1968, then the completion of main-line electrification and the introduction of Ro-Ro ferries ended the 'Boat Trains' and their unique experience for passengers of their train negotiating urban streets. The town has now lost all cross-Channel ferry services.

The line became *un-used*, never formally *dis-used* apart from a few enthusiasts' specials, Diesel-hauled, and an experiment with a Parry 'People

Mover' tram. Network Rail let the local Council finally remove all except a few yards kept as a historical relic, late in 2022. It uses the head remnant to stable PW engineering trains but, oddly, has forgotten the signal still lit red, forlornly facing non-existent up trains on the now-removed harbour branch!

The ex-GWR panniers were also the main propulsion for the Weymouth - Portland branch-line until the last year or so before final closure in 1965, when assorted other classes worked its dwindling goods traffic. As Weymouth is the starting-point for lines to London (ex-SR) and Bristol (ex-GWR) there was a sizeable steam depot near the station.

Still not spotted the almost unique 'sticky-up bit'? Look at the rear of the footplate! As the trains worked through a town street, including residences, at a brisk walking speed, that bell was preferred to the far louder whistle for warning pedestrians.

To end on a very different note, I have read *De Re Metallica* (in English!) and seem to recall it includes, perhaps surprisingly for its era, Health & Safety. The review does not mention that.

Yours faithfully,

Nigel Graham
(Weymouth)

Dear Martin,

I would like to congratulate you on the inclusion in your magazine of the construction articles by Gerald Martyn on his 3½ inch gauge GWR tank engine. There have been a number of large, very detailed locomotives as well as a few that I would describe as very specialist interest models so I believe a modest sized locomotive of a more general interest model will be well received. Also Mr Martyn gives several very good reasons for the inclusion of such a model.

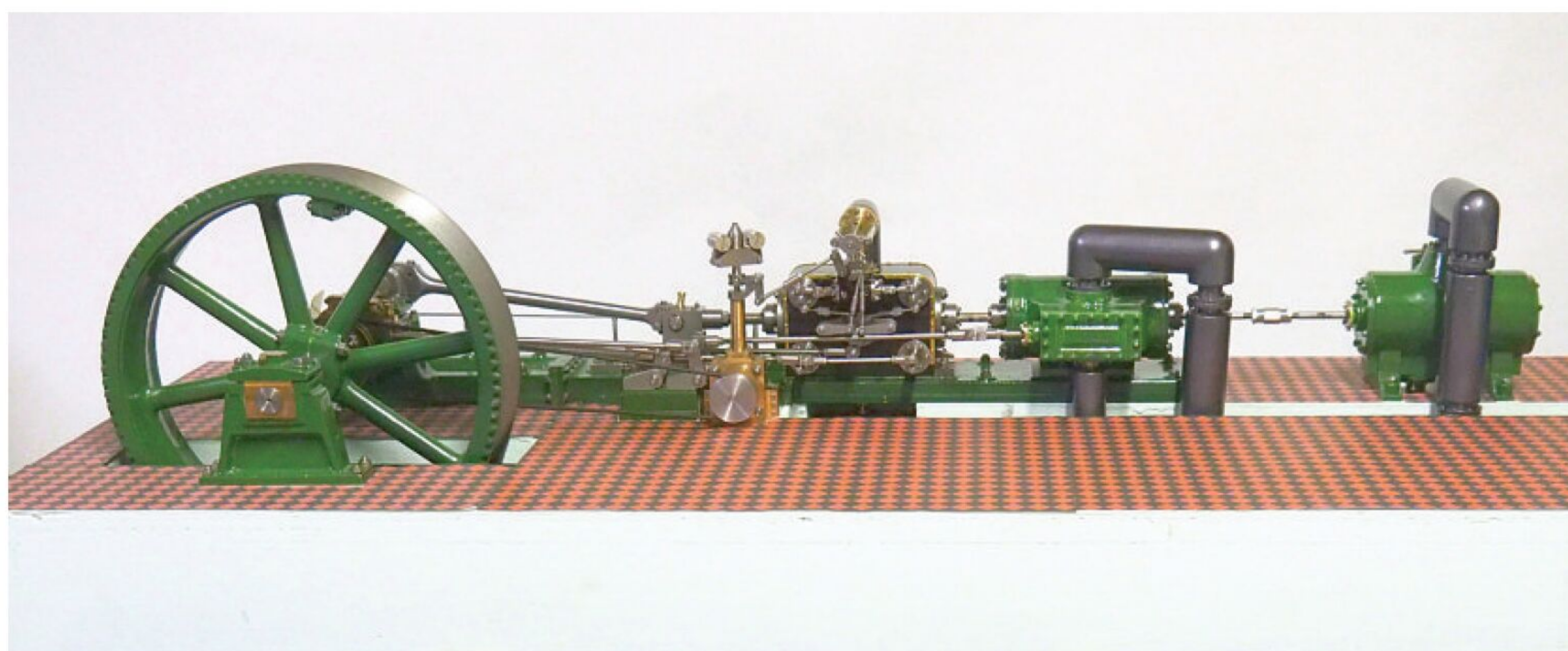
I look forward to seeing the series progress.

Best wishes,

Donald Spence
(Shirley, West Midlands)

A Tandem Compound Mill Engine

PART 6



David Thomas builds Arnold Throp's model of a Corliss mill engine.



Continued from p.591
M.E.4754 October 18

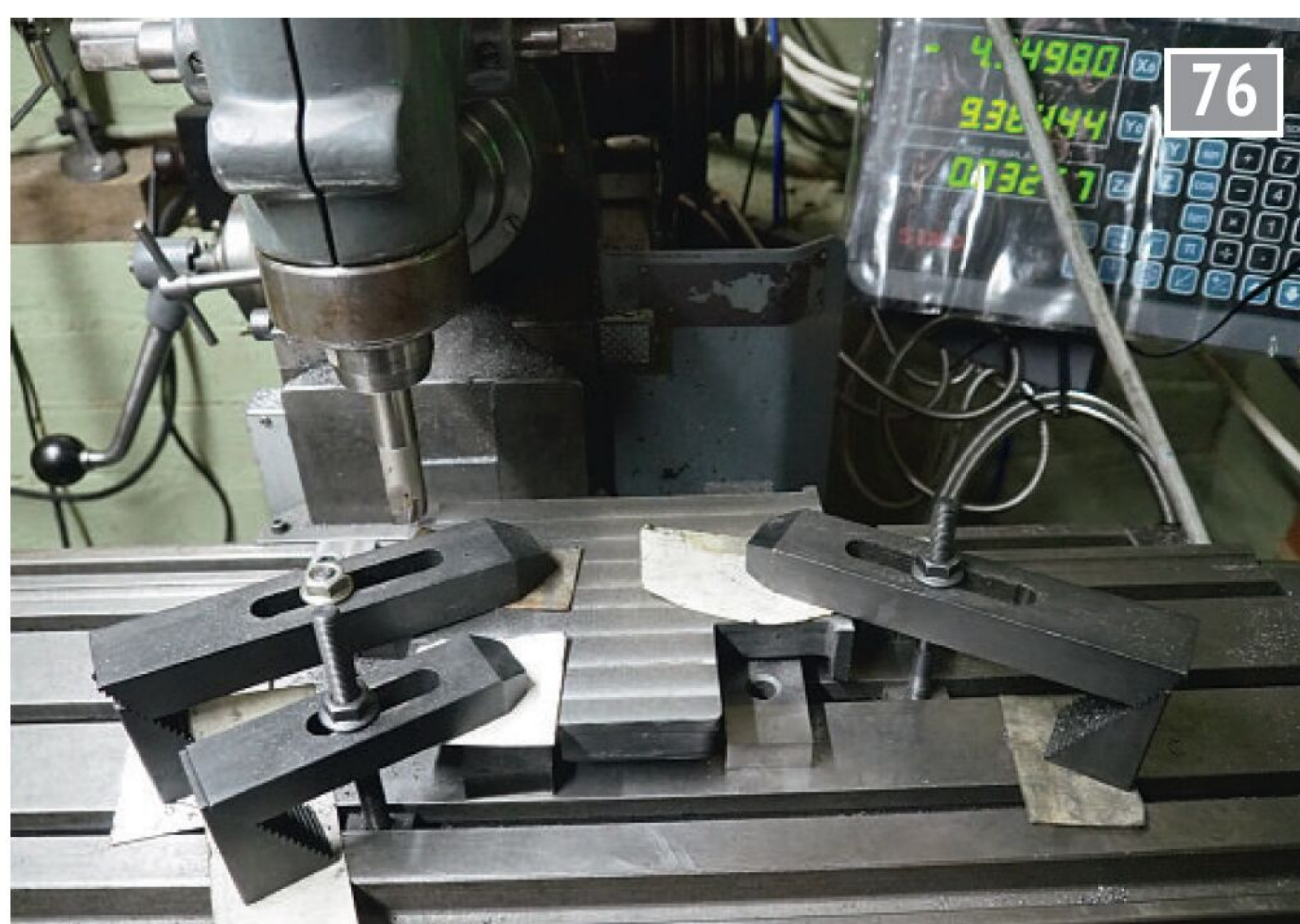
The slide and cylinder soleplate castings, as with most of the others, had only small machining allowances and needed careful setting up. Fortunately, the tops of the foundation bolt bosses were close to being in a horizontal plane and only needed a small amount of work with a file to provide a stable underside for clamping to machine the underside (**photo 76**). The drawing of the slide is in two parts; **fig 14**

gives the outer dimensions and **fig 15** shows the hole details and positions. **Photograph 77** shows the first step in bringing the upper surfaces to height. These surfaces were then used for clamping whilst the crankshaft end (the 'X' datum surface) and the lower rear edge ('Y' datum) were cleaned up (**photo 78**). With the datum surfaces established these were used to align the previously machined engine bedplate and make the top and

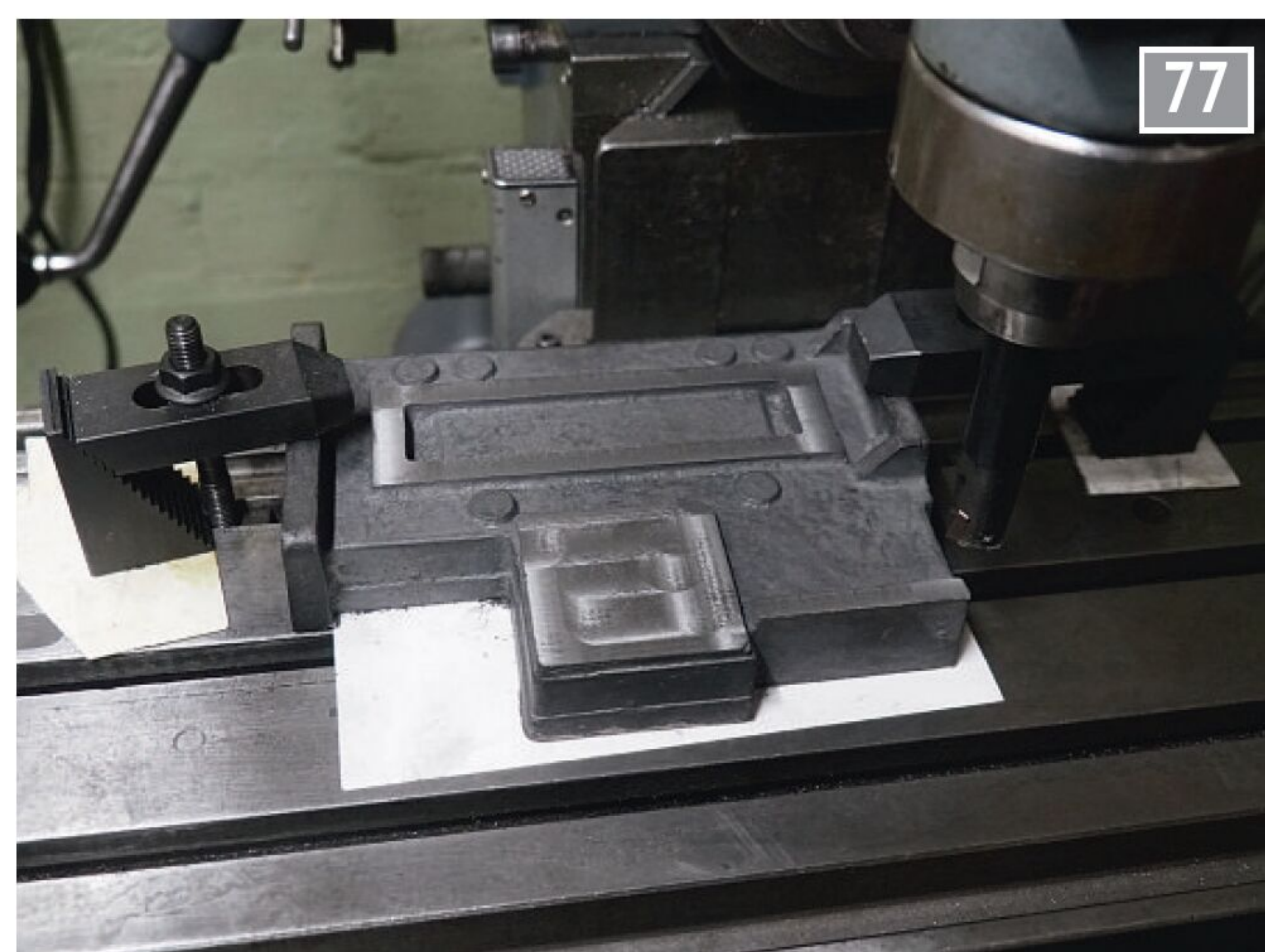
sides of the mating flanges match (**photo 79**). The slide surface and oil retaining wells (**photo 80**) and the various holes (**photo 81**) were then machined and drilled.

Figure 16 has the drawings for the crosshead and slipper and the nuts for the piston rod and crosshead pin are also detailed there. The AF dimensions shown are arbitrary and a builder can use whatever looks right and suits them - not everyone will have a 1BA spanner. The four screws that attach the base plate to the slipper are shown as 6BA; a useful alternative is M2.5 and if you use this the countersink angle should be 90 degrees.

For the crosshead itself start by squaring up a block to the outside sizes then turn one end down to for the circular boss, drill and tap for the thread to secure the piston rod. The plain side of the hole for the crosshead pin should be a close fit and **photo 82** shows a D-bit in use for this. The slot for the connecting rod little



The top of the slide casting only needed a little filing to provide for stable clamping. Milling the underside of the slide casting needed a lot of clamp juggling.

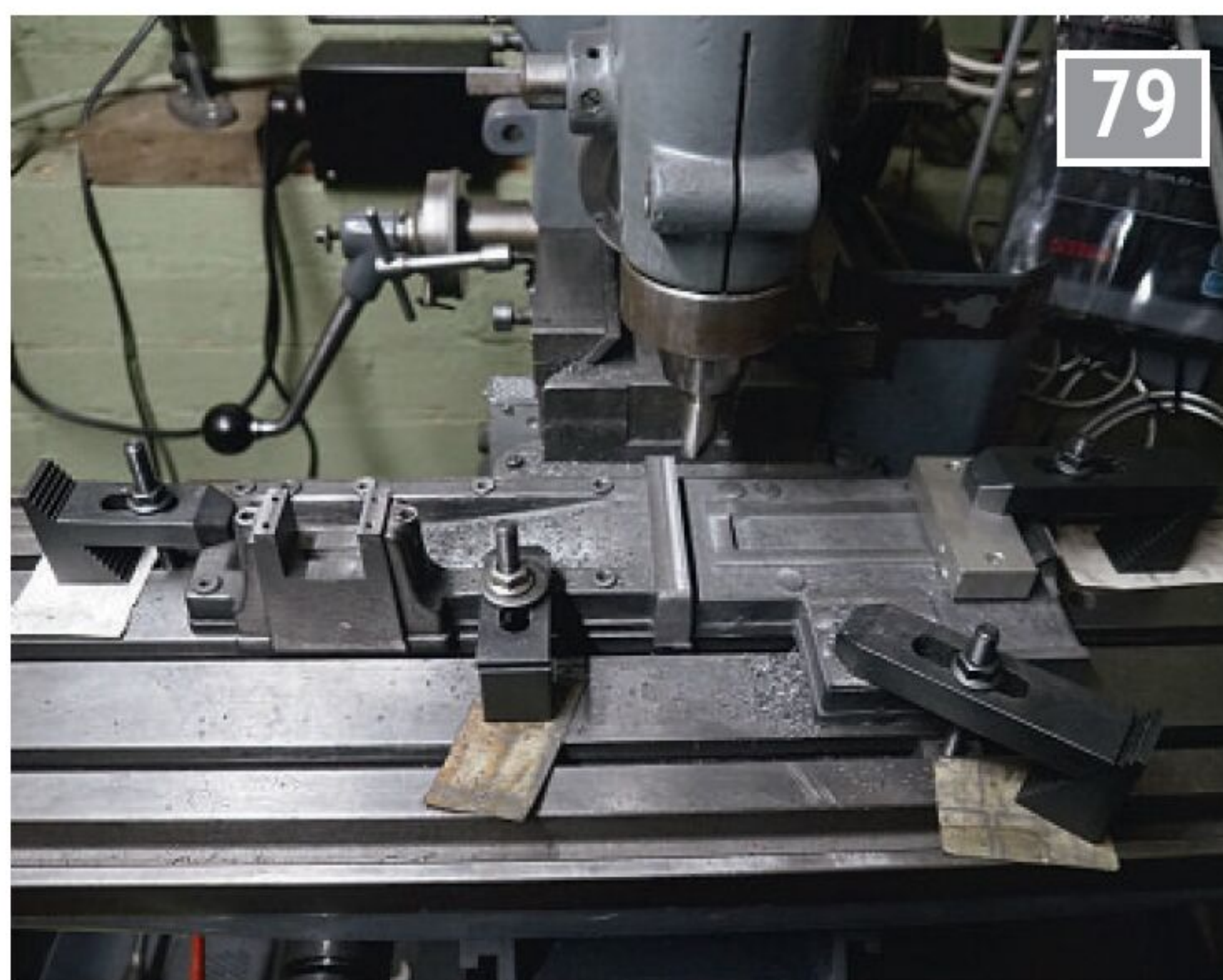


With the underside cleaned up the top surfaces can be brought to dimension ...

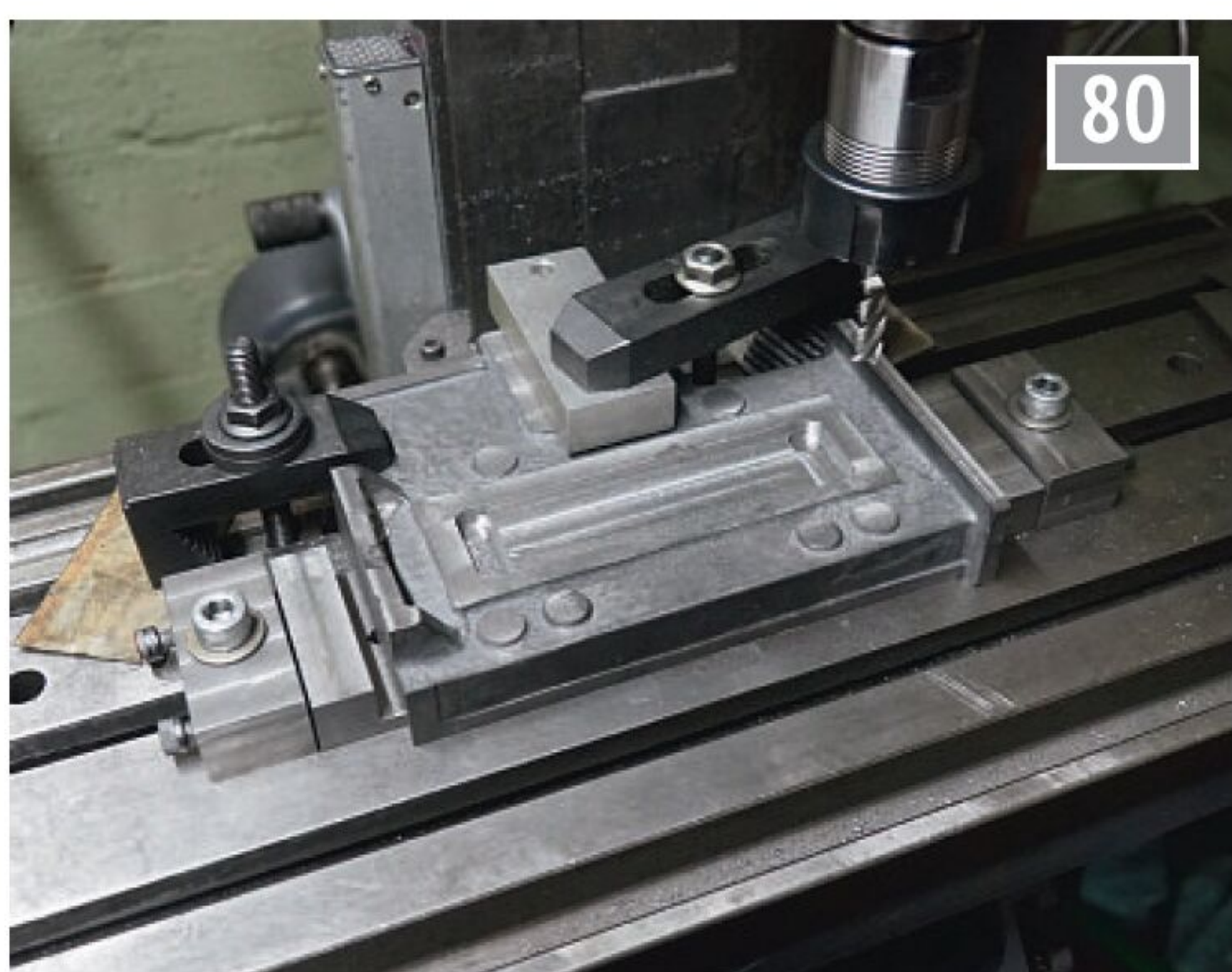




... and the crankshaft end and outside edge (not visible) of the casting milled flat. These surfaces are the X and Y dimension datums.



Slide and cylinder soleplate clamped together to bring the end flanges to the same finished size.



Here the machined outside edge is visible while the slide surface and oil wells are machined to size.



The casting was aligned with the mill axes, the datum surfaces located and the DRO axes set to zero at these. Holes for the foundation bolts and for the handrail stanchions were drilled by coordinates.



Counter boring the crosshead for the gudgeon pin.



Starting the slot in the crosshead for the connecting rod ...



... which is then turned through 90 degrees to square off the end.



For the sake of appearance only the slipper has angled ends. Here the part is set up in a sine vice with the end coated with marker pen to show where the cut has reached.

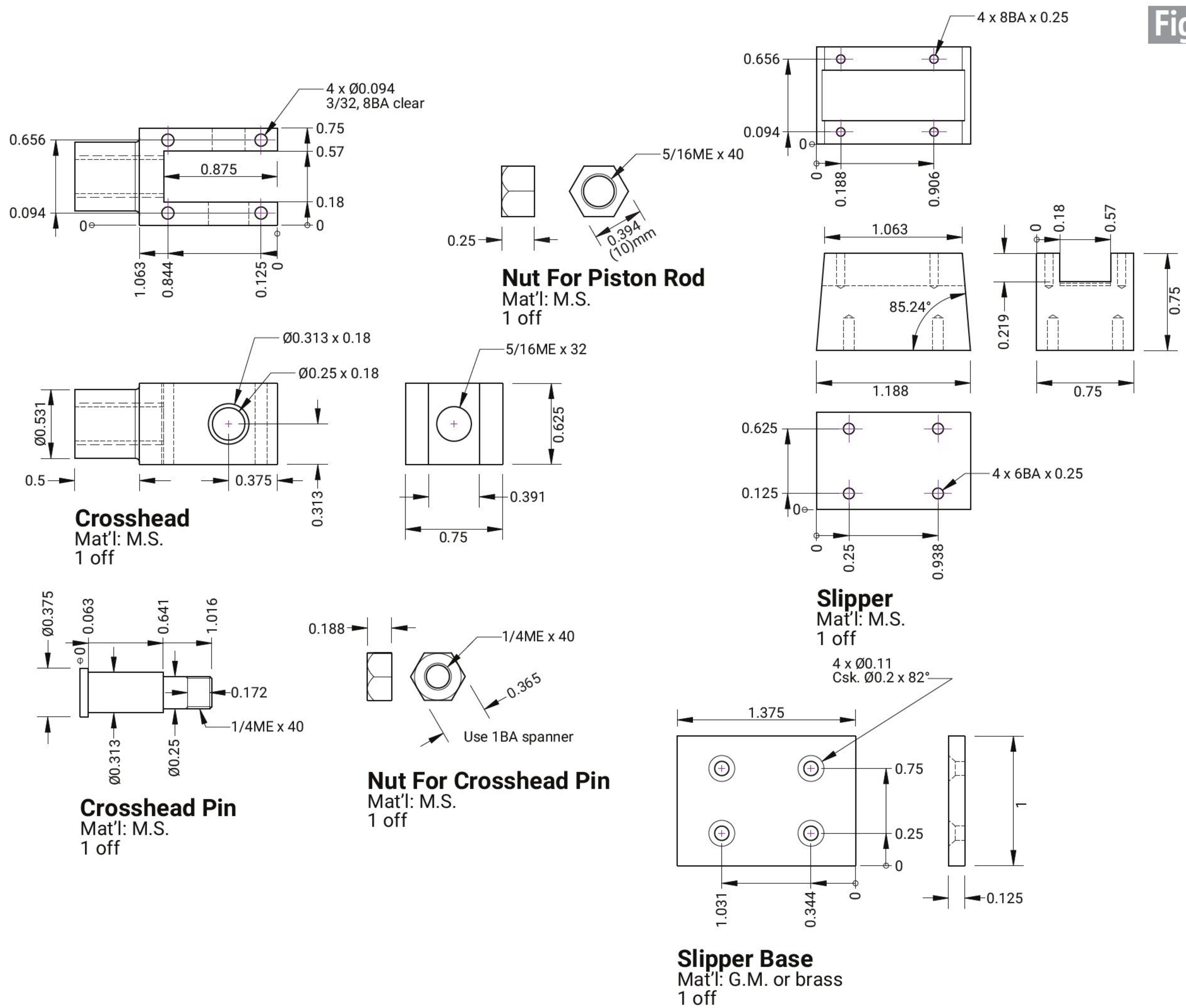
end needs to have square inside corners for clearance and **photos 83 and 84** show this being done in two stages. In photo 83 the end mill is narrower than the finished slot and is moved across to take a fine finishing cut on each side. This may have been unnecessary and a single set of cuts as in photo 84 is probably all that is needed.

The slipper body also starts out as a rectangular block with a slot milled along a long edge to give clearance for the little end. The angled ends are decorative and could be marked out by hand for milling out but a sine vice makes getting the dimensions to drawing simple. In **photo 85** the end of the block has been coated with black felt tip to show progress. In my case the slipper base came out of a piece of scrap bronze but, considering the limited running hours likely for the model, brass plate should last well enough. In **photo 86** the marking out is for a sanity check; the holes were located using an edge finder and the DRO. Taking this extra step is a version of 'measure twice, cut once' and it has saved me from grief often enough to be my chosen method. The finished slipper assembly is shown in **photos 87 and 88**.

A pair of surfaces that won't be needed for a while are being machined in **photo 89**. These will locate the governor when it is finally made, and I think these could have been done when the rest of the slide surfaces were machined. However, this is the sequence I used so that is how I'm reporting it - it's too long ago now to be sure but I probably just forgot to mill them at the appropriate time! In **photo 90** the slide casting shows some light brown coating which indicates how long it was between some stages of the project. The other parts shown in photo 90 are the keeper bars and oil splashers which are just bits of rectangular bar.

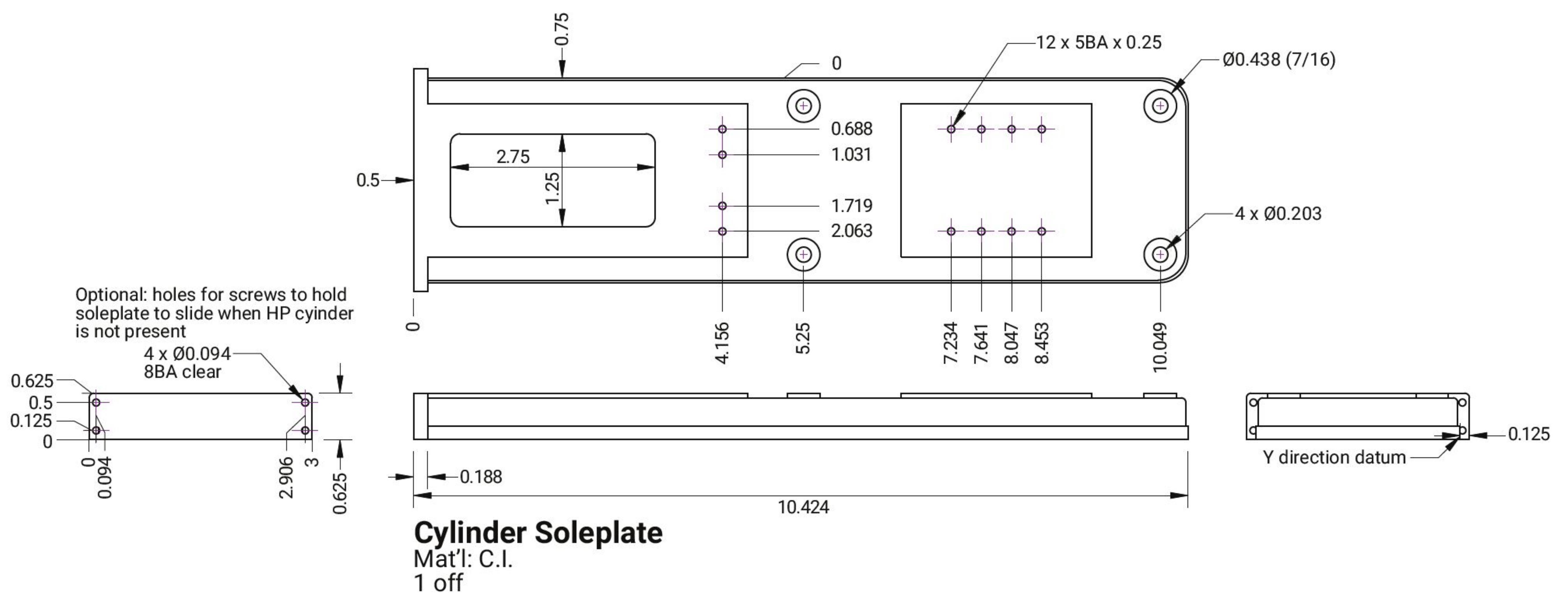
Figure 17 is the detail drawing for the cylinder soleplate which supports

Fig 16

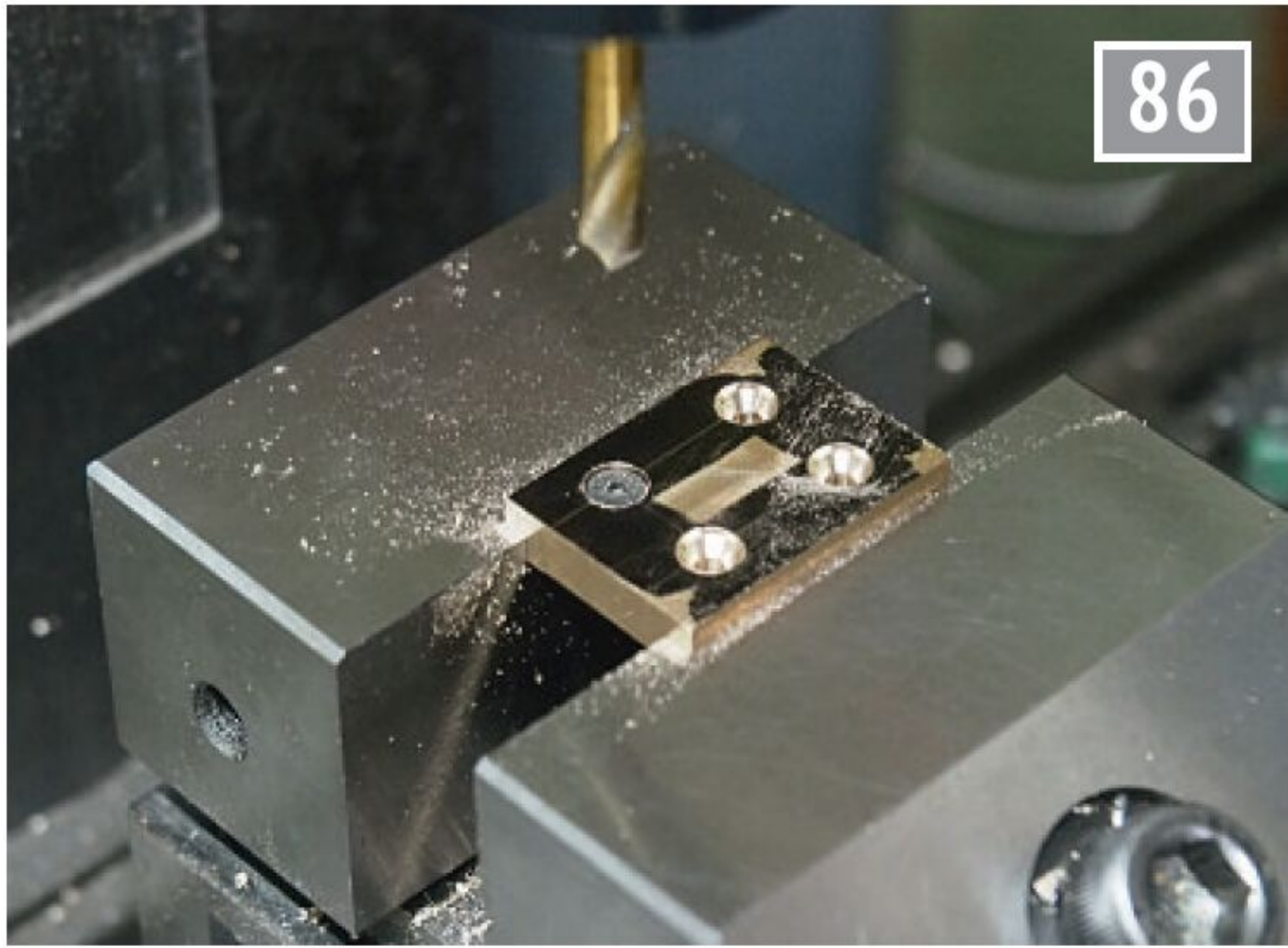


Crosshead and slipper drawing.

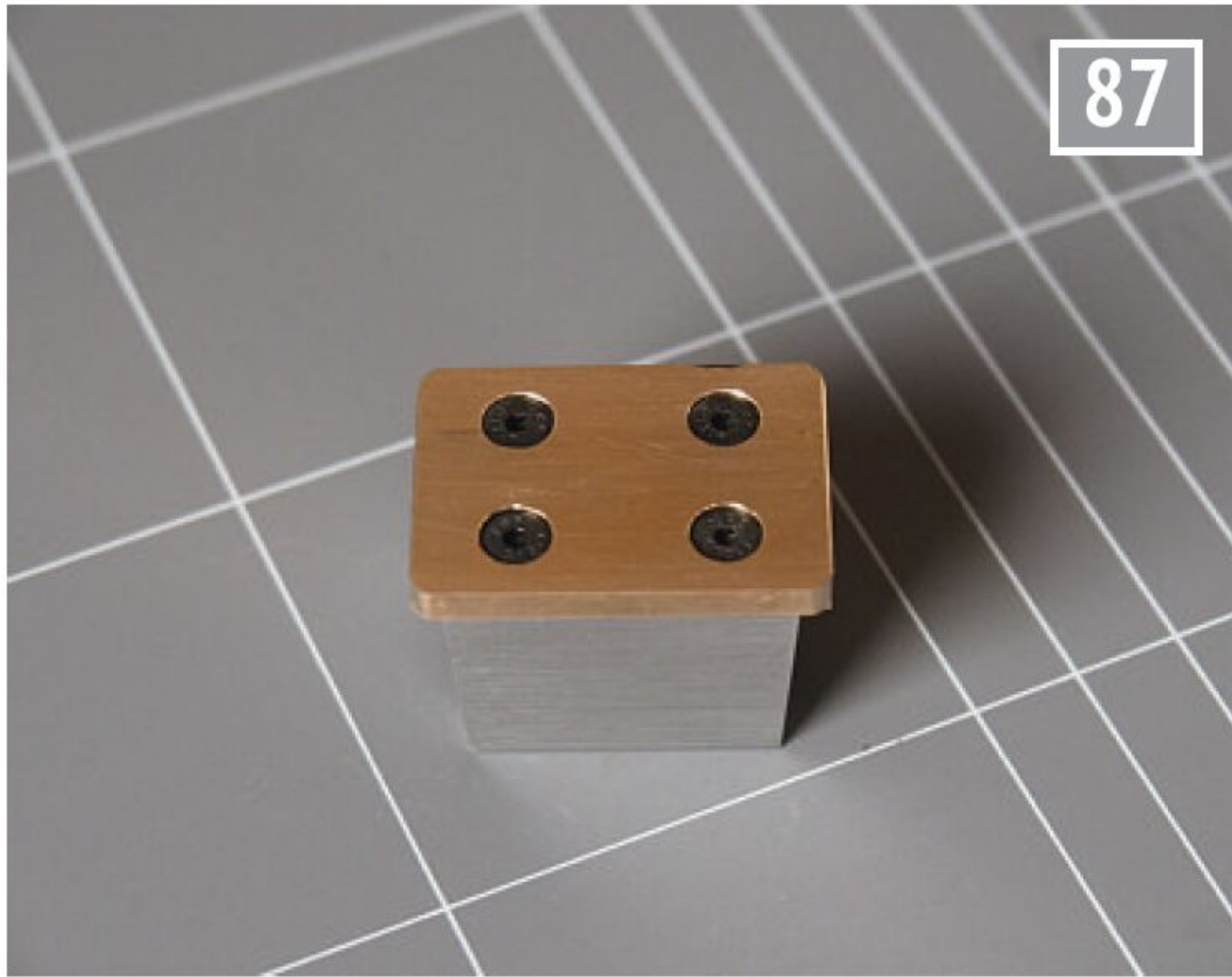
Fig 17



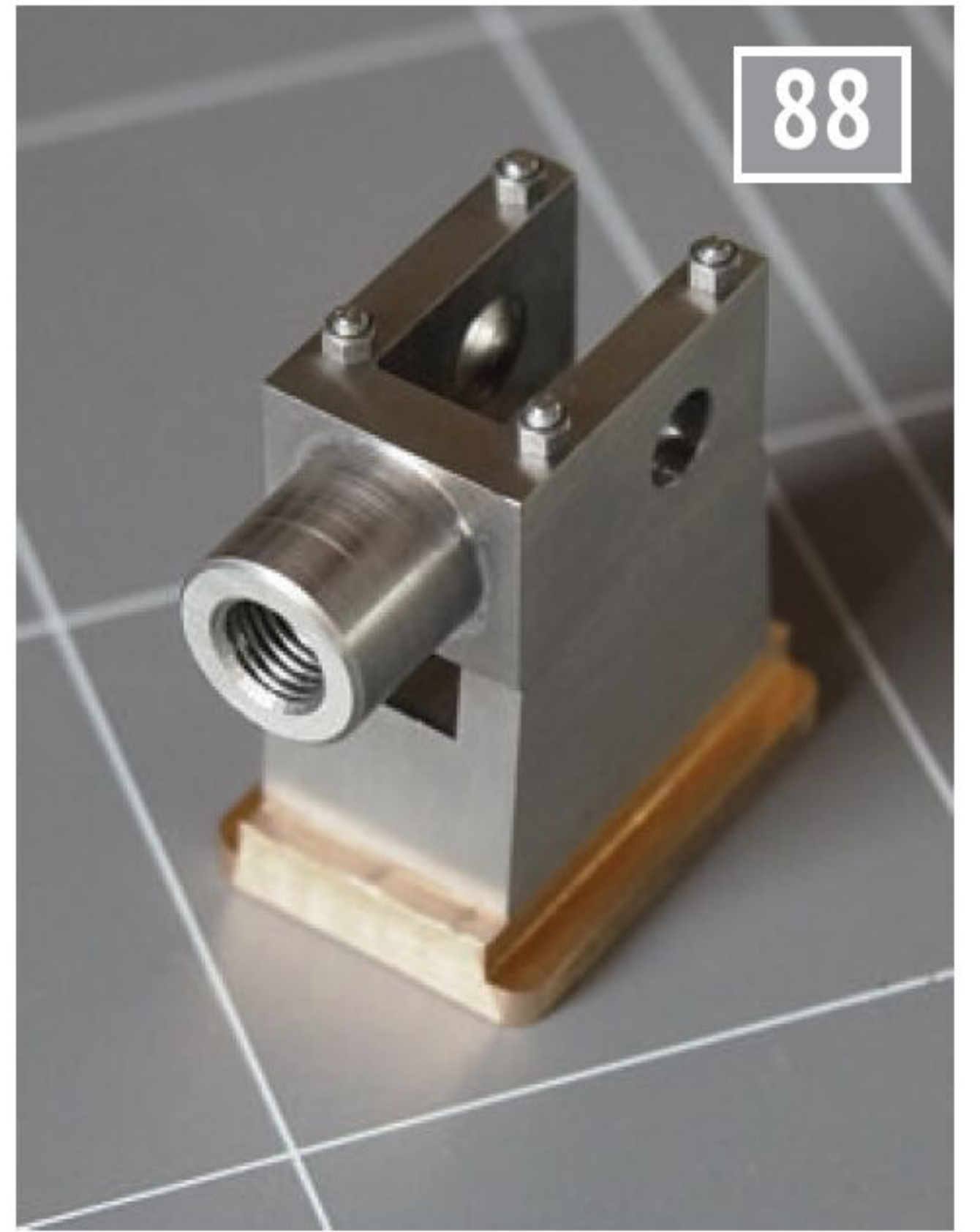
Cylinder soleplate drawing.



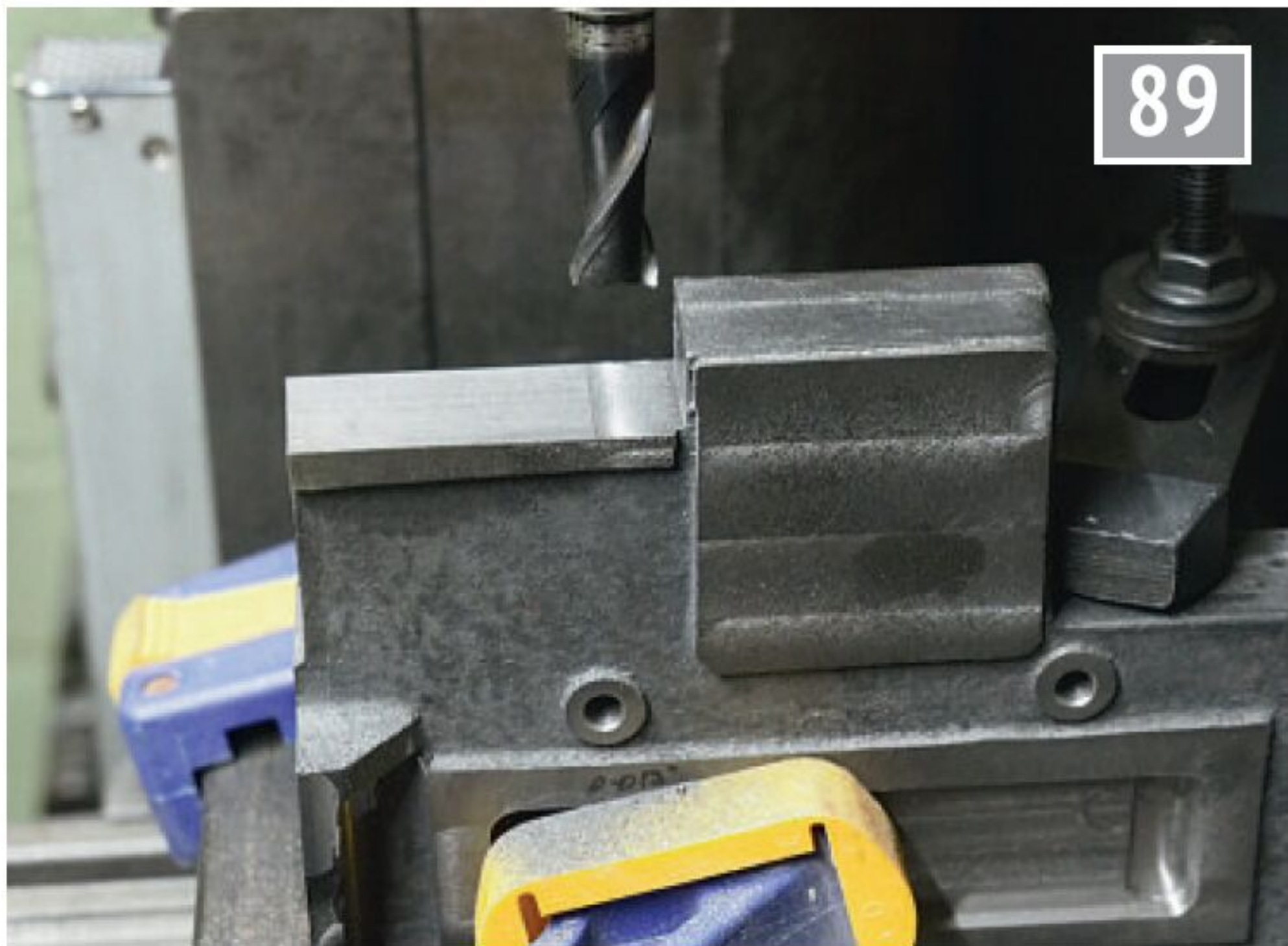
86
The slipper base is milled from bronze stock and the four holes countersunk to suit the available screws - 90 degrees for M2.5, 82 for 8BA.



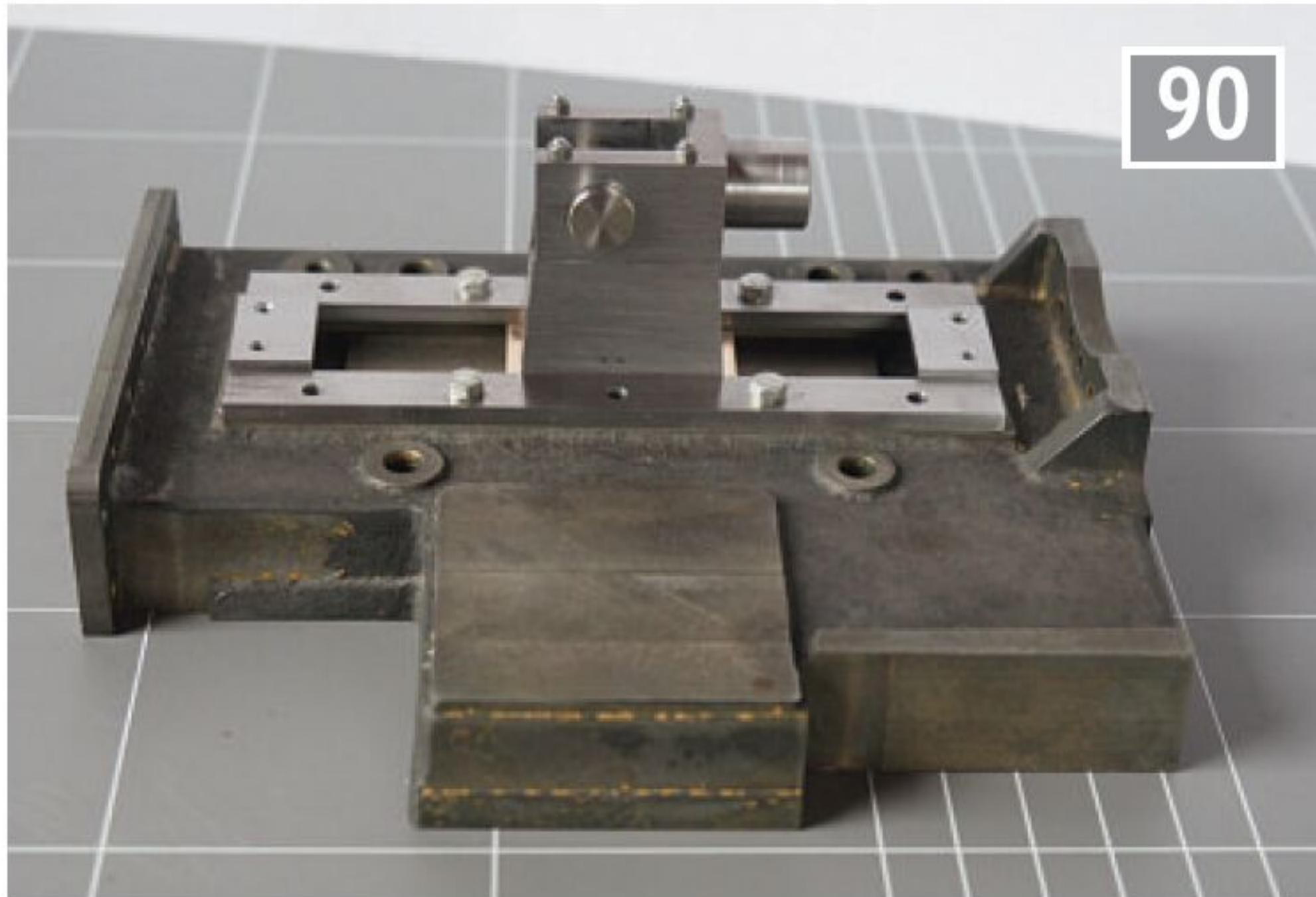
87
Setting out from datum surfaces and using a DRO gives first time results.



88
The assembled slipper and crosshead.



89
Comes the time to fit up the slide and slipper and you notice that you haven't machined the seating for the governor!



90
Trial fit-up of the slide and slipper with the keeper bars and splashers. At the right-hand end you can see the curved cut-out to clear the HP cylinder flange has been filed out by hand.



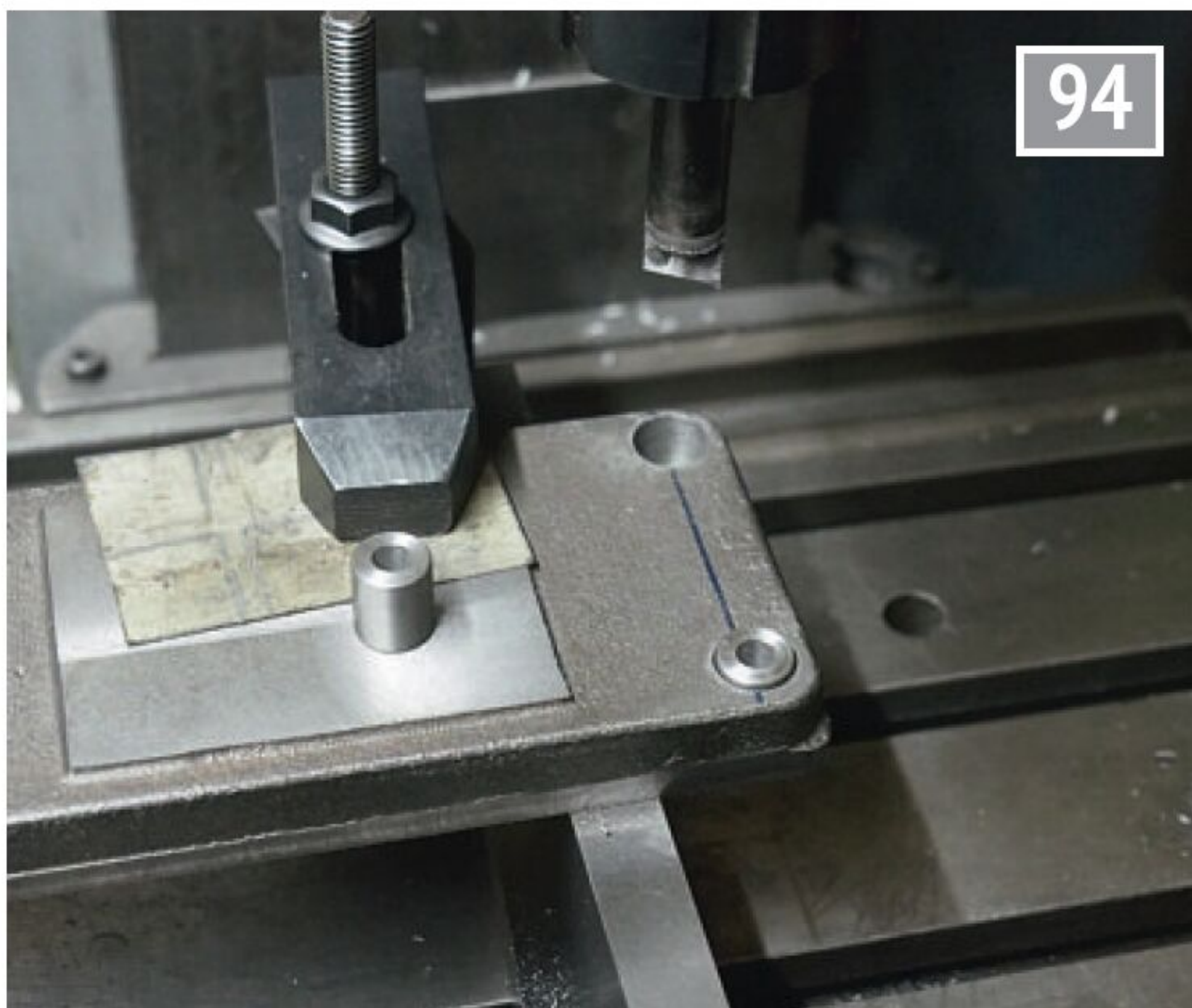
91
As with the slide the top projecting surfaces of the soleplate were filed to give stable clamping then the underside cleaned up. This required a lot of clamp juggling. Making a set of those low-profile clamps locating the corners of the casting is a very good idea.



92
With the soleplate turned over the cylinder mounting pads are finished to height.



93
Two of the bosses for foundation stud nuts were missing from the casting. Holes were drilled in appropriate places and ...



94
... mild steel parts were epoxied in.

and locates both HP and LP cylinders. As with the slide, the highest surfaces on the iron casting were close enough to smooth and level to need only a bit of smoothing with a file to support the casting upside down on the mill in order to clean up the underside (**photo 91**). A lot of clamp juggling was required, and the low-profile clamps were, again, particularly useful (**ref 9**).

The same clamping set-up was used with the part turned right way up to finish the two cylinder mounting pads and the bosses for the holding down studs to be brought to height (**photo 92**). The original drawings showed two more holding down stud bosses at the outer end of the casting, but these were missing from my casting. These were fabricated and glued in with JB Weld (**photos 93 and 94**). Just why I made the pads so much longer than necessary I cannot remember - a ¼ inch would be plenty.

●To be continued.

REFERENCES

Ref 9 Hinkley, John, *Low Profile Mill Clamps*, Model Engineer's Workshop, June 2017 #255, pp 20-22.

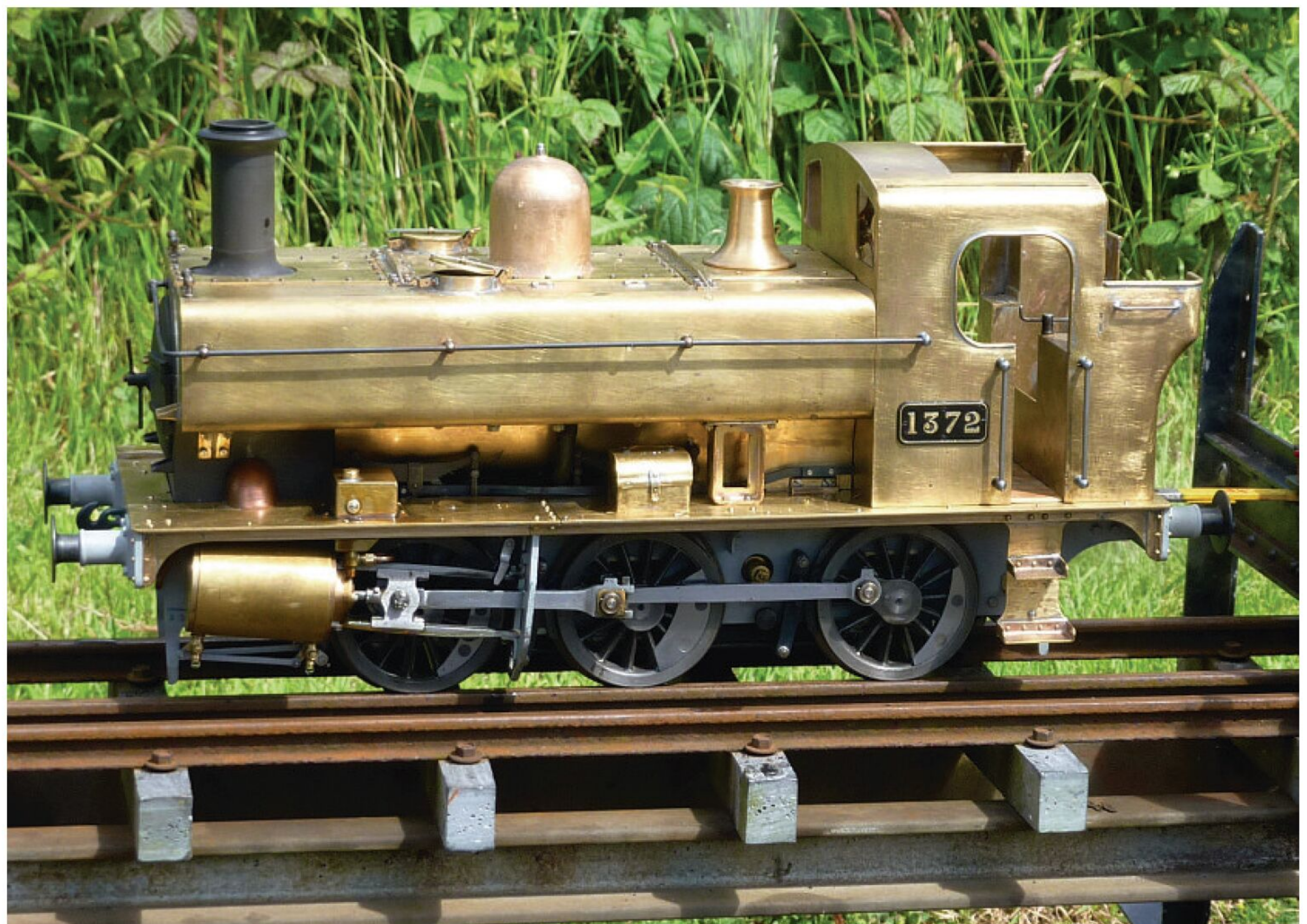
A GWR Pannier Tank in 3½ Inch Gauge

PART 4 – STRETCHERS AND BUFFER BEAMS

Gerald Martyn decides to build a locomotive that he can lift.



Continued from p.562
M.E.4754 October 18

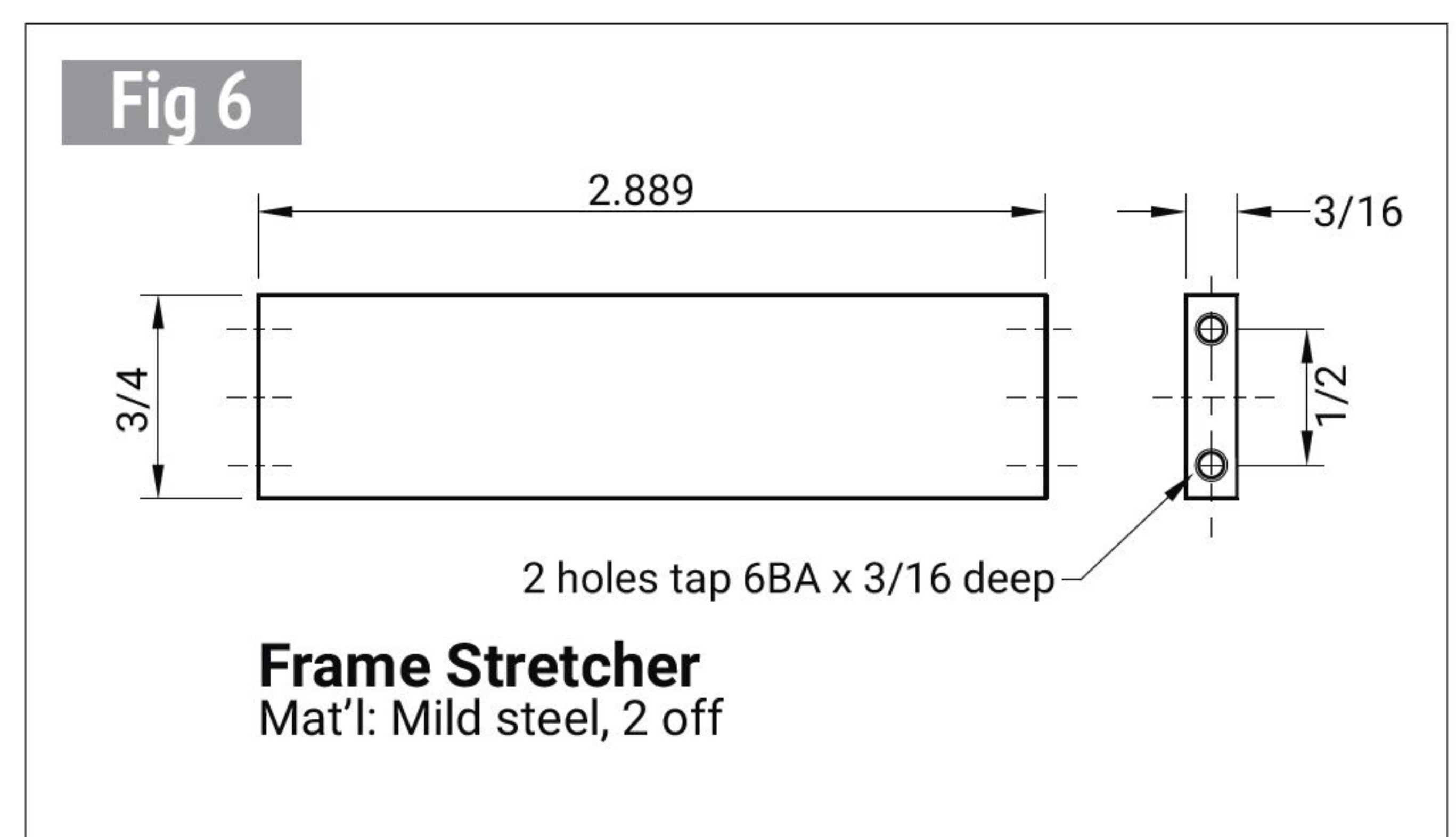


The two stretchers are in their near correct position but are much simplified, being just bits of 3/4 x 3/16 inch bar (**fig 6**). Note the 2.889 inch dimension, being the width between the frame plates. This slightly odd dimension is to account for using 3mm steel for the frame plates rather than 1/8 inch as in the old days and puts the outer faces the customary width apart for a 3½ inch gauge model. It's odd but not as frightening as it looks. If it can be measured then we can generally make it.

First square up the ends of a length of bar. This is easy with a milling machine or if the vertical slide is set-up on the lathe. Just pop the bar in

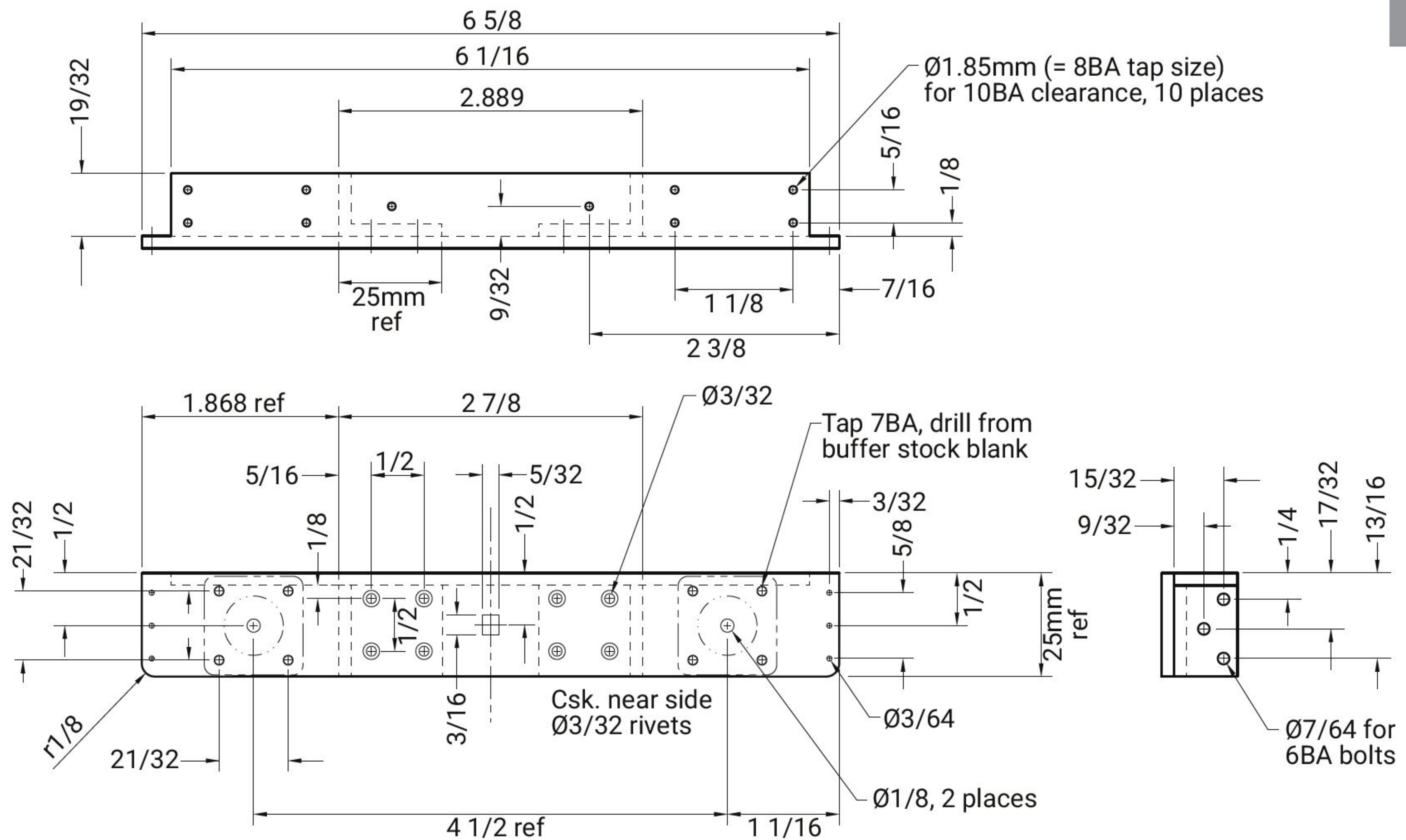
the milling vice and skim the ends flat. Mark out the 2.889 inch dimension from each squared end, or otherwise use the nearest next longer mark on a rule. Hacksaw off and pop

each piece into the milling vice in turn to simply skim down to length, using a (digital?) caliper to check progress. It's no great problem to get accurate to a 'thou' or so this way, though



Stretchers.

Fig 7

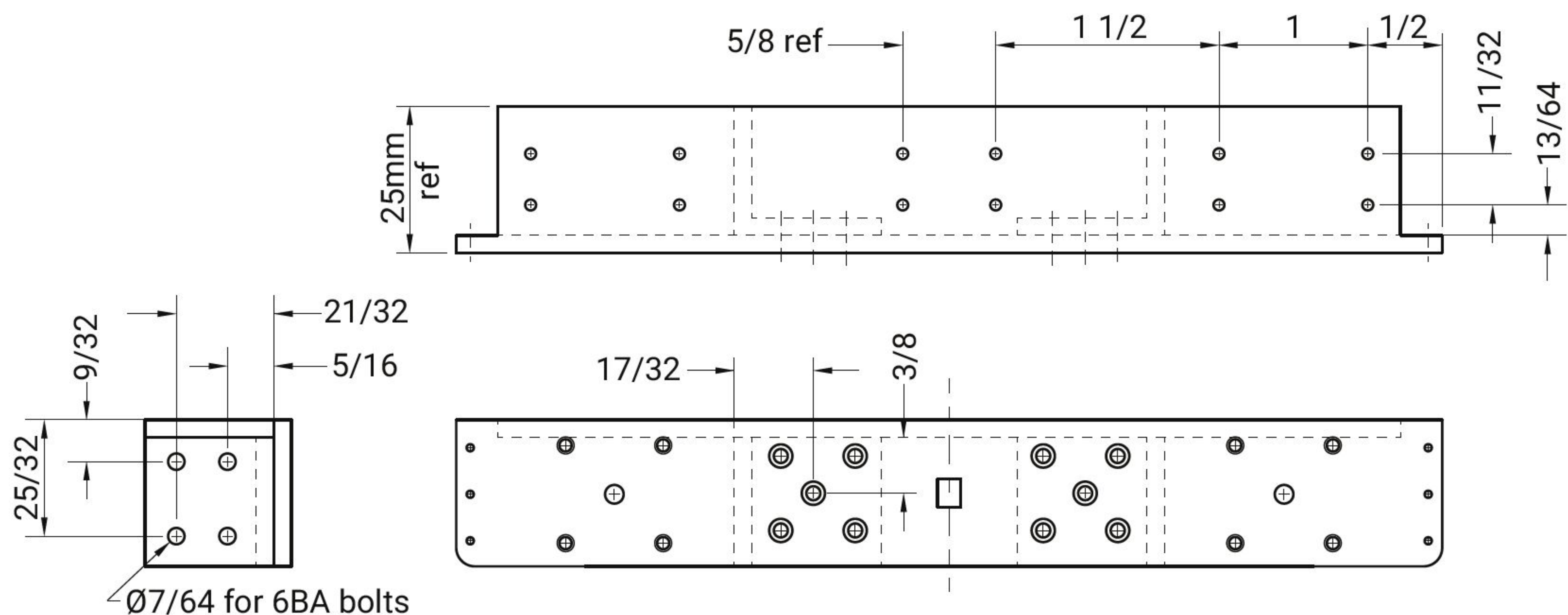


Front Buffer Beam

Make from 25 x 25 x 3mm mild steel angle or use Rob Roy buffer beam materials

Front buffer beam assembly.

Fig 8



Rear Buffer Beam

Differences to front

Rear buffer beam assembly.

there's no need to be quite so precise. Mark, drill and tap the 6BA holes in the ends. Done. In about an hour. The alternative method is to use files and a square instead of milling, which is how my first couple of engines were done, but it takes a while longer.

The buffer beams, (**figs 7 and 8**), are constructed similarly to *Rob Roy*. I've eliminated

the slots in the upper leg of the angle, where the frames fitted in, replacing them with laser-cut rebates in the frame plates. These slots were quite hard to cut neatly, and served little purpose in the rear beam. The beams are easy to make and I've dimensioned to make a best fit with the mating parts, to minimise any effects of tolerances in materials. I

had expected the angles to be supplied as 25 x 25 x 3mm stock, but the ones I had were nearer to the original imperial 1 inch size. Skinny imperial rather than plump metric I think. If you get this too then some slight adjustment to the rebate in the frames will be needed; a simple job with a file. *Rob Roy* uses 3/32 inch rivets to attach the angles to the

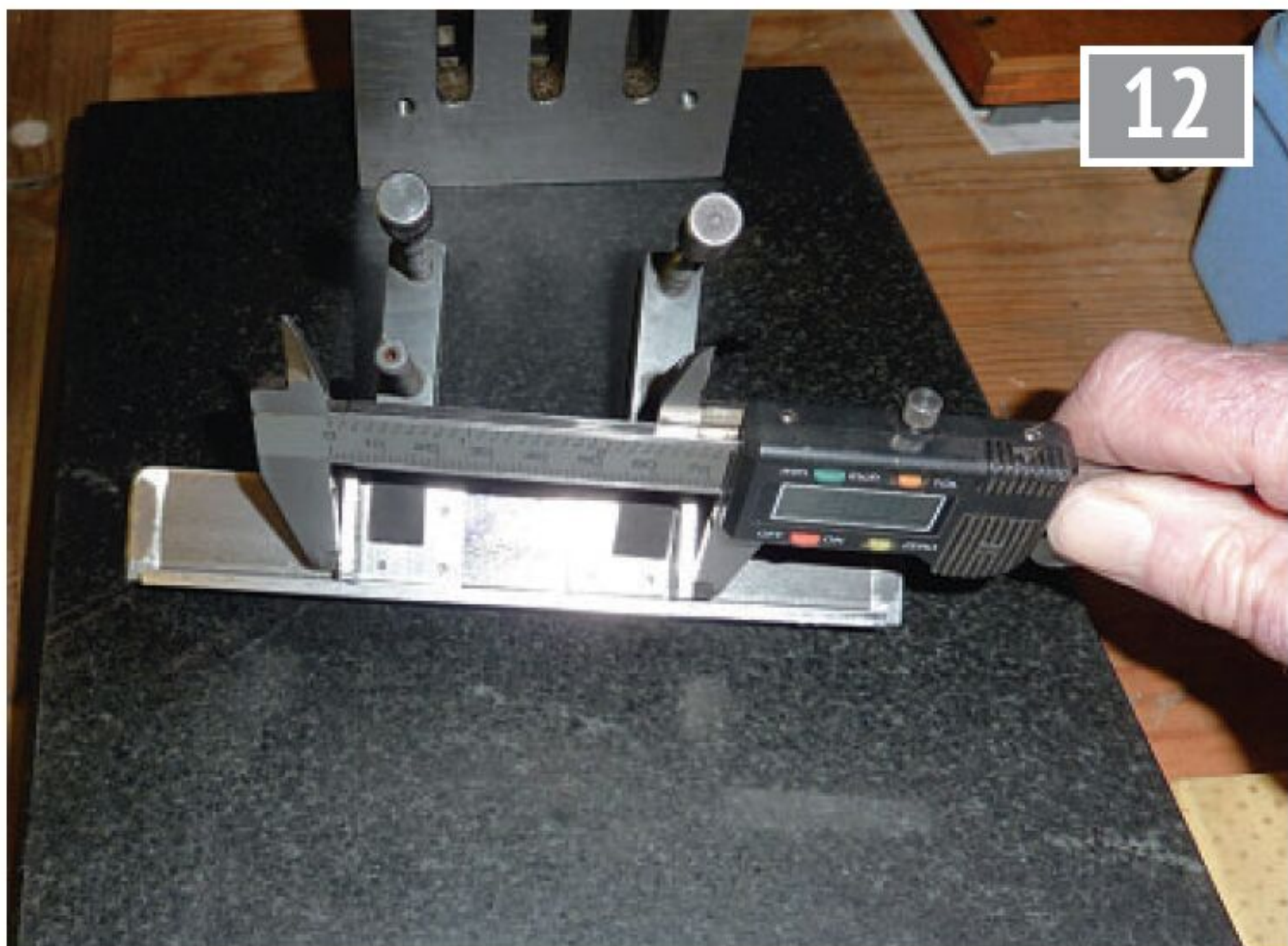
beams and I have continued with this. Some may think they are a bit weak but I've not heard any tales of *Rob Roys* making bids for freedom, so they must be okay. Illogically, Martin Evans shows six rivets per angle in the front beam and four in the rear where all the load comes on. I've revised this to four at the front and five at the rear.



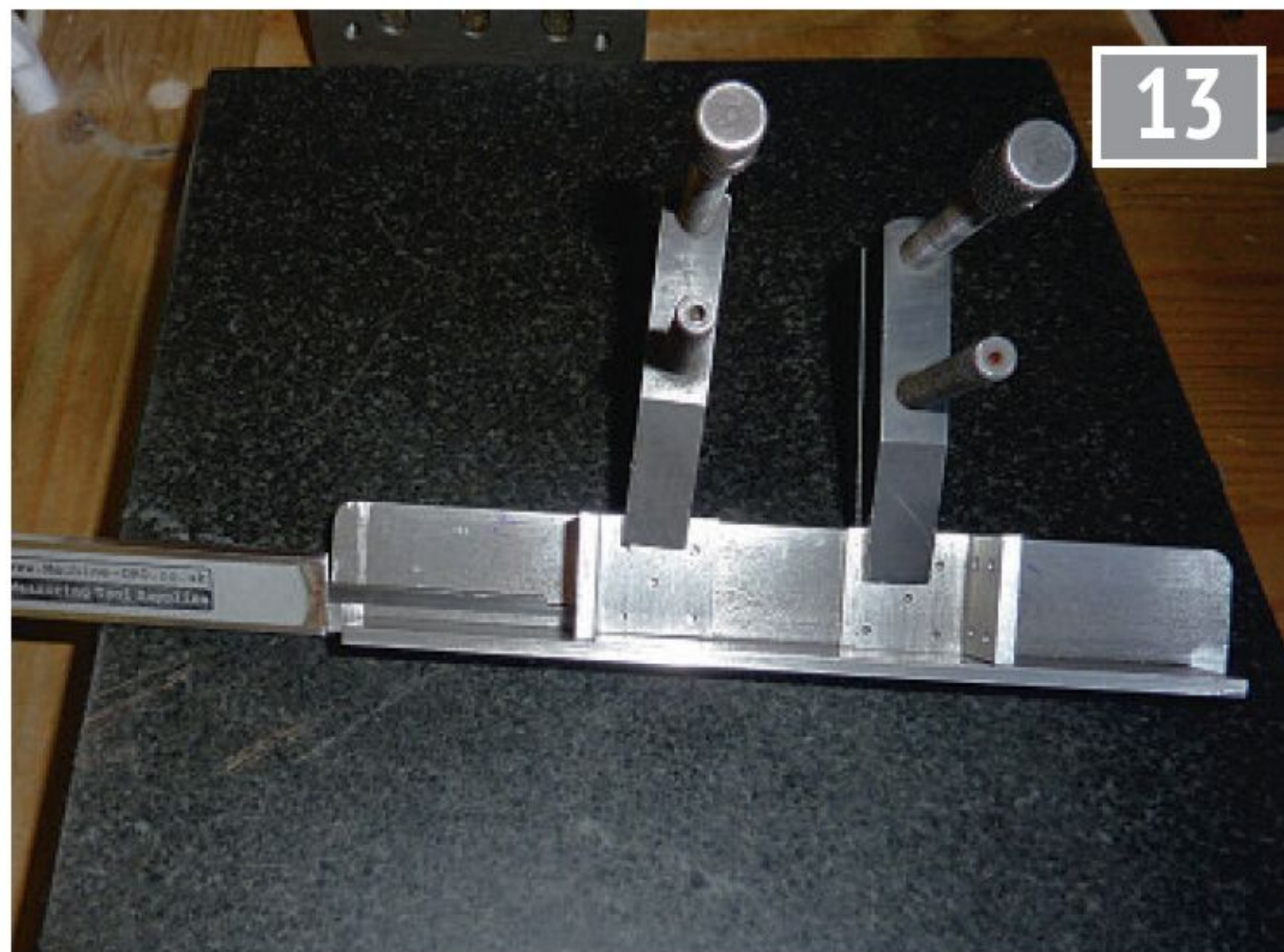
Hacksawing the buffer beam rebate.



Filing to finish the rebate.



Measuring the width across the buffer beam angles.



Measuring the buffer beam ends.



Rivets done - angles dimension near enough right.

Start by checking the angle is a 'square' 90 degrees and correcting as necessary with a file or in the mill. Now is the time to say I quite enjoy a bit of benchwork and, having milled the beams to length, in a similar manner to the stretchers, I cut the rebates at each end with a hacksaw and file (**photos 10 and 11**). Note the vice soft jaws, which are essential to protect the work. These are just bits of aluminium angle from one of those DiY chain stores. Cheap and simple and if the remainder of the length hasn't been used for something else

(which happens a lot) then easy to renew. Cut the frame attachment angles to size and mark-out and drill all the holes before attaching to the beams. Sit them on the beam when necessary to mark the holes in the right places when the dimension requires. The dimensions as shown should ensure alignment with the top and front edges of the frame. A small chamfer is required to make them sit neatly into the corner of beam angle, then put them in more or less the right place and clamp lightly with toolmaker's clamps. Measure

the spacing (**photo 12**) and beam overhang (**photo 13**), and move them to get the 2.889 inch dimension and equal length each end of the beam. Check they are still snug in the corner of the beam angle and tighten the clamps, tight. Drill through for the rivets where accessible, countersinking the outer face. Parts can move when being rivetted so keep the clamps on until all accessible holes are drilled and rivetted. Only then remove the clamps and drill/rivet any remaining holes. **Photograph 14** shows a finished beam; near enough right.

The holes in the beam outward faces are not too critical and those for the buffer stock are best spotted-through from the laser-cut backplate. Note that pictures of the original engines show bolt heads to the outside here, with no washers, just in case some expert should tell you this is wrong. I've shown threaded holes, because the top of the beam angle prevents use of nuts behind, but the lower holes could be clearance size for bolts and nuts to save tapping them.

Holes in the beams' top faces may also be drilled but here there's a worry about tolerances - differences in size or thickness in raw materials and also variations in our own work. CAD design is mathematically accurate and gives the impression that if everything is made to drawing then it will all go together just-so. Unfortunately, in the real world all our materials, and indeed everything we make, will not be exact. All materials used should be delivered within some dimensional range, or tolerance, but it may be quite wide. My prototype frames were made from steel sheet measurably under thickness but within reasonable manufacturing tolerance. Because some holes here and on parts yet to come are (unavoidably) referenced to the frame plate inner, some to the outer, and some to the beam ends, then together with my own deviations these could make them misalign with later parts. My hopes of Meccano kit assembly were at risk. To counter this the normal practice is to drill one part and then drill through the mating part on assembly. Well, I marked and drilled the holes in the beams and brackets then, when the time came, had the corresponding holes in the platework laser cut. To find out if they fitted, then wait 'til we get to the platework section. If you are not confident with marking out hole positions then leave them until the platework kit is available and spot them though then.

The frame assembly can be bolted together now. The bolt lengths needed are unlikely to be a 'stock' size so cutting-down is required. This is an almost universal difficulty and I normally just buy the longest available, which don't cost much more than short ones, in the sure and certain knowledge that they will need adjustment whatever I buy.

Next, the motion brackets and plate support brackets.

● To be continued.

Another Steam Plant

PART 1

Ian Beilby
builds
another
steam plant, this time
with an electrically 'fired'
boiler.



Regular readers of *Model Engineer* may recall a series of articles I wrote on the construction of a live steam plant which were published in the magazine between the 7th of October and the 15th of December 2022 (M.E.4701 *et seq.*).

The articles illustrated and described how I built and assembled a working model steam plant principally building the engines from kits purchased from Chiltern Model Steam. The article aimed to show what can be done by the steam enthusiast with the minimum of tools and equipment and encourage the beginner to 'have a go'. The plant was deliberately designed to be visually interesting and incorporate all the features that I considered important on a working steam plant, features that would display well and interest the novice onlooker with little knowledge of steam engines or steam propulsion.

The response from readers was very encouraging and as such I was invited to display and demonstrate the model and give several talks on the steam plant to local societies and model engineering clubs in my area.

Clearly the project was not designed to be of specific interest to an experienced model engineer with a fully equipped workshop and years of engineering experience, someone whose knowledge of the subject would be far greater than mine. So, as you can imagine, I was greatly surprised and pleased to see how much interest even well-experienced

engineers showed in what I had done. It was particularly nice to meet and talk with several long-established club members and other engineering enthusiasts who said they found the steam plant most interesting from both a constructional and engineering point of view. The interchange of ideas and comments were most constructive, helpful, and encouraging, discussing possible improvements and features that could be added or possibly changed for the better. One of the suggestions was to design a smaller steam plant that would be less expensive to make and yet still retain and illustrate the important features relative to a working model steam plant - a project that could be built as a joint effort, possibly by a school or educational establishment and used as a portable and educational working model. Another model would also provide me with an opportunity to improve on some of the things that I did wrong or would have done differently had I known what I know now.

Having given the matter much thought, I decided to make the next steam plant using a smaller boiler and just one engine but, for added interest, to incorporate an interesting and practical engineering device found on many traditional steam engines during the 19th century.

Of course, the original 19th century stationary engines were never built just for fun or display; they were always built to perform a specific task in order to make life easier,

more productive, and beneficial for industry and society. With this in mind, I also decided to include another interesting accessory to show how a simple single cylinder engine can be used to generate yet another source of useful energy and power.

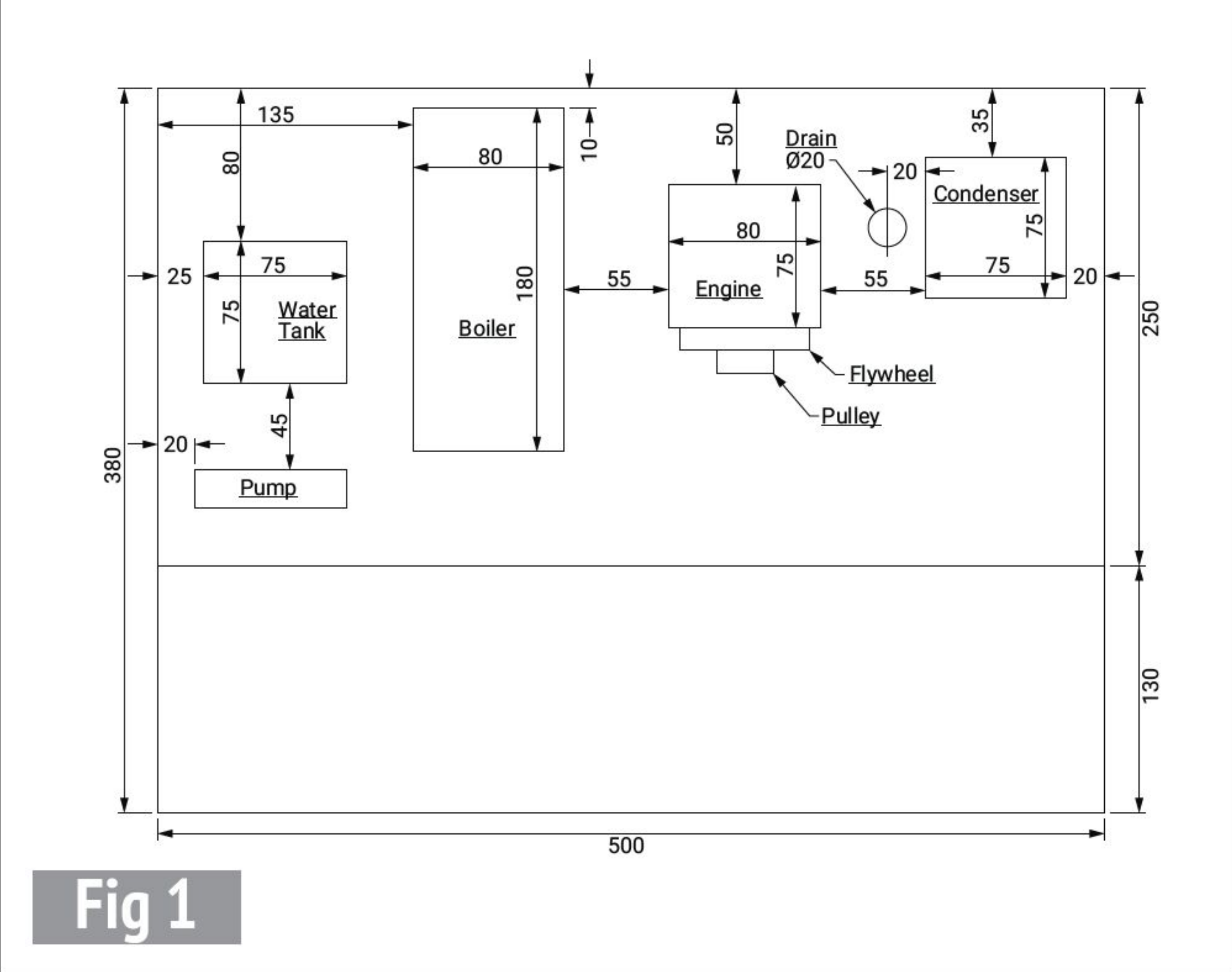
Since constructing my previous steam plant, electrically fired boilers have come on the market which can make the running of a steam plant much more convenient and less expensive than with a gas or spirit fired boiler. They are quicker to heat up and do not require refueling as with a gas or spirit fired boiler... plus none of the heat goes up the chimney! Electric boilers also do not emit any carbon monoxide, which is another improvement, especially from a health and safety point of view.

Operating an electric boiler requires just as much know-how and understanding as that of any other type of boiler. Constantly checking the boiler pressure and water level are vital features of good boiler management and must be understood by the operator.

As with my previous model, I wanted to demonstrate many of the essential features of an efficient steam plant, so a water tank and a condenser would also be included.

To run the plant for a reasonable length of time, the boiler requires intermittent topping-up of water. A water tank and pump ensure the boiler can never run dry and longer periods of running can be sustained.

A condenser, although not



'Floor plan' of the steam plant.

essential, is an interesting and highly efficient way of collecting and disposing of the engine exhaust steam. The steam is contaminated with engine oil and needs to be disposed of responsibly. It also provides a visual aid to understanding vaporization and the behavior of steam when cooled. From a practical point of view I also wanted to include some means of attaching an air compressor, useful for short testing runs and quick and easy demonstrations, so a steam turret of some description would have to be made and conveniently incorporated on the plant.

Having decided on the number and type of ancillary items that I would include on the model, the next job was to choose an engine.

I decided to use another engine from Chiltern Model Steam. I was delighted with the performance, design and quality of the previous engines I had bought from the company and this time I chose a single cylinder vertical engine that I thought would be visually interesting and not too difficult for the beginner to make in a reasonable amount of time. The electric boiler, also from Chiltern, is designed to provide 20psi which is more than capable of powering a single cylinder engine under a light load, which is perfect for this project.

Having settled on the boiler,

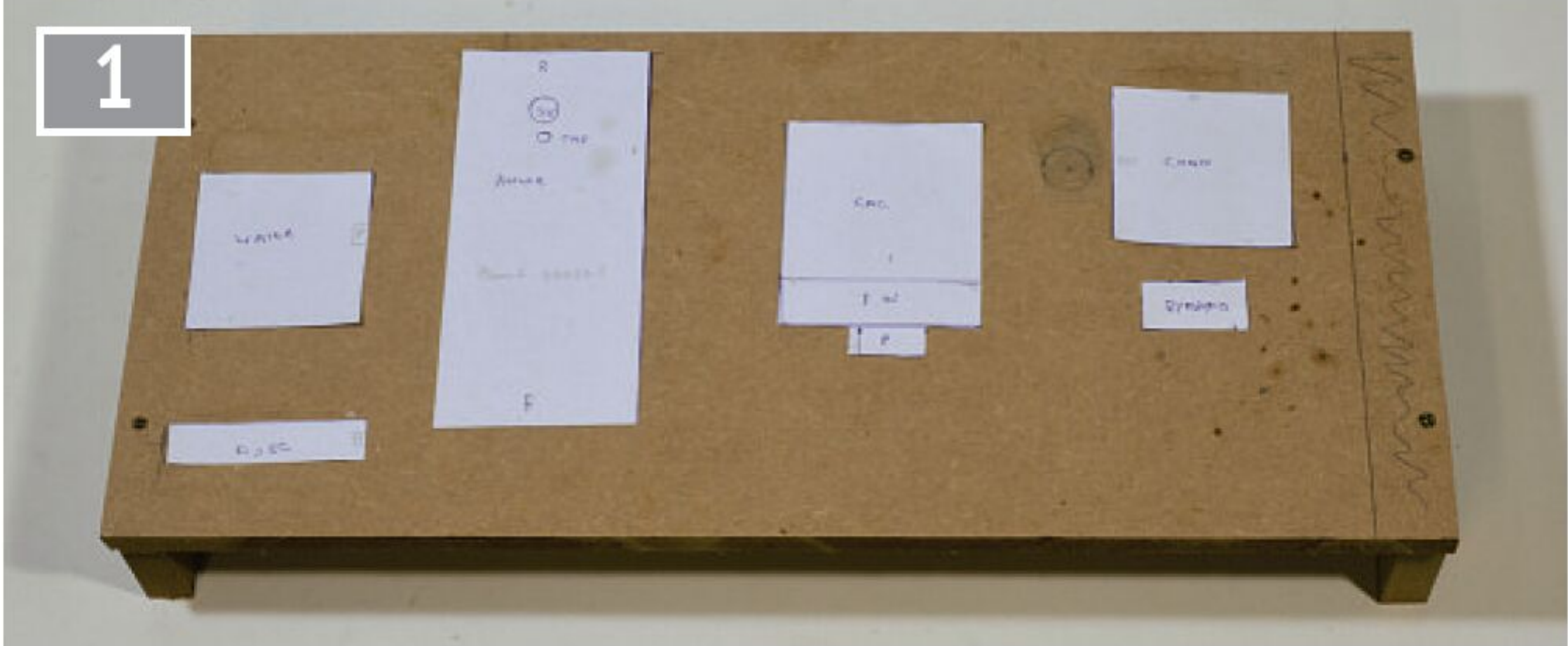
type of engine and the other items I would be using on the model, a sketch was drawn with the dimensions of the engine and the other various accessories to determine the size of board that would be required to house the components. I wanted the model to be portable and not too heavy, capable of being transported easily by one person. I calculated that a board 38cm x 50cm would be sufficient to lay out all the components in a logical and accessible way and provide a visually interesting working model.

A scale plan was then drawn as shown in **fig 1**, giving me something to refer to and work from when constructing the base and fitting the items in place.

I wanted the base to be easy to construct, robust and allow good access to all the various component parts of the plant. I also wanted to try and future-proof the finished plant to some extent, leaving some space and provision for possibly another steam driven accessory or perhaps a different small engine to be added in the future.

Irrespective of the amount of planning, things seldom go exactly to plan and slight modifications are inevitable - however, the fewer the better.

Working from my drawing I then cut out some paper templates to give me a better



Trial placement of the various components on the baseboard.



Construction of the baseboard.



The engine kit from Chiltern Model Steam.

idea regarding a visual footprint of the model (**photo 1**). As the boiler was fired using mains 220V electricity, an AC voltage regulator and wiring route also had to be included during the planning stage. I did not want the electrical components and wiring to be fitted on the board alongside the boiler and other accessories but they had to be part of the overall scheme, permanently fixed in place and easily accessible.

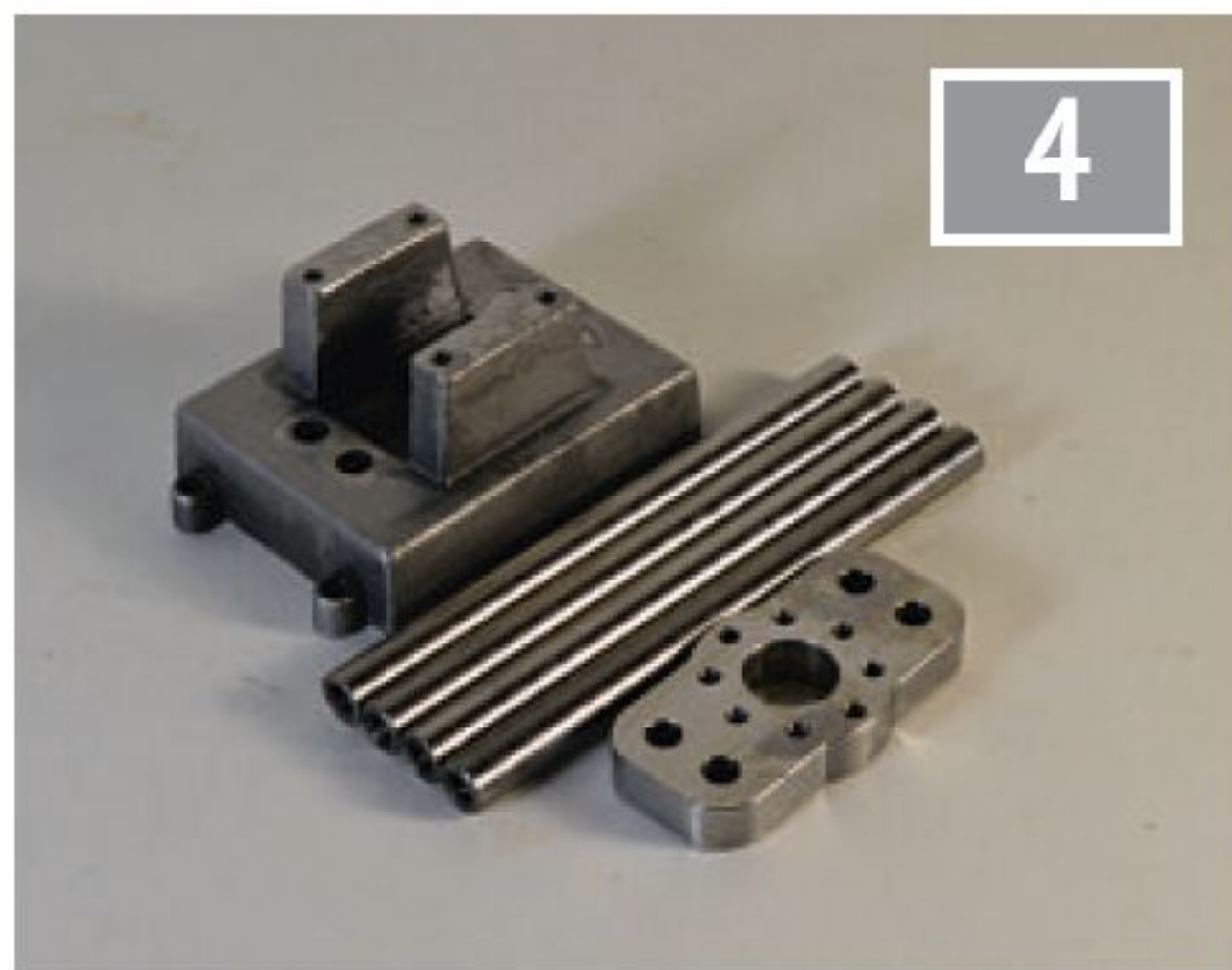
Photograph 2 shows the two-level board that I constructed. I thought this design would work well, both visually and practically.

The board was also designed to be very simple to construct, assemble and be easily transportable.

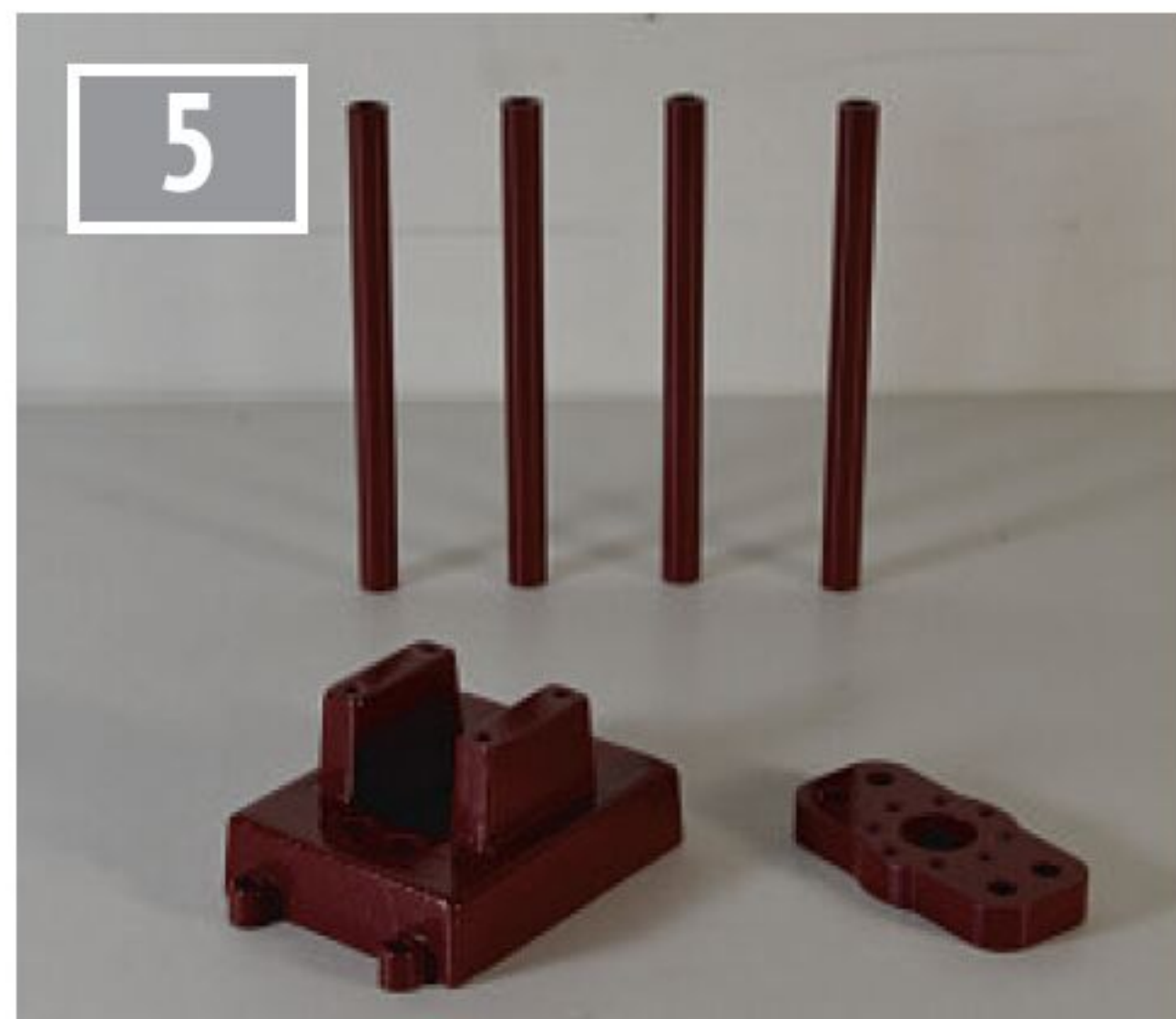
The design incorporates an accessible space beneath the main board and a removable front board which will make the fitting and maintenance of the components easy as well as providing sufficient space for the electrical wiring to be hidden away. I visualized the layout with the boiler, engine and accessories on the top level and the electrical controls and some free space for possible future additions on the lower level.

The next job was to assemble and paint the engine, followed by the various other components.

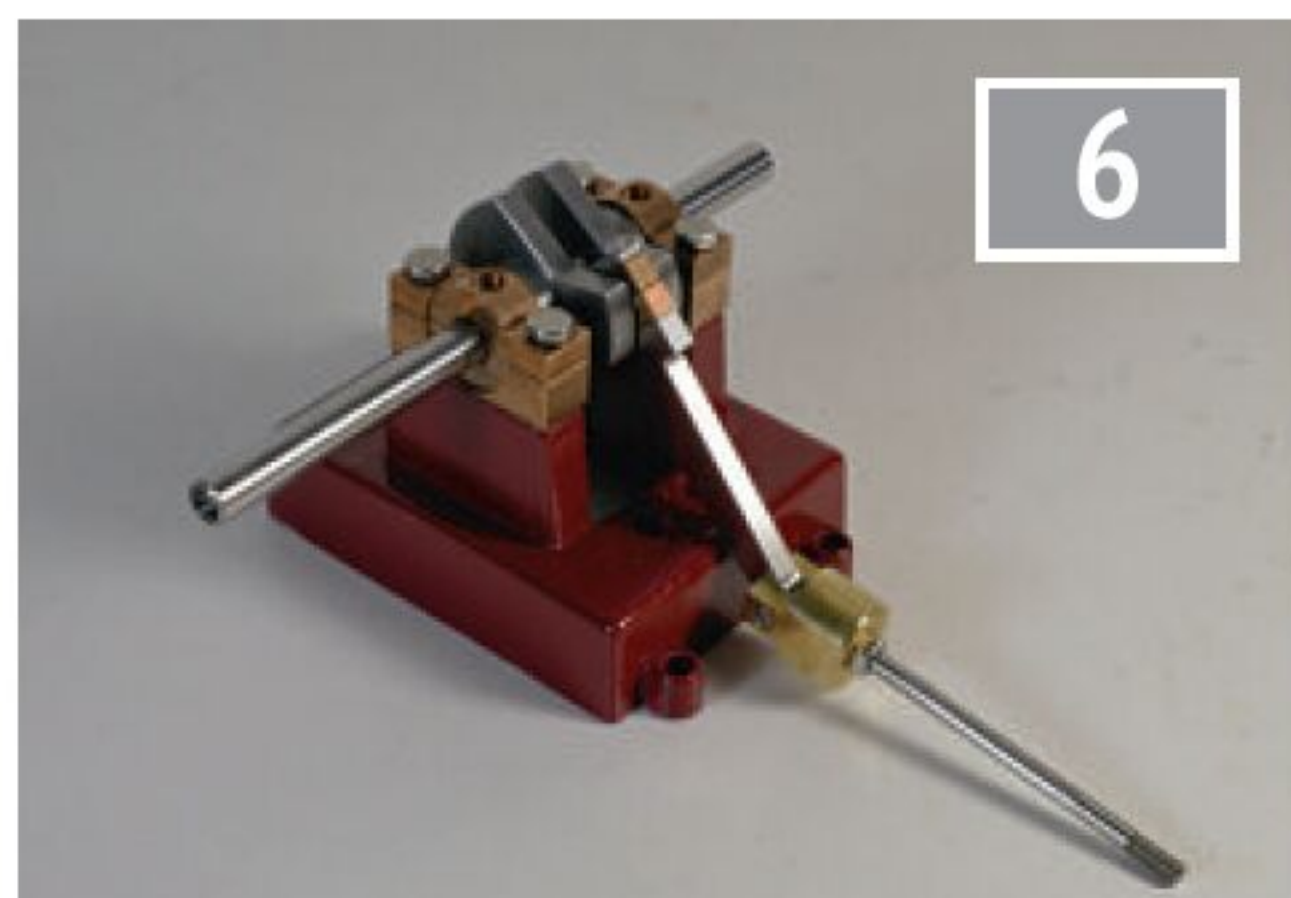
The engines are sold in kit-form and **photo 3** shows the unassembled engine and parts as received from Chiltern



It was decided to paint the steel parts.



Steel parts having received a coat or two of a suitable colour.



Starting assembly with the crank and connecting rod.

Model Steam. An exploded diagram is also provided as well as comprehensive instructions. The parts list should be checked to make sure all the items, nuts and bolts are present and identifiable. It is recommended that the kit is assembled first before painting to familiarize yourself with the parts and to make sure the engine has been assembled and runs correctly. The engine is then dismantled in reverse order, painted and finally reassembled.

I find it best to identify all the components, bolts and fittings and then keep them separate for ease of assembly. Some of the nuts and bolts are quite small and it pays to use a compartmentalized storage box in which to keep them.

The instructions should be repeatedly read until you understand each of the assembly processes, confidently moving from one stage to the other. When assembling the components



The crosshead guide is fitted.



The cylinder end cover and piston are added...



...followed by the cylinder.

always make sure the bolts are screwed in correctly and not cross threaded - never use undue force. If a component is not seated or threaded properly, remove it and re-align it before attempting to screw it in place. You can see from



The valve gear is assembled ...



...and the steam chest added.



A fully assembled engine.

photo 3 that there are not a lot of parts to this engine, and it should not take long to assemble if the instructions are followed carefully.

A screwdriver, pair of pliers, Allen key and spanner for use with M2 and M3 hex

head screws/nuts are all that are required. Only the base, pillars, slider tube and cylinder top plate being steel require painting, for protection against corrosion with this engine, and in **photos 4** and **5** you can see the components before and after painting. The painted engine in different stages of assembly can be seen in the remaining photographs.

In **photo 6** the crankshaft is fitted onto the base and the connecting rod and piston rod attached to the crankshaft. The crankshaft should be rotated whilst gradually tightening the bearings, enabling the bearings to center themselves properly on the shaft. In **photo 7** the slider tube has been fitted along with the columns and top plate. The four columns should be loosely attached to the base and gradually tightened whilst rotating the crankshaft. Whilst rotating the crankshaft the slider should be seen to operate freely in its tube. When the column screws are fully tightened the bottom cylinder plate and packing nut along with the piston can be fitted to the top plate (**photo 8**).

Photograph 9 shows the cylinder fitted to the top plate. Again, whilst tightening the cylinder screws the crankshaft should be rotated ensuring the piston moves freely in the cylinder. The eccentric rod and valve assembly is shown in **photo 10** and in **photo 11** the valve assembly fitted into the cylinder chest. The bearings were oiled and the engine was then tested with an air compressor and ran smoothly and evenly on 10lb of pressure.

Photograph 12 shows the fully assembled engine with the flywheel fitted to the crankshaft and the oiler fitted to the cylinder chest.

In the next part of this article, we will take a look at the electric boiler, water tank condenser and some other items I intend including on the plant.

● To be continued.

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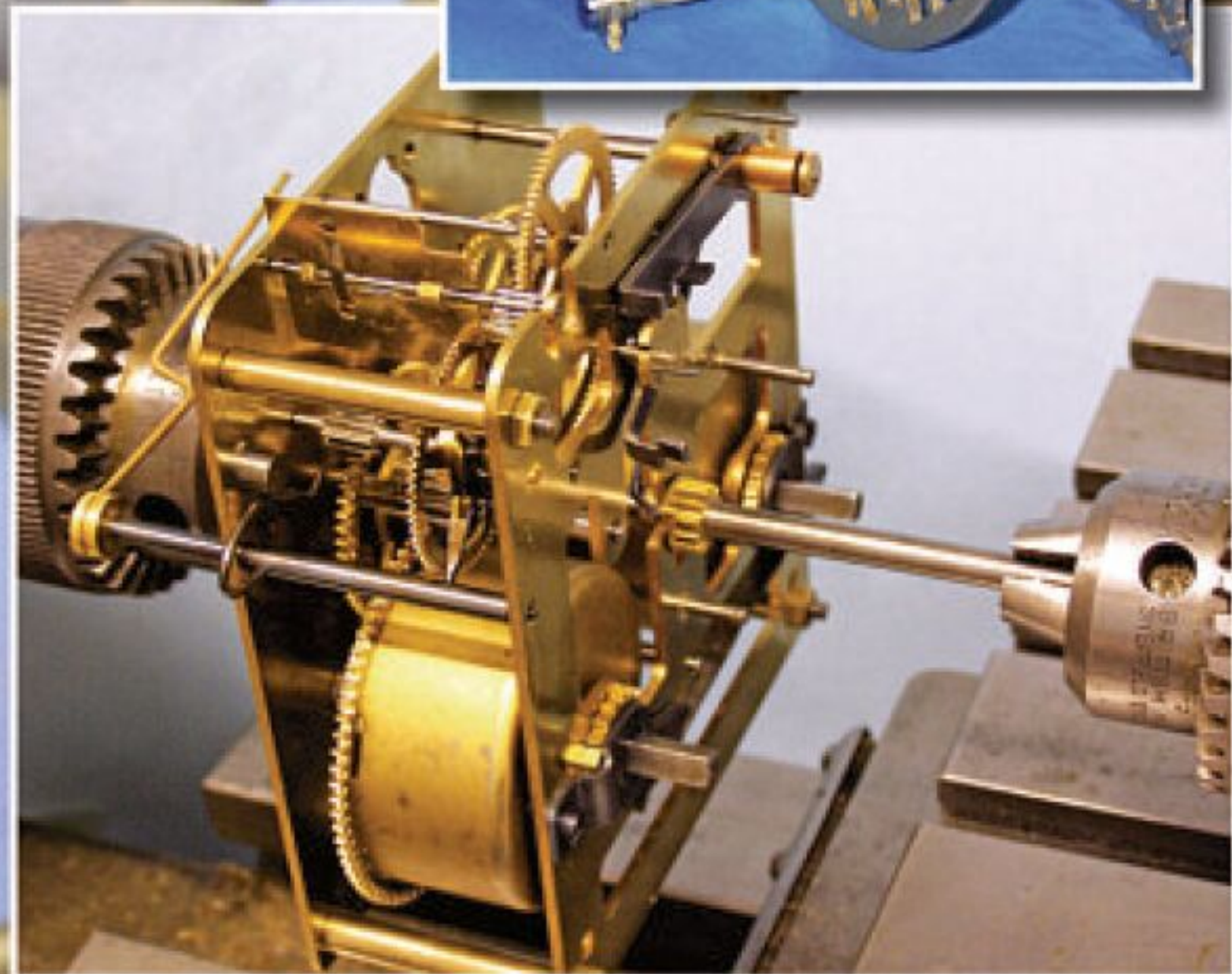
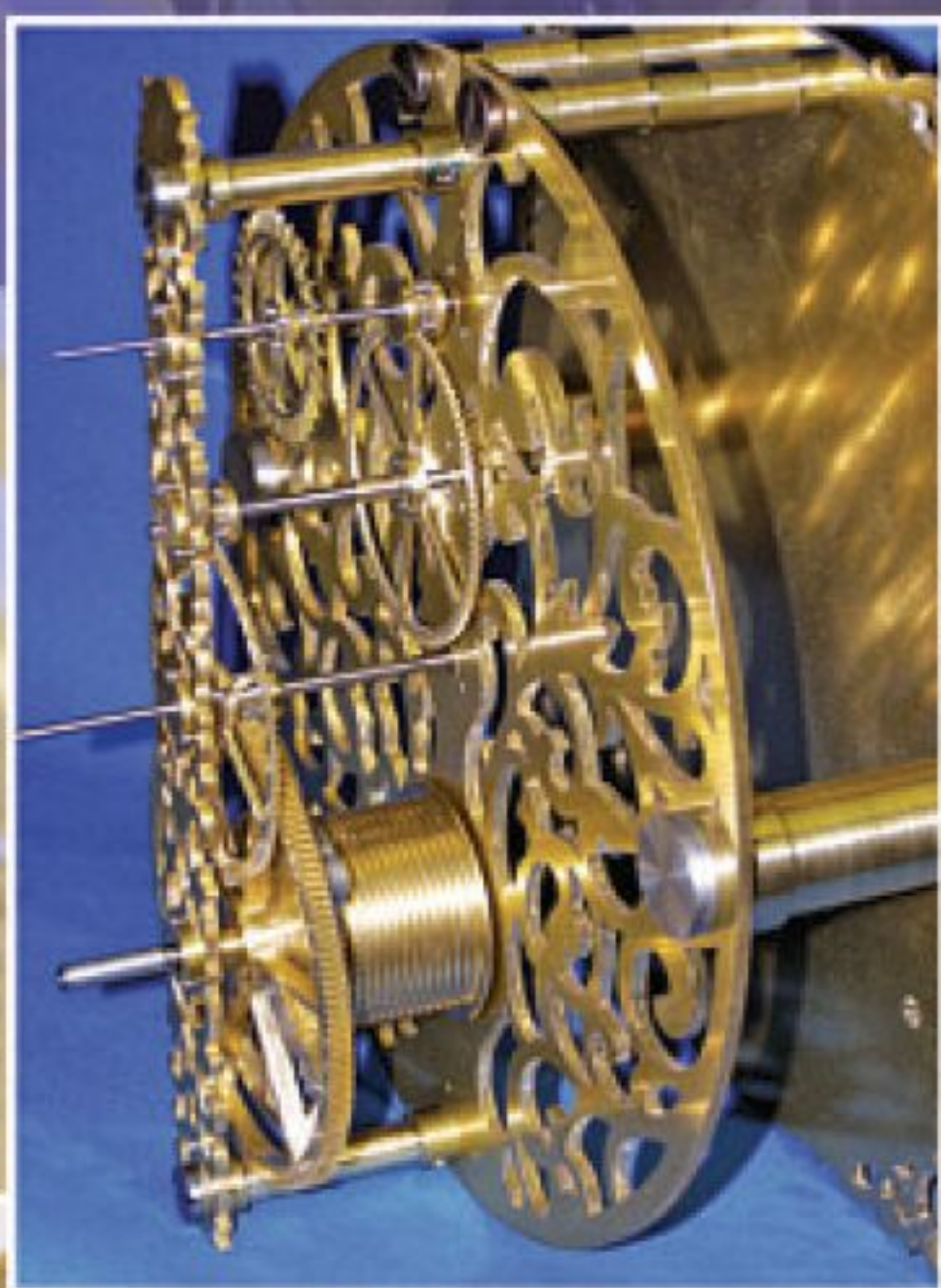
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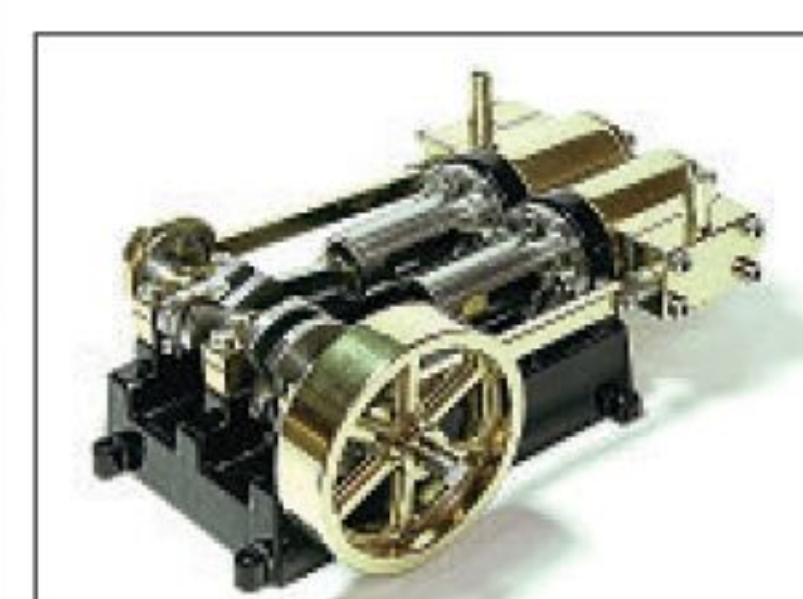
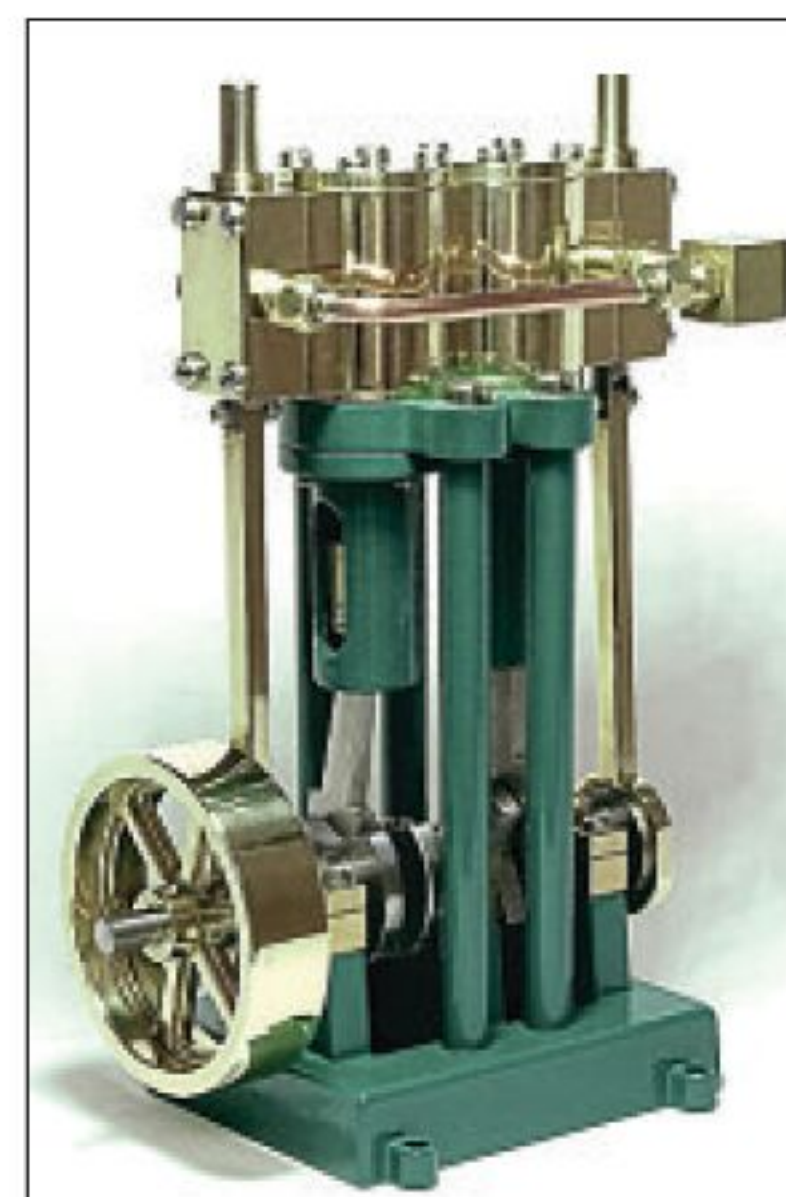
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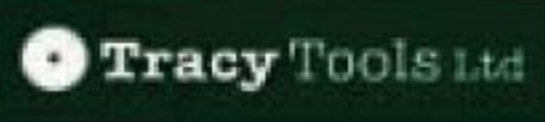
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■ Wanted: Model Engineer Volume 176 Issue 4015, 19 April 1996, or at least Eric Whittle's article on his V8 four-stroke aero engine.
E. bjsbyl@windstream.net.

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Unseizing a Beam Engine

PART 2

SMEE's
**Mitch
Barnes** gets

to grips with an ME Beam Engine steam plant, which had become seized up at some point in its past.



Continued from p.565
M.E.4754 October 18



SMEE



This series is a transcript of a talk given to the Engine Builder's Group at the Society of Model and Experimental Engineers (SMEE) in May 2024.

On with the reversion back to its former glory

The following description is partly for the benefit of the owner and also for all those others who are new to steam and yet to build their experience with steam models. Many model engineers are like me, making engines for display rather than running and the procedures required to 'steam' a model are still a foreign country. To the experienced reader, much of this article will be second nature.

Unseizing this engine would be an interesting exercise to say the least. There is nothing onerously difficult, whether it's going to be an easy or a less easy job, but an explanation of the procedure might be helpful to others so here goes...

Sometimes this problem can be a breeze to solve and sometimes it's more akin to a hurricane (**photo 7**). Well, here we are, presented with an



That nicely machined cylinder was soon going to turn out to be a can of worms!

immobilised engine, bought for no other reason that the buyer very much liked the look of it and there's nothing wrong with that! How are we going to get this very static model running again? And what would 'getting on with it' entail?

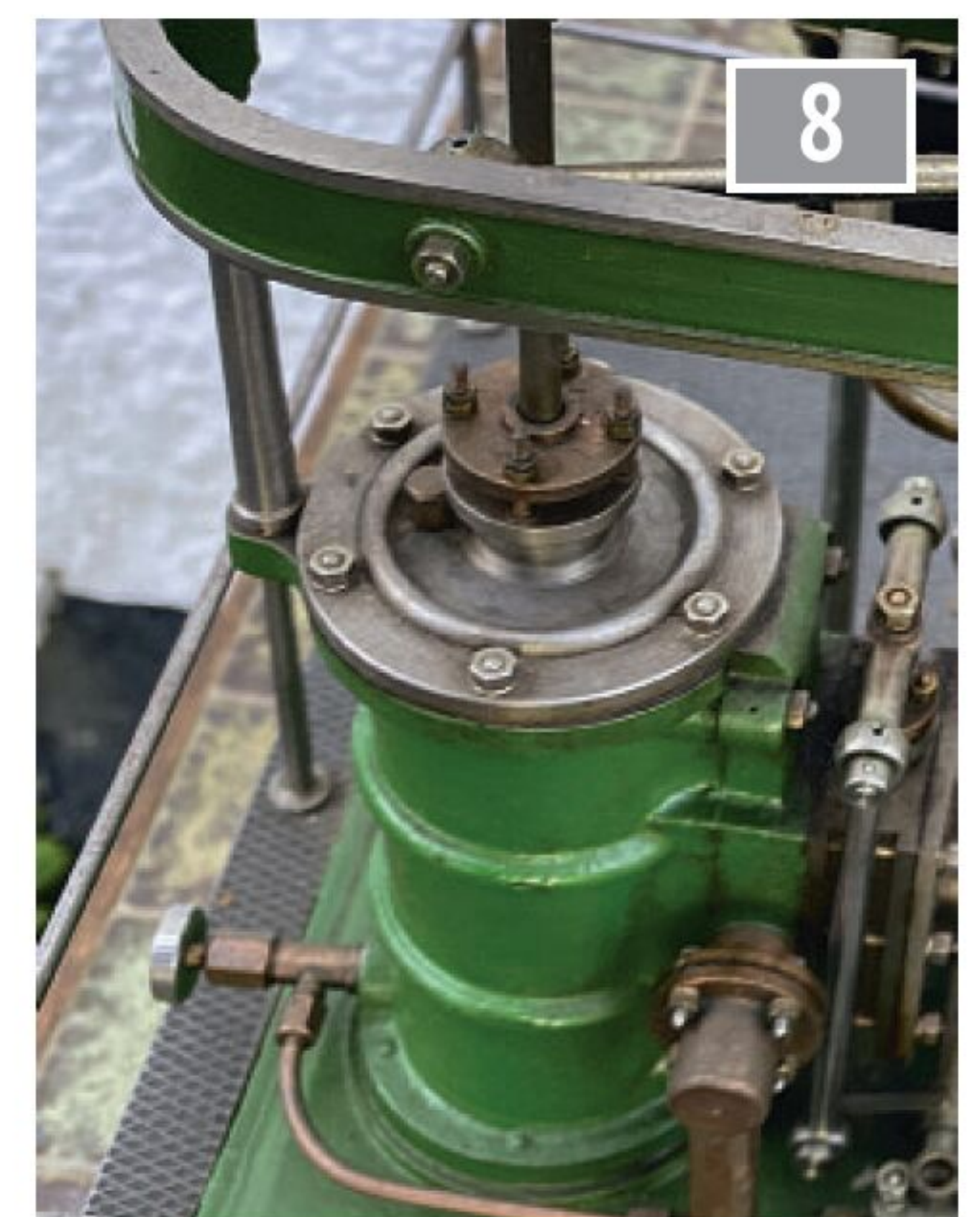
The owner reasoned that despite very little experience with steam, he could learn that aspect of ownership over the next few months and years. As for its current 'stationary' state, considering that it was originally built from rough castings, in even the worst case scenario it can't be impossible to get it turning over once again, under the power of steam, even if it might require a new cylinder to be made.

At the other end of the effort spectrum, the job might be easy: a bit of oil could help, as the whole engine was very dry in this respect, so it could merely be that to sort out. Easy! It'll be done in less than an hour! Let's get on with it!

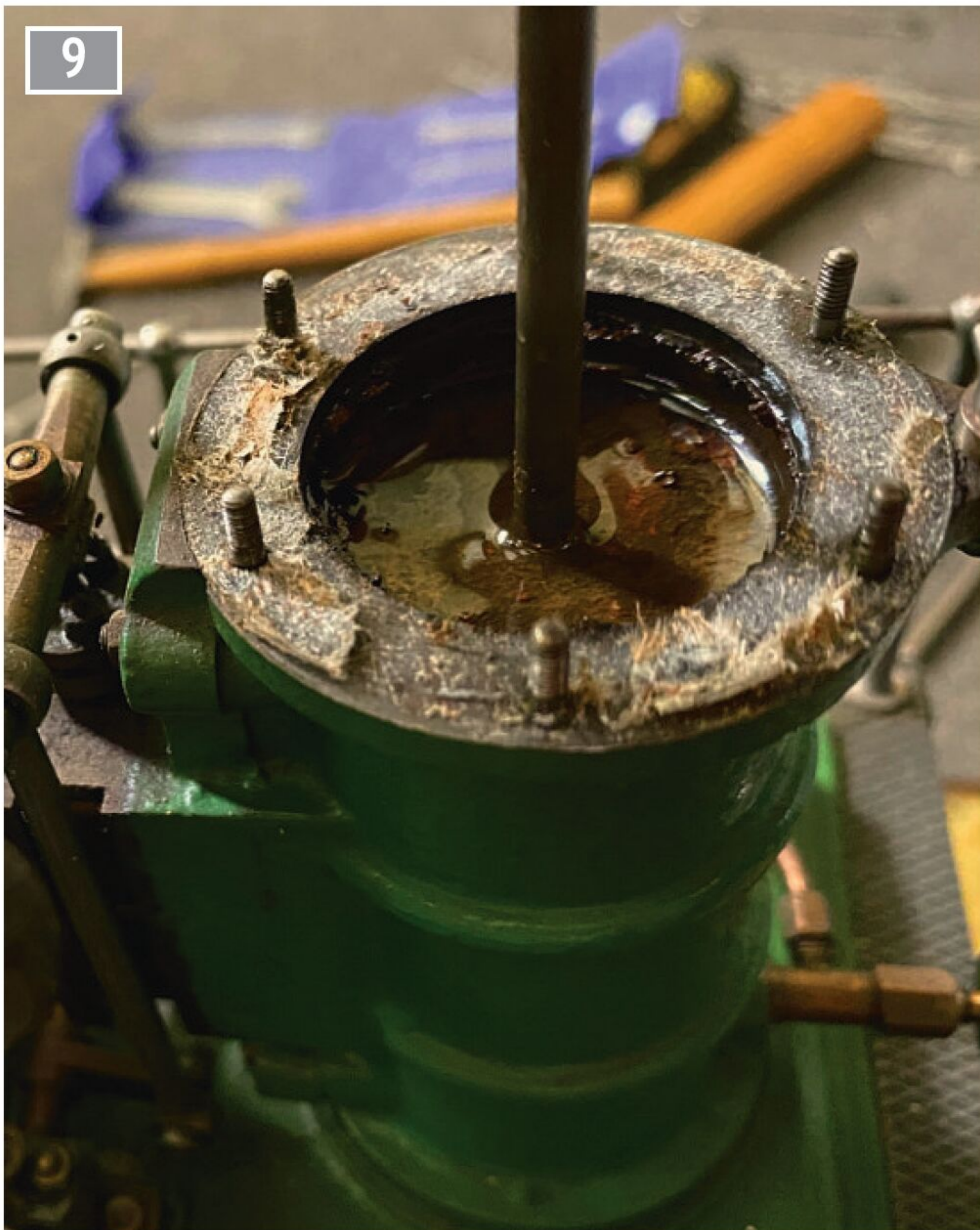
I thought that water may have been the culprit on this engine as the boiler still had some sloshing around when the model arrived with me. Because the 504 - strangely, to non-boiler-familiar me - has no blowdown valve, I decided to drain it by removing the safety valve and sucked out all 520cc with a small bore rubber tube and a syringe! Luckily, apart from a bit of discolouration as I reached the bottom of this unintended reservoir, the water was as clear as a bell.

As the photo shows (**photo 8**), there is a brass filler cap - an oil inlet - on the cylinder cover, into which I could squirt some oil to ease the seizure a bit, perhaps. That might do the trick - one can hope!

Well I could have done that with or without the cylinder cover in place, and it wouldn't have taken much oil to fill the space above the piston as it



A hopeful sign is that there is a little hexagonal brass lubrication plug in the cylinder cover... we could drop some oil in there and free the piston up.



Oh dear. I've been beaten to it: someone else had the same oily intentions as me at some point.

was stuck almost at the top of its stroke. I had another go at seeing if the thing could turn over: it may not be the piston anyway. It didn't make any difference so this may not turn out to be a quick job after all. Oh well, let's undo the nuts and see what there is.

Naturally, once the nuts and their washers were off and safely in a labelled resealable bag, the cylinder cover was stuck firm. Of course it was, as any model engineer who runs engines will have experienced. After some running with all that heat, oil (hopefully) and steam, the gaskets have done their job in making the cylinder steam tight and a bit of persuasion will be required to lift the (theoretically) now unsecured cover.

My chosen method is to gently tap a Stanley knife blade into the joint with a small hammer. Working around the perimeter first one side then the other, then the points in between, one works around it several times, enlarging the gap that eventually appears.

Patience is key here as we don't want to damage anything, least of all me! That blade is sharp and so are its pointy corners, so I generally grind them off to give blade ends a radiused look as if they are related to the round-ended scissors we were issued with in junior school.

Eventually a thicker blade can be eased in and the method repeated until the gasket has given way all the way around, allowing the cover to come off. There was almost the entire length of the piston rod to slide the cover along, to get it out of the way. Then we can put some penetrating oil in, if required, to free that piston.

Here goes, lift up the cover and what do we have (**photo 9**)?

Not to worry, there was corrosion in there but surely with so much oil the cylinder cover might not be too bad. Let's peer around and take a look (**photo 10**).

I confess that when I lifted the cylinder cover and saw that pool of oil, and then



Ah. Oh well ...

the underside of the cover, I realised that I really was going to be in for a long haul. No doubt the seller also realised that oiling it hadn't worked immediately but hoped that it would by the time the sale happened. Evidently after a while, the auction house realised that they'd have to state that the model was seized. I'm glad they did: another stationary engine bought last year had the same trouble but no mention of this was made by its auctioneer. It now does turn over but only just and will require a lot of work to fix properly. Something for another article perhaps because its problem is slightly different and that engine is a quite unique Stuart Turner hybrid.

Ho-hum, back to this project - it is what it is - just get on with it and fix it. We want this fine engine to run again. It's just too good not to try.

I tried a rod poked into the cylinder and a few taps with a hammer. The piston wouldn't budge. No luck there then.

As they say in the military, 'a battle plan never survives first contact with the enemy'. As my plan had been to pop some penetrating oil in and free it all up that way, and now that this had been proved futile, another plan was required. So, what now?

One positive feature was that the piston appeared, under a lot of tarnish and general 'gunkiness' to be made of brass rather than iron; it might therefore not be totally rusted together and even if it was, *if* I could get the piston rod out, I could bore the piston out of

the cylinder and make another one of slightly larger bore. There is a lot of cylinder wall thickness available to play with (at least 1/8 inch/3mm) and as this is an engine that, if well made, will run on low pressure (they should be refined to the point that they trundle over no faster than 30RPM), there'd be no worry at all about losing a millimetre of wall thickness, so while things looked pretty dire at this stage, all was far from being lost.

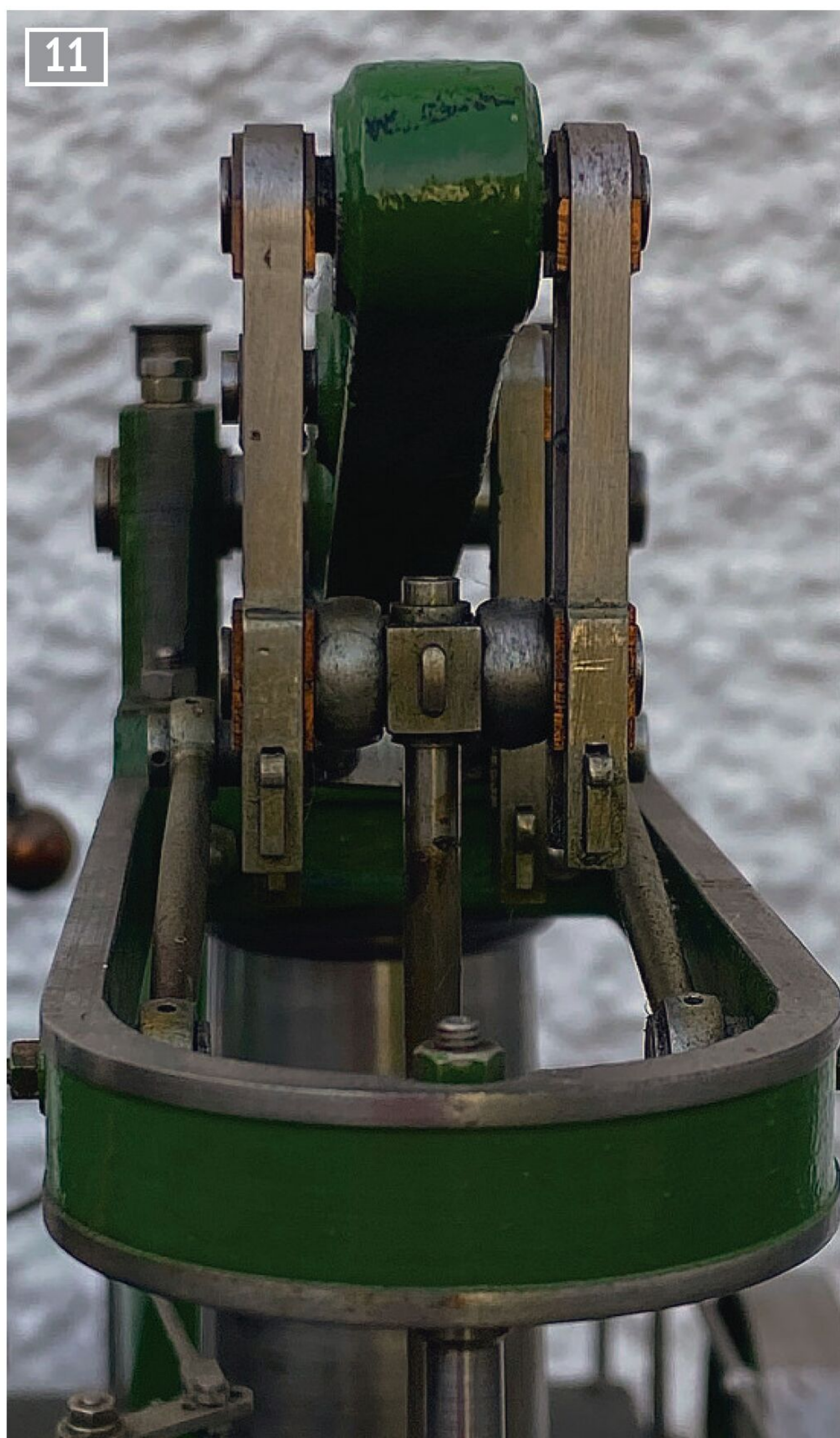
Opening up the cylinder had revealed the main reason why the engine was seized but it may not be the only reason! What if something else was also seized up? I'd have to disconnect the piston rod from the parallel motion and find out. Either way, the cylinder would have to be removed and assessed, then dealt with.

There was no way that I could remove the piston without first taking the cylinder off the engine. I was also very concerned that doing so might damage the piston rod so I needed to get that off too, before any piston removal forcing could be attempted. The crosshead at the top of the piston rod had been precisely made, true to full-size practice, with a cotter that secured the crosshead and piston rod together. The piston rod didn't want to come out of the piston either. At this point, I also couldn't remove the cotter and crosshead! That cotter pin needs to be tapped out but it had decided that it was perfectly happy where it was and even getting a hammer near it to do any tapping that might help change its mind was nigh on impossible (**photo 11**).

If I could remove the piston rod altogether, however, I'd probably not need to remove the crosshead as there would be no need at all. This is what I hoped, as this cylinder was rapidly turning into a real can of worms.

As is evident from the photos, there was a lot of gubbins (an engineering technical term) in the way, that would have to be disconnected before the cylinder could come

11



I wasn't too enamoured with the thought of damaging the crosshead and its cotter if I could help it. Getting to the cotter to tap it out was going to be tricky so best avoided if possible.

off. People often forget the fitting and assembly phase of building an engine and I'd be disassembling it before I could do anything, but it might be a lot easier if I could remove the engine from its hollow base unit. Then I could mount it on my workbench and easily get to everything. Just unbolt the bedplate bolts (not forgetting those holding the crankshaft outrigger bearings down of course). Easy! Let's do that then.

Okay ... so the holding down bolts weren't any more interested in coming undone than the crosshead cotter. No sir, not from above anyway. They simply wouldn't turn.

Turning the whole steam plant on its side to look underneath, all but four of the nuts or whatever fixings those bolts went into were buried within the structure of the base unit. The same applied to the railings which were also in the way. How about taking the railings off to ease access? To do that, I'd have to remove the nicely applied skins of the base walls, which may or may not expose the fixings, which looked to me to be another can of worms. Never mind, live with it: accept that they are staying and I could still work around them, though the job would just take longer.

At least all six of the cylinder

12



The underside revealed that this was going to be even more awkward but never mind. This is the view of the underside of the base, very strong and serviceable but not quite up to Chippendale standards.

holding down studs were visible - I just needed to remove their nuts (**photo 12**). Two of them would be very tricky to put back because they were partly shrouded by woodwork but I could Dremel some of the plywood base away to accomplish this later on.

But we are getting ahead of ourselves here ...

The first part of all this was to disconnect the parallel motion from the crosshead, to see if anything else was seized, and then remove that U-shaped extension to the entablature. This acts as a brace for the cylinder, connecting it to the column to rigidify the engine - as per the real thing, yet again. Back in the 19th Century, after a few decades of building single column beam engines, the builders (and customers no doubt!) realised that this single column configuration, while elegant, wasn't very strong so braces like this U-shaped extension appeared to help things along. Extant examples of single column engines show that some were built with such braces but others evidently

had them retrofitted. Such braces were commonly used in A-framed engines which were earlier iterations of the beam engine (along with the six column, the earliest in fact) though all configurations continued in production throughout the age of the beam engine. It's just that single column engines, due to their inherent weakness were rarely made in larger sizes.

● To be continued.

Geoff Theasby
reports on
the latest news from the
clubs.



A new attraction in Scotland is a sort of roller coaster for those who don't like heights. It runs downhill on a type of track, reaching speeds of 30 mph, a sort of Cresta run on rails. A video is on YouTube, filmed at a similar track in Germany: www.youtube.com/watch?v=mWZipukcDd4
In this issue: the Roving Eye, flowerpots, GCR update, 'LBSC', superglue, a laser cutter and a folly.

Grimsby & Cleethorpes Model Engineering Society, September, tells of members who visited Sheffield SMEE for their Open Day. The *Railway Magazine*, July carried a story about a new type of locomotive, using a Class 60 as base. It will contain 20 modular steam generators running on hydrogen and oxygen to make steam. Greg Marsden apologises for the low page numbers this issue; he was dragged 'kicking and screaming' away on holiday and returned only a couple of days before the deadline.

W. www.gcsme.com

This picture is taken from the internet but ownership cannot be traced. If the picture was taken by you I will happily acknowledge it (**photo 1**).

The rest are all from the one visit, so I have spread them throughout the text.

The Broadcast Engineering Conservation Group, BECG, in Hemswell Cliff, Lincolnshire, is a comprehensive collection of TV and radio broadcasting hardware that we normally never see. My apologies if this seems off-topic but every one of us uses their facilities at some point in our existence. Located in the former Sergeants Mess of RAF Hemswell, the museum has preserved TV and Radio 'behind the scenes' equipment, from mobile boom mikes to mixing desks and outside broadcast vehicles. It is not normally open to the public but a Heritage Open Weekend in Mid-September, of which I had never heard, stimulated my interest. They have cameras, videotape machines, autocues, telecine machines (for showing cinefilm on TV), specialist vehicles, including outside broadcast vans, transmitters, all working, more or less. There was no entry fee but a suitable donation is requested. There were outside broadcast specialist vehicles (but not a 'Roving Eye', a vehicle with a TV camera on the roof, AND cameraman). A compilation of short films

on some of the equipment in use was running on a loop. Tea and coffee were free, for a donation. A TV camera used at the coronation of Queen Elizabeth was on show, as was the radio complement from a Lancaster bomber, a tribute to the airmen flying from here in 1939/45, who did not return. A Motorola round screen domestic TV receiver, 7V5RA, from 1948, is a rare exhibit. Also a classic lozenge-shaped ribbon microphone, 'Model A', which epitomised the BBC for many years. In the transmitter room, a dedicated transmitter water-cooling system had been devised for testing purposes, using 'Yorkshire' fittings, which were made in Keighley, my home town.

W. www.becg.org.uk

Kingpin, autumn, from **Nottingham Society of Model & Experimental Engineers**, features on the front page Diane Gent and Ann Hopkins, new gardeners, pictured tending to flower pots in the shape of a tank locomotive and wagon. Editor Jayne Ball apologises for the short newsletter but sufficient copy was not forthcoming and eight pages have been cut. However, there has been a steady drip of new members, so if they can be persuaded to write items for **Kingpin**, so much the better. Idea! What about a year's free membership for contributions to **Kingpin**, of more than X in number? Nigel Munday describes the Perrygrove railway in Gloucester. Joe Hoy went to the Rugby Model Engineers Open Day, whilst The 31st Sweet Pea rally at Leyland was attended by Nigel and Jayne and there was a portable railway event at Quorn, GCR, to which some visitors took their own track so a large layout was constructed. This meant that four trains could be operated at once. Saturday evening saw the Great Central Railway staff invited to drive the miniatures. Malcolm Holmes has requested a full size Hymek for their next open day, after having driven the 7¼ inch gauge version. Ticket sales for the weekend amounted to over



Thunderbird 4 (from the internet).



Debs on TV at BECG.

£2,000, an astonishing amount. Nigel also writes on the NSMEE garden railway. Colin and Joe Hoy took a trip on the Midland Pullman to Minehead. Tom Ingall reports that the planning permission for the next stage of the GCR reunification has been formally requested. The club website NSMEE.org.uk has been further improved with a members sales and wants section.

W. www.nsmee.org.uk

Debs at the TV museum (photo 2).

Ivan and Barbara Smith keep us up to date on **Stockholes Farm Miniature Railway**, with Newssheet 41. Ivan is a very happy man as *Duchess of Sutherland* has been restored and reassembled after 15 years in the 'shops'. A visit by York Photographers went very well and they wrote to say so afterwards. The Stockholes Rally in June also went well and their visitors too were kind enough to send a 'thank you' letter - see YouTube

'Stockholes Rally 2024'. On Bank Holiday Monday, some 3D shunting went on, *Duchess of Sutherland* was removed from the bench and set on its wheels, whilst it was replaced by *Patriot*. A very strenuous task, that, and thanks to all who helped. The 'Sceptic' tank has been attended to - I hope that this didn't attract adverse comment... Ivan's birthday was celebrated by a trip on the Torbay Pullman. A VERY long day, which began at 04:30 and they arrived home at 00:30 the morrow. Congrats to member, Melvyn Bailey on being elected Mayor of Clowne. No, not that scary figure at fast food joints.

Here is a copy of a sound mixing desk, created for a Cilla Black 'Special Note' - all the controls are labelled, unlike many of the cobbled-up panels in *The Avengers*, *Dr Who*, *The Professionals*, etc. (photo 3).

Steam Chest, the journal of the **National 2 1/2 inch gauge Society**, October, shows the trophy of **Rugby**



Copy of a sound mixing desk, built for a Cilla Black special.

Model Engineers Club 'LBSC' Memorial Bowl, which carries a sliver of railway track. Whilst I was working on the Welsh Highland Railway, I asked if I could have a similar section, for use as a paperweight. I was told that it would be okay as, although they had tried to sell them as souvenirs, there were no takers. I also have a larger offcut, about 100 mm long, which forms a good anvil. Anyway, the plaque itself is made from wood sourced from Rainsbrook House which once stood on the site, we are informed by Mike Huddart. Des Adeley reviews Eddie Castellan's book on *The Battle of the Boilers*, which occurred a century ago - a time when hats of all kinds were worn, flat, trilby or top, according to the feeling of those beneath - those who claimed they ruled the world, those who thought they ruled the world or those who really did run the world. (But not necessarily in that order... Rather like a comparison between the mainstream newspapers - *The Times*, the *Express* and the *Guardian* - Geoff.) Later, Eddie Castellan 'the man himself' writes over five pages on how his book was written. It contains a deal of information about 'LBSC' himself. These days, the term 'himself' is used advisedly, as he lived for a time as a woman. Another item, that I was not aware of, was that methylated spirit was very expensive and

difficult to obtain at the time (1920s) and therefore a coal burning boiler would have been an attraction. Several other running days at various club tracks are covered. Simon Bisson also takes five pages to describe another of 'LBSC's (which?) locomotives, A Rugby Running Day is described by Cedric Norman; there was a good turnout and a host of locomotives to admire or drive. One that stood out was US 4-6-2 locomotive of the Baltimore & Ohio. Simeon Jackson relates his experience in cross drilling small holes for R-clips in the pins coupling railway vehicles together. He produced a nice little jig after a few tries and was able to manufacture half a dozen similar pins. Unfortunately, all were equally wrong since the drawbar clevises were 12 mm deep, not 10, and the pins were just a bit short. However, the next time.... Neil Heppenstall added a Warco Lathe to his workshop, a second lathe to his elderly Myford. The Myford will be retained, as it is still good for some work. Cedric reports on the Whitwick running day and a series of photos shows a variety of motive power, one of which looks like a large boilered Tich judging by the prominent boiler feed clacks. A couple of steam railcars were also an unusual diversion.

W. www.n25ga.org

Hi-tech plumbing for a transmitter (photo 4).



Hi-tech plumbing.

Criterion, September, from **High Wycombe Model Engineering Club**, is introduced by new editor, John Whittaker. Members visited Bekonscot Model Village, assisted by good weather and sunshine and which included a Gauge 1 model railway. The group were amazed by how much there was to see. A photograph of Dave Cox, new station master, is said to prove that he often does remember to clip the tickets. An event, 'Music on the Common' was held in July at which the Club would attend. The preparations were hampered by those with malicious intent, who had filled some of the locked containers with superglue. A couple of days was spent trying to reclaim access but the event continued with the help of two loaned tables, as a third store proved more difficult to enter. Philip Howard built a 3½ inch gauge brake van. There is not much around in plans for this scale so he had to design his own. He was helped by the very

first issue of *Model Engineer* in 1898, which contained plans for a mineral wagon. An SR 'pillbox' was envisaged, from Diagram no. 1579, although the entire body was reversed, rather than rehing the doors, which were found to interfere with the seating in the duck. Last made in 1948, ten have survived into preservation. Philip then bought a 3D laser cutter with which to make it. The cutter chosen could not cut blue or clear plastic, which mandated another method for glazing the windows. This is dealt with in a later issue.

W. www.hwmecc.co.uk

Motorola TV receiver, type 7V5RA, from 1948 (**photo 5**).

B&DSME News, July, Aug & Sept issues, from **Bournemouth & District Society of Model and Experimental Engineers** begins with letters of thanks from several people, members and non-members, saying how much they had enjoyed the Centenary celebrations of the Society. Chairman Ron Barson muses on why there



1948 TV receiver.

are so few steam engines operating at the track and, what is more, he has been asked to restart the Tuesday evening meetings. As most venues would charge about £75 per evening, there would have to be more members attending. The previous sessions tailed off with barely a whimper. Dick Ganderton and Nick Feast have rearranged the year, in that September precedes July and August. Nick has now been translated to editor. Enjoy the bed of nails, Nick. A page headed 'What to Do in an Emergency' offers useful advice, both for old hands and junior members, with which they should acquaint themselves. The September issue informs us that a recent 'Points of View' programme, the promise was made in 1997 to increase the number of school leavers going to university to 50%. The subsequent period has shown the folly of that statement and we now have a shortage of qualified engineers. Not only that, but the writer of that policy has since admitted that it was wrong. An item to be considered at the AGM was the failing faculties of older members, who may be a danger to themselves and others, quite unknowingly. I have not seen this view expressed elsewhere and it is a subject all Societies should consider. Editor, Nick, points out that the above item on venue cost refers to a private room. Of course, there are



Microphone details.

numerous pubs in which members could meet, at no cost, although drinks and food will often be on sale.

W. www.littledownrailway.org.uk

Classic BBC ribbon microphone Type A. Strictly, 'AXBT' (**photo 6**).

ME

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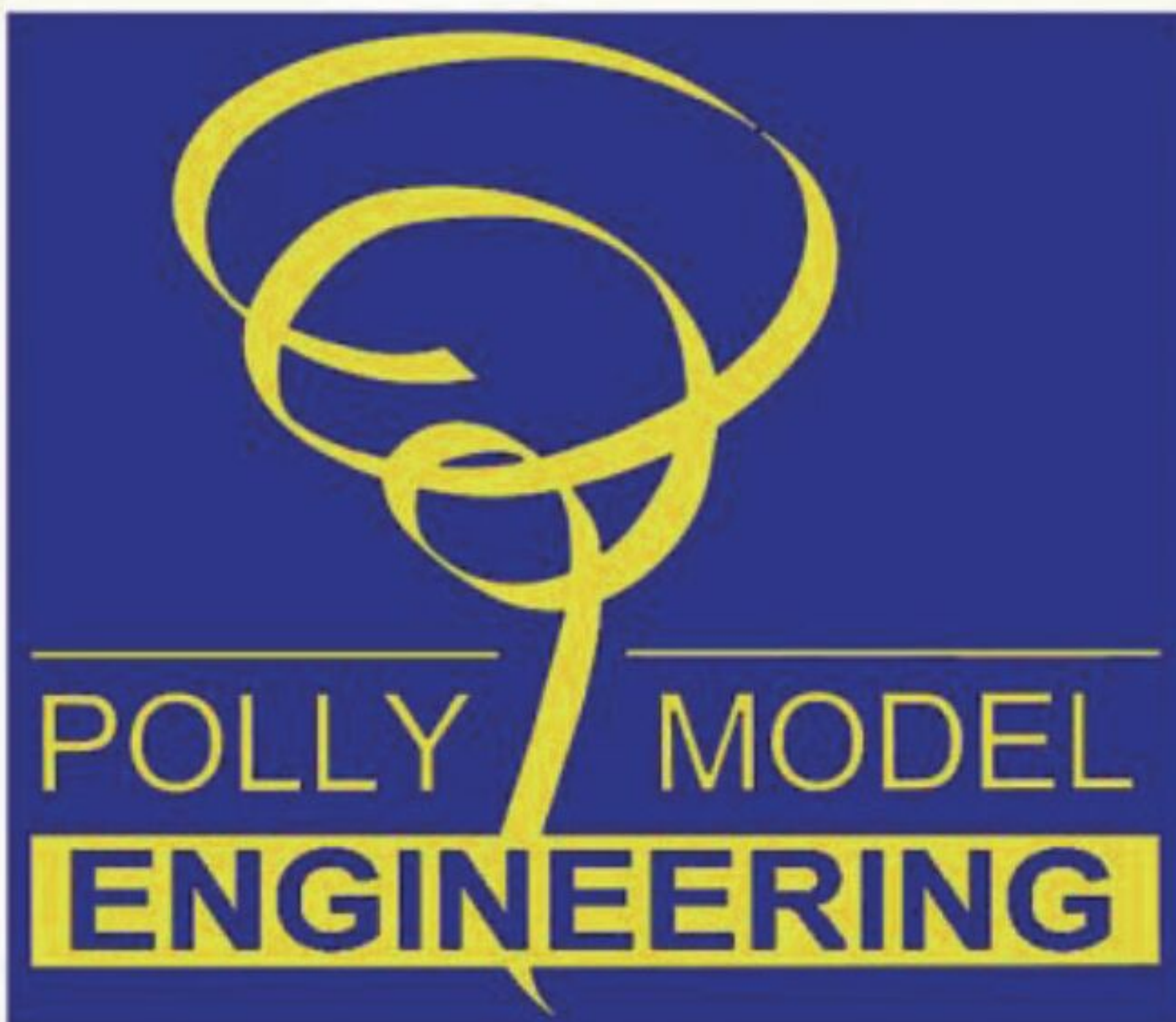


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