

THE ORIGINAL MAGAZINE FOR MODEL ENGINEERS

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MODEL ENGINEER

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Sentinel S4 No. 9086 of 1934 heads for home over Waddington Fell after a weekend steam gathering at Slaidburn in the Lancashire hills. Read Colin M. Harris' account on page 170. Photo, Steve Heyes.

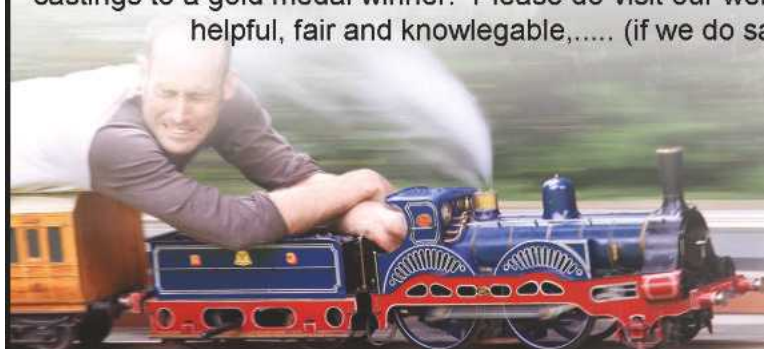
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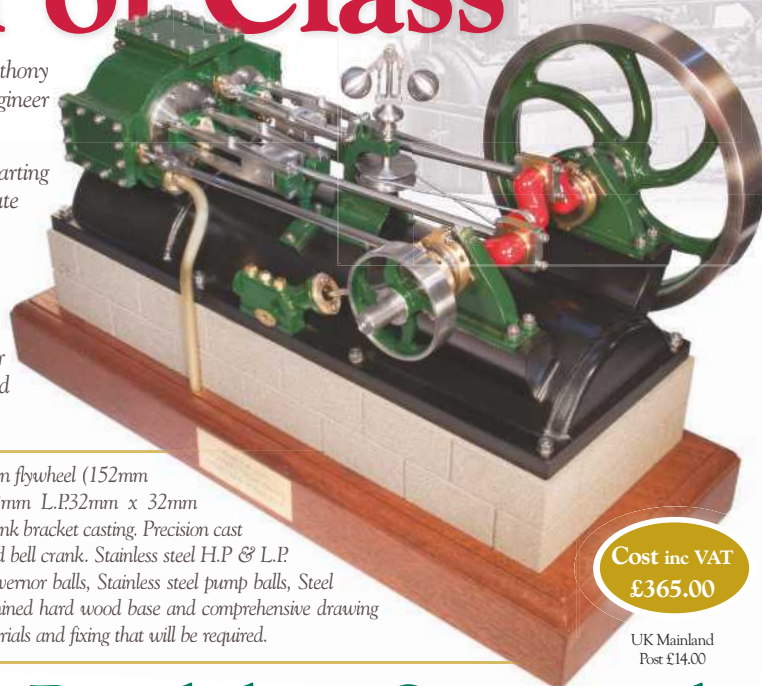
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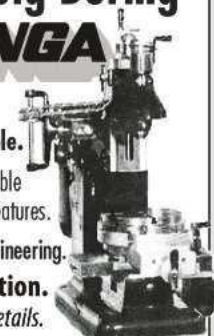
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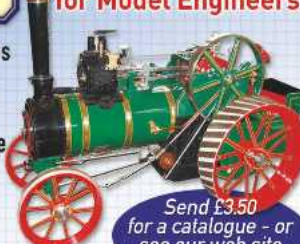
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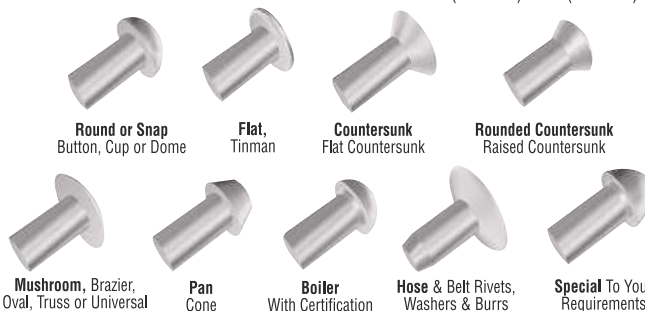
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Lord Braybrooke: 1932 - 2017

Robin Henry Charles Neville - 10th Lord Braybrooke - was born on 29 January 1932 and was but a child at the time of the outbreak of the Second World War. Upon being evacuated to Llandovery in South Wales at the age of seven, he found himself accommodated in the home of a retired Great Western Railway Guard and it was whilst here that he learned about, and became fascinated with railways - a love that stayed with him throughout his life.

Following a short career as a commissioned officer in the Command Rifle Brigade and a spell with the 3rd Battalion King's African Rifles in Kenya and Malaya he returned to England to study history at Cambridge where he graduated in 1955. He held a Pilot's licence and operated Audley End International Aerodrome from the family estate near Saffron Walden. Robin was also a keen motorcyclist, had an interest in photography and was a natural conservationist dedicated to sustainability on his Audley End estate. He Chaired the Rural Development Commission for Essex for six years and was President of the Essex County Show. The family seat, now in

the care of English Heritage, is regarded as the finest Jacobean mansion in England and his name has, in recent years, become synonymous with political debate over the question of succession and gender.

We remember him best, however, for his creation in 1964 of the Audley End Miniature Railway, a 10¼ inch gauge line that runs through the grounds of the Audley End estate of which he was most fond and with which he was actively involved for fifty years. The line, which now extends to about a mile and a half, was opened by Stirling Moss and has given much delight to families ever since. Offering much of interest, it traverses the River Cam, winds through woodland and features tunnels and halts along the way. The motive power is varied and David Curwen (Curwen and Newbury of Devizes) was responsible for supplying several locomotives. Lord Braybrooke had an affection for American outline and one of his favourites was a tremendously powerful (for its gauge) Denver & Rio Grande K36 2-8-2, *Sara Lucy*, often seen double-heading with American inspired 2-6-2 locomotive, *Bruce* based on a Sandy River & Rangely Lakes Railroad prototype. More recently another David Curwen-built engine was added to the fleet - based on Penrhy Quarry locomotives, *Linda* and *Blanche* - *Barbara Curwen* arrived in 1997. Diesel traction augments the fleet, in particular *Henrietta Jane*, a diesel hydraulic, double ended engine built by Tony Crowhurst, based on a Jamaican sugar plantation prototype.

Lord Braybrooke's wish was to have a final ride around the railway so on 14th June, the day he was laid to rest, No. 3548 Lord Braybrooke pulled a wagon containing the coffin draped with the union flag followed by No. 489 Sara Lucy pulling a four-coach train for members of the family.

Photo, Ron Greensitt.

The Saffron Walden Society of Model Engineers have, for years, enjoyed the kind hospitality of Lord Braybrooke as they run a ground level track in 5 and 7¼ inch gauges, partly alongside the 'big railway'. Jeff Dickinson from SWSME said; 'Lord Braybrooke was a remarkable man, a true gentleman and steam enthusiast; our club owes its very existence to his enthusiastic support.'

The family predecessors had some railway connection; the Eastern Counties Railway built their line through part of the estate in 1864 and consequently the coat of arms adorns Audley End Tunnel.

Lord Braybrooke's eldest (of seven surviving) daughter, Amanda Murray now runs the railway with a team of committed staff and it is a fine legacy to a dedicated railway and steam locomotive enthusiast. There will be a memorial service at St Mary's Church, Saffron Walden on 21 July at 2.30pm.

Sentinels

It would seem there might be something of a Sentinel theme running through this issue. That's certainly a fine example on our front cover! (I might be biased - that's me driving it.) There were two present at the event at Slaidburn (page 170), we also have mention of the oldest surviving in our *Engineer's Day Out* feature and possibly the newest in a product review on page 185. For anyone interested, the Sentinel Drivers Club (SDC) have recently published the "*Sentinel Model S Steam Waggon - Drivers Instruction and Maintenance*" on their website. It's quite useful, actually, because towards the back it lists, over some 12 pages, all the coal yards where we can pick up fuel - not to mention the Sentinel Service Depots and parts stockists. (Ahhh ... if only...). If you are in the vicinity, the SDC will be gathering at the Weald of Kent steam rally on 5/6 August this year.

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Technologie sans Frontières

PART 4

Dr. Ron Fitzgerald looks at English and French locomotive design in the second half of the nineteenth century.

Continued from p.23
M.E. 4563, 23 June 2017

'All steam locomotives in France are scheduled to be withdrawn by 1971. Thus will end the story of the finest locomotive work the world has ever seen; a story of highly efficient but often highly complicated machines, worked by the best trained and most competent locomotive men there have ever been.

A lot of superlatives perhaps but nobody who has studied steam locomotive work in many countries will deny their truth.' **Dr. P. Ransome-Wallis.**

30



M. de Glehn,
administrateur de la Sté alsacienne de constructions
mécaniques, qui construisit la première locomotive
compound pour grands réseaux français.
(Cliché Sté alsacienne de constr. mécaniques.)

Alfred de (patronymic von) Glehn .

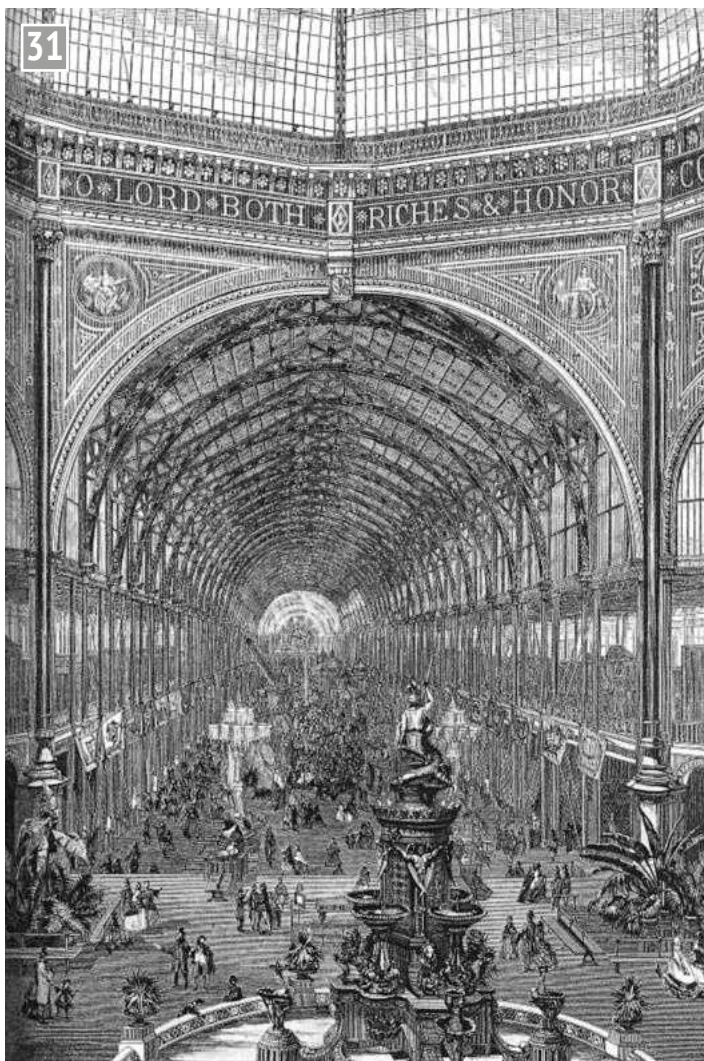
Alfred de Glehn

George Alfred von (later de) Glehn (**photo 30**) was born on the 15th September 1848 to parents, Robert William and Agnes von Glehn of Peak Hill Lodge, Sydenham in Kent. His paternal grandfather was a native of Reval (Tallinn after 1918), part of the German aristocracy that ruled Estonia under Russian suzerainty. The family held extensive estates in Estonia and doubtless the timber trade with England established the international connection. According to the census of 1851, Robert's birth took place before the move to London as he is recorded as having been born in Reval. Through his marriage to Agnes Duncan, he became a British citizen; she was Scottish and of Huguenot extraction, a distant descendant of the Bernoulli family. Like his father, Robert continued to be engaged in mercantile activity, being described towards the end of his life as a retired East India trader. At the time of the census, Robert and Agnes had ten children of whom Sophie was the eldest at 13 and George Alfred the second to youngest at two. The name

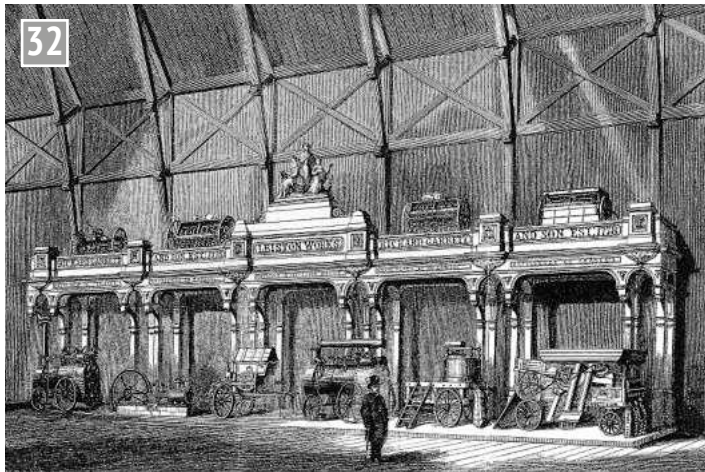
George appears rapidly to have fallen out of use.

One biographical account maintains that Alfred's eventual career in engineering was a response to seeing the machinery exhibits at the Great Exhibition held in the Crystal Palace. This seems unlikely as the exhibition was dismantled in October 1851, before Alfred had reached the age of four. Some confusion may have arisen from the fact that the glass and iron palace was re-erected in Sydenham close to his home but the engineering exhibits had been dispersed by that time. If any exhibition was influential in forming his enthusiasm for the mechanical arts it is more likely to have been the 1862 Exhibition (**photo 31**), held in Kensington on the site of the present Natural History Museum.

The same source that states that 'the Exhibition' was a formative influence maintains that de Glehn's principal interest was in agricultural machinery. The agricultural machinery builders were well



*The Great Hall of the 1862 Exhibition.
(Source: Official Catalogue of the 1862 Exhibition.)*



Richard Garrett's stand at the 1862 Exhibition.
(Source: Official Catalogue of the 1862 Exhibition.)

represented at the 1862 show (photo 32) and it was here that Thomas Aveling had his first major opportunity to display the pioneering traction engine for which he gained an award. Garrett's portable engine was also commended (photo 33).

The account of de Glehn's career continues (translated from the French):

He dreamed of becoming a farmer His parents, however, were unable to acquire land as the family was very numerous and their resources modest ... consequently, after his school years in Sydenham he took up a course at King's College where he was a very good student. After his studies were completed he attempted in vain to obtain work with agricultural machinery manufacturers. When he was 20 years old (1868) he left England and applied for work at the Le Havre dockyard where he was hired as a labourer. He was noted by the management and was on the point of being appointed draughtsman when the war was declared in 1870. The works were closed and de Glehn returned to England ... where he became attached to the 7th French Ambulance Division working in London and subsequently at the rear of the French army at Chalons sur Marne ... He then went to Zurich (Polytechnic) where he followed the courses without being an enrolled student.

The census confirms that his family was large by modern standards but not exceptionally so for the

Victorian period. As to the matter of family wealth, the house, Peak Hill Lodge, was a modest villa residence suggesting an equally modest prosperity although the family's resources appear to have been sufficient to provide Alfred with some independence of means throughout his life. Parental support would have been necessary to maintain him during his periods of education, at least.

Particular interest attaches to the two academic establishments which he attended. It was notoriously the case that Britain lacked any systematic, nationally structured organisation for training engineers and technologists before 1880. In contrast, France had been developing high level scientific and technical education from the second decade of the century through its specialist Ecole and Polytechnique institutions. These rapidly became distinguished in both teaching and research. Similar engineering and science schools arose in the eighteenth century in Germany and by the end of the nineteenth century, German polytechnics - and later, universities - were offering the best technological education in Europe. In contrast, Britain placed little premium on advanced academic technological education. The British engineering industry preferred the *ad hoc* tradition of internal

apprenticeship which, unlike taxes, did not impinge upon its profits. Against the background of similar convictions, the national government eschewed any form of state intervention.

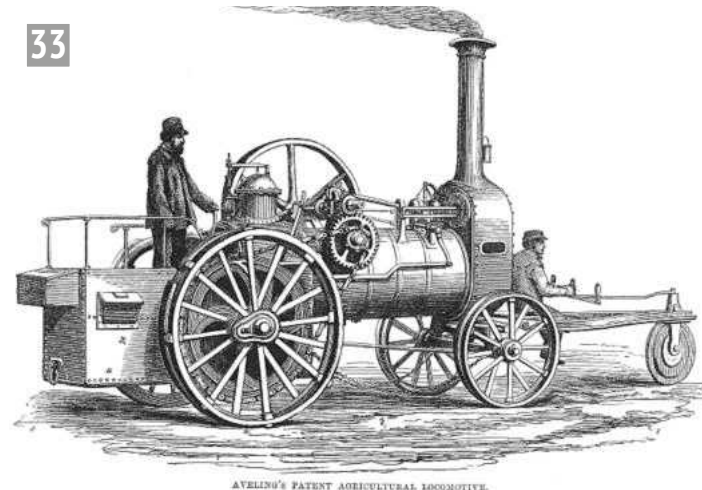
The more perceptive realised that inadequate technological education was a major British shortcoming in a world of growing international competition. Successive official and unofficial enquiries in the second half of the century emphasised the growing disparity between Britain and the rising industrial powers of France and Germany. In the newer science based industries such as chemical and electrical engineering, German competition was chilling the soul of British industrialists and even in traditional areas such as textiles, mining and railway engineering the German and, to a lesser extent, the French and Belgian lead was becoming obvious. In spite of this, much of industry continued to fight a rearguard action against state sponsored technical education and scorned academic qualifications.

This background highlights the distinctive character of Alfred de Glehn's pathway into his chosen career. A more conventional approach to entry into the British engineering profession would have been for his father to have secured a premium apprenticeship

for his son at one of the large engineering concerns. It is tempting to assume that Robert von Glehn, with his cosmopolitan background and his commercial connections with mainland Europe, saw the limitations of this method of training and instead opted to send Alfred to King's College in London.

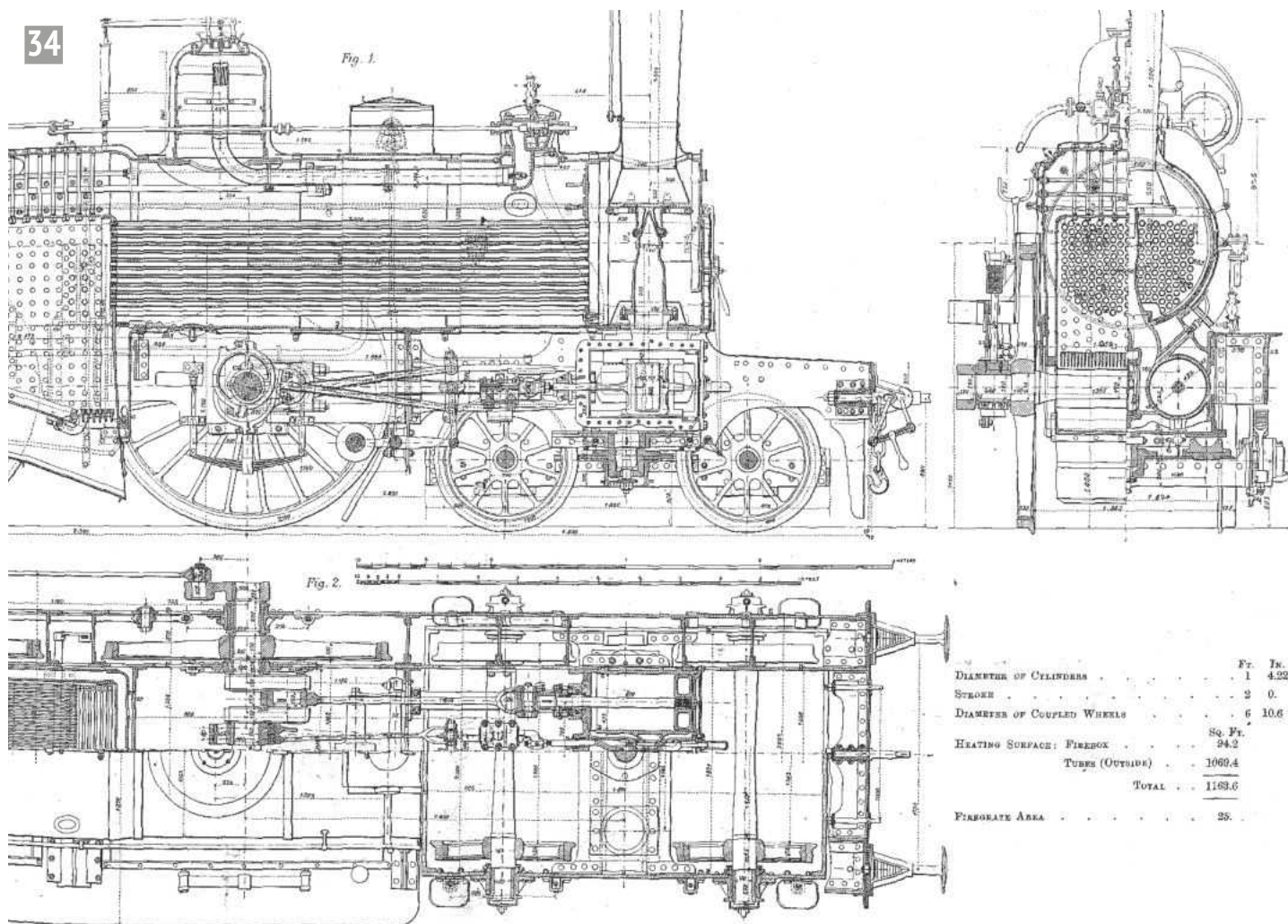
King's College was one of a handful of English academic institutions to offer high quality scientific and technological education. Its origins lay in the later eighteenth century when it had been founded as an Anglican rival to the non-conformist University College. King's College was a deeply establishment foundation; members of staff were required to be members of the Anglican Communion, although this was not demanded of students. Bathed in an ambience of Anglican piety, the purpose of King's college was twofold: to prepare its students for commercial and professional life and to give preliminary training to those who wished to go on to Oxford or Cambridge to read for a degree.

King's was part of the British tradition of liberal education and made no attempt to turn out specialists. This did not prevent the staff from being of the highest academic calibre. The Rev. Henry Moseley was the Professor of Natural Philosophy (which embraced all engineering



Charles Burrell's Traction Engine shown at the 1862 Exhibition.
(Source: Official Catalogue of the 1862 Exhibition.)

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Cross-sections of fixed pivot bogie Outrance. (Engineering, April 16th 1880, p. 303.)

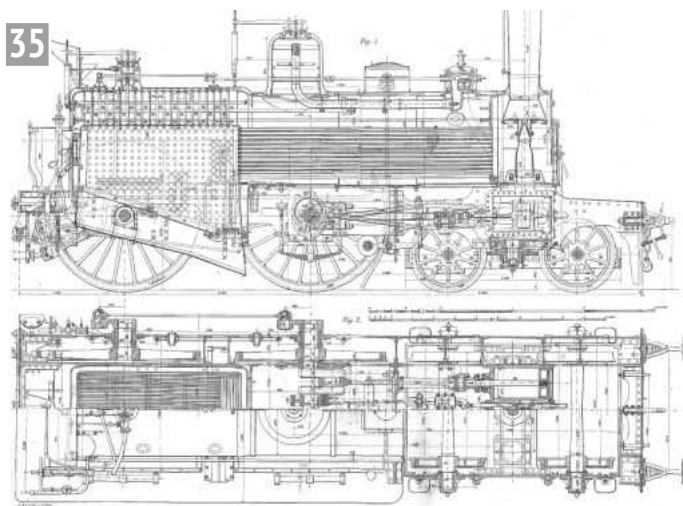
subjects at that time) and had been a seventh Wrangler in the Cambridge Tripos. He was part of the Cambridge revolution in mathematics and his *Mechanical Principles of Engineering and Architecture*, published in 1843, was the first English language study of analytical mathematics applied to structural and mechanical engineering. J. F. Daniell held the chair in chemistry and the head of geology was Charles Lyell, the founder of scientific geology. Charles Wheatstone succeeded Moseley as Professor of Experimental Philosophy and he would have been tenured at the time that Alfred de Glehn was a student.

Details of Alfred von Glehn's attendance at King's survive in the college's archives. He entered the Department of Applied Sciences in 1866 at the age of 17. The entry papers record that he had received his initial education at Blackheath

Proprietary School under the headmaster, the Rev. E. Selwyn. The subjects that he studied at King's were Divinity, Mathematics, Mechanics, Arts of Construction, Chemistry, Geology, Mineralogy, Manufacturing Art, Geometrical Drawing, Surveying and Workshop. He was exempted from Chapel. His attendance record was generally very good but as to his being ... 'a very good student' ... the register entries never rose above moderate, fair or satisfactory and, on occasion, doubtful or indifferent. He left in the summer of 1868 having completed the full course.

There were numerous major engineering concerns that might have offered employment within ten miles of his home and one of the greatest marine engineering firms of the day was located in Blackheath;

35



Cross section of fixed pivot bogie showing hemispherical bearers. (Engineering, April 16th 1880, p. 303.)

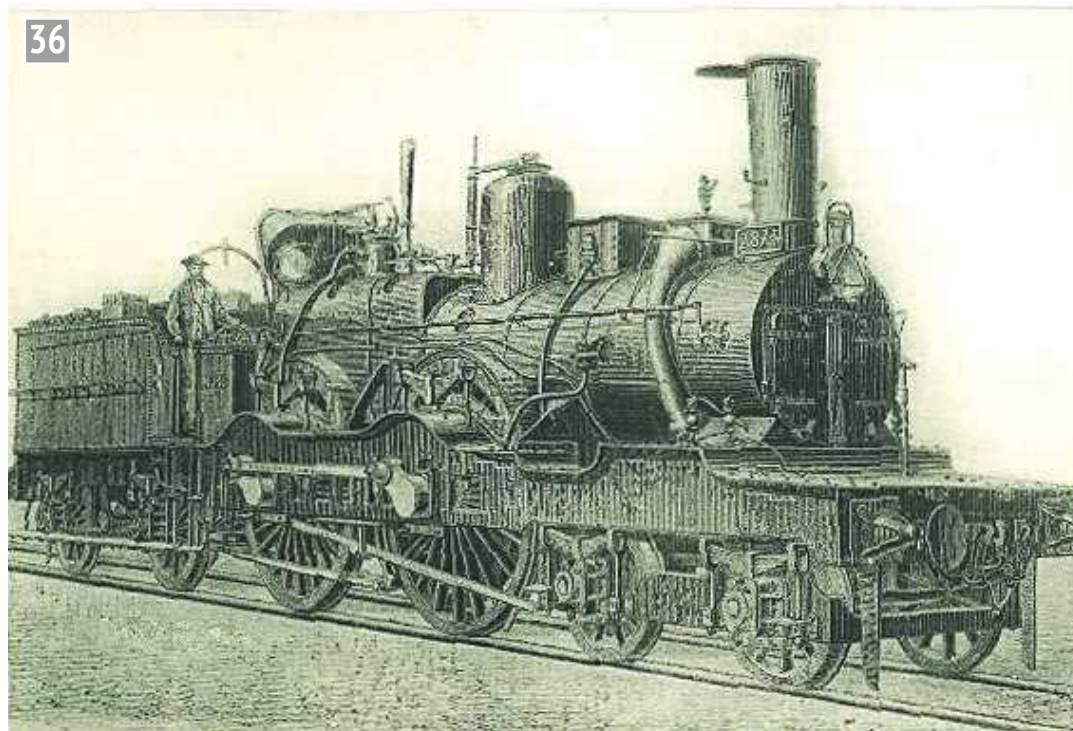
John Penn and Sons. If he approached these concerns it has gone unrecorded and it is not possible today to determine why he failed to gain employment with the English agricultural engineering firms that the above biography states that

he favoured. His migration to France was eased by his abilities in European languages, but subsequent progress at the Le Havre naval dockyard was disrupted by the Franco-Prussian war. The sequel was a continuation of his education at Zurich

Polytechnic and again his choice of academic institution is of interest.

Zurich Polytechnic was at the forefront of developments in the new science of thermodynamics. Clausius, of entropy fame, Zeuner, whose valve diagram is still familiar in these pages and Linde who founded the modern refrigeration industry were all at Zurich. Moreover, Zurich lay within a belt extending from Munich to Belgium that the great British authority on the steam engine, D. K. Clark, recognised as the new centre of gravity of European steam engine building. The region of Alsace was the focus of this rising force in engineering technology and through the work of G. A. Hirn and his assistant M. O. Hallauer, it was attaining pre-eminence in the scientific analysis of steam power. Hirn and Hallauer's investigations in the eighteen-sixties and seventies conclusively demonstrated the advantages of superheating. Alfred de Glehn's education at King's and Zurich implies that he was academically better equipped in his chosen subject than the vast majority of his counterpart engineers back in Britain. In fact, his education was much more comparable to the rising generation of continental engineers.

In the autumn of 1872 de Glehn applied to the recently formed Société Alsacienne de Constructions Mécaniques for employment. The initial reaction to his approach was not favourable; the textile machinery department was fully staffed whilst the head of the stationary engine division was not inclined to entrust his trade secrets to an Englishman. De Glehn then approached Edouard Beugniot, apparently applying to him at his house and offering to work without pay. Beugniot was persuaded and de Glehn was given an unpaid trial as a draughtsman in the locomotive studies department. This was sufficient to make an impression and after twelve



Three-quarter front view of L'Outrance. (Source unknown.)

months he was elevated to the status of a salaried employee at the modest emolument of 100 Francs per month. Paradoxically, in view of the attitude of the stationary engine department manager, de Glehn's language talents proved a major asset and under Beugniot, de Glehn's career advanced. In 1875 he was appointed head of the locomotive research section.

Shortly after taking up the post, de Glehn was confronted with the delinquencies of the Nord Delabèque 2.821 class. Delebecque and Bandalari's attempts to resolve the instability problem by applying the fixed pivot bogie have already been discussed and a number of locomotive historians include S.A.C.M. and de Glehn as partners in this exercise. Some go further and accord de Glehn a central role in lengthening the front end of the locomotive and applying the new bogie. It is notably the case that in June 1877, when the fixed-pivot bogie version of Delabèque's Belpaire firebox Outrance class emerged from the Mulhouse works, the bogie had several characteristic features of the later, well known, Alsace Bogie (photos 34 and 35).

Although the rebuilding resulted in France's first 4-4-0, the claim was insecure as the fixed pivot bogie remained suspect. It did not survive into the following 2.834 batch which reverted to the earlier form of 2-4-0 construction using a radial axlebox leading axle. De Glehn's talents evidently outweighed the lack of success that attended the first rebuilding of the Nord locomotives and a few days before he died in 1878, Beugniot nominated de Glehn as the head of the locomotive department. **Photograph 36** shows a three-quarter front view of L'Outrance.

Notwithstanding its shortcomings, the great power of the Delabèques in both 2-4-0 and 4-4-0 guises made them the mainstay of the heaviest and fastest trains on the Nord but penalties continued to be incurred as the incidence of broken crank axles increased. In 1886 the eminent French railway engineer, Edward Sauvage, read a paper on crankshaft failure as experienced by the Nord railway between 1881 and 1885. There had been 158 defective crank axles reported of which 58 entailed total fracture. The majority

related to crankpin breakage. The most significant offenders were the Delabèques. In 1884 the matter again passed to S.A.C.M. where, it would appear that de Glehn decided that the central problem lay in excessive stress on the crank axle arising from the high loading that the cylinders exerted.

He considered the problem for two years and his eventual solution was to divide the same energy release between more than two cylinders. Configurations of more than two cylinders had been tried previously to increase the power of the locomotive but the experience had shown that applying full boiler pressure invariably overtaxed the boiler. De Glehn's masterstroke was to adopt compound expansion. By this means the same quantity of boiler steam that had entered the Delabèque's two cylinders would yield its energy by progressive expansion across a greater number of cylinders of (hopefully) equal power output, with correspondingly lower crankshaft stresses.

●To be continued.

A Rotary Valved Engine

James Wells makes an experimental model.

The piston engine with poppet valves has remained virtually unchanged since the dawn of internal combustion. The reciprocating poppet valve with rotary crankshaft have a long and proven track record but there have been various attempts to use rotary valves.

While a university lecturer, at almost regular intervals a student - and at least one professional vehicle mechanic - had asked me why rotary valves weren't used in I/C engines. Consulting the various text books a typical answer was to dismiss the whole thing with 'the advantages never became obvious' despite some ingenious attempts. No clear-cut answer for failure emerged and so I decided to enquire further.

There has been some success with using rotary valves in I/C practice but seemingly at the cost of increased complexity. Details of the two most workable systems may be found in *Automobile Engines* by the late Professor Church.

As there have been a few comments and enquiries about rotary valves used in steam engines within *Model Engineer*, this seemed to be a useful starting point and the steam cycle requiring the valve to rotate at crankshaft speeds simplified construction as reduction gearing became unnecessary.

Sketching out a simple steam engine on paper, it soon became obvious that the rotary valve was either to be mounted on the end of the crankshaft with steam pipe linkages for inlet and exhaust, or on the head and with a simple belt or chain drive to the crankshaft. Being unable to locate a small sized bicycle type chain and sprockets, and as a simple belt drive was liable to slippage, the simplicity and advantages of the former arrangement became obvious.

Most of the materials came from the scrap box with the cast iron sourced from a broken bench vice although Reeves supplied the pipe connections, drills and taps for cutting the threads. The general construction is manufactured from aluminium with a cast iron liner, piston and valve. Swept dimensions are $\frac{5}{8}$ inch bore and $\frac{3}{4}$ inch stroke. As the steam passages seemed to be longer than usual, with the possibility of condensation reaching the cylinder whilst warming through, I decided to fit a cylinder drain valve.

Although construction was fairly straightforward there were a few problems encountered. The first was that after assembly; the moving parts would only turn very stiffly. Having carefully relieved all the obvious places, the problem still remained. It was only later that I noticed the block moving fractionally as I tightened it in place. Having prevented this, the whole thing fitted nicely in place with free movement.

The other problem was more profound. Despite my most careful efforts, I was never able to construct a completely steam tight rotary valve that would also turn reasonably freely. At best, there was a slight steam leak.

With the steam experiments completed, taking the rotary valve idea into I/C then seemed unnecessary as the probable answer to the original question now seemed fairly obvious.

Although the steam cycle can have a high inlet pressure, there isn't a combustion explosion as such. So at least the requirement for the valve to keep rotating against the inlet pressure could possibly be reasonably easily met in steam practice but not in I/C.



Photograph by the
Photographic Lounge, Billericay.

For internal combustion, the poppet valve is down on its seat as a violent explosion occurs and washes over the same seated valve. No direct movement directly against the combustion force is required. In contrast, for mechanical reasons the rotary valve has to keep rotating against the force of combustion. Ideally, the moving rotary valve should be able to halt for the combustion stroke and continue movement after combustion. The technical difficulties of arranging such an intermittent movement are far more easily met by the poppet valve.

It was my conclusion that these are the probable and simple, practical, reasons why rotary valves aren't used in I/C practice and not common in steam practice.

In the years since I first advanced this explanation and using the model, this conclusion seems to have been reasonably well accepted and which in turn seems to lead back to Half Breed engines. When a steam engine was converted to internal combustion, the poppet valve was the usually chosen system.

ME

The ENV Aero Engine

Stephen Wessel continues an occasional series on the construction of an elusive prototype.



Following on from my introductory article in *M.E.* 4550, 23 December 2016, this article will cover the finishing of the crankcase, the crankshaft and its installation, the oil and water pumps and finally the cylinders. As this isn't a step by step 'how to make it' kind of piece I shall stick to generalities, concentrating on the more interesting design matters rather than detailed machine set-ups.

An important alignment issue concerned the tappets and valve stems; the former take their positions from the already machined crankcase while the valves take theirs from the cylinders to which they are inclined at 3 degrees. Any mismatch between the top of the tappet and the valve stem would be very obvious so a jig was needed to hold the valve housings in their correct positions during brazing. **Photograph 13** shows how this was done.

Two straight rods were screwed into the tappet guide holes, the bare cylinder placed firmly over its studs and a special transfer plate clamped around it to 'record'

the position of the rods relative to the cylinder. The cylinder was then removed with the transfer plate in place. The cylinder head was clamped on, alignment checked and the two valve guides installed with a rod going through each and into the transfer plate. These short rods would stay in place during brazing. Providing the various bores in the head were correct this should mean the valve stems will align accurately with the tappets (**photo 14**).

The final brazing was one of those jobs where you have only one chance to get it right. If anything were to move out of alignment it might be nigh on impossible to remelt just one joint without all the others joining in the fun. Never underestimate the power of capillary forces during soldering and never rely on a 'tight' fit remaining tight when red hot. The molten solder acts like oil and Mr. Sod is hovering over the job in high expectation of chaos. Pins are the answer. I drilled a couple of $\frac{1}{16}$ holes through each existing joint and through the new joints before fluxing, then with flux in place, hammered in small nails.

In fact, it all went well. I used Tenacity 5 flux with the American Easyflo 45 which flew around and right through all the joints leaving a visible

witness on the inside. Pickling in 10% sulphuric acid for half an hour got rid of the flux and mill scale. Once completely dry I grit blasted all eight cylinder assemblies and checked thoroughly for defects. There were a couple of suspect joints so back to the fire for them; plenty of flux, a bit more solder and the job was complete (**photo 15**).

Final boring

The last machining operation on the now complete cylinder units was to bore to final size taking off about 0.020 inch, internal grind then hone each one, the object being to get them round, parallel, smooth and all the same.

The cylinder was supported by a threaded mandrel screwed into the top of the unit and a fixed steady around the lower end. Power was transmitted not by this rather small thread ($\frac{3}{8}$ x 32) but by dog, as for between centres turning. The three support jaws of the steady were not used and fully retracted out of the way. There were two reasons for this: firstly the impossibility of centring the job on the lathe axis (if this is not done the bores would be tapered) and secondly because to get sufficient rigidity for boring without chatter the pads would have to be closed down too tightly on the not perfectly smooth exterior of the cylinder to allow free rotation. The solution was to mount a large ball bearing on the outer face of the steady; this was housed in a thick plastic ring which was accurately centred and dowelled to a previously machined face on the steady. A thin aluminium sleeve was fitted between cylinder and the inner race. This set-up would allow each cylinder to be installed without moving the steady and provided



13
Transfer plate clamped around the lower part of the cylinder. Adjustable bushes register the exact position of the two rods that represent tappet axes.



14
Cylinder head and two valve housings being lined up with the transfer plate. Various pins and screws hold everything in place during brazing.

enough rigidity in the system for clean boring.

Before tackling this task, which I knew would be very difficult, I spent some time experimenting with my air driven die grinder to see how much metal it could be expected to remove, given that my compressor has only 50 litres. The answer was not much, maybe a thou or two. Final honing would not, from experience using one of those little three-legged jobs in a portable drill, remove more than a few tenths. This meant that the boring would have to be accurate with a decent finish. If the material had been either stainless, cast iron, free-cutting mild steel or non-ferrous, this might not have been so hard but I had chosen one of the worst, something akin to bog-standard EN3. No matter what shape the tool is - and even if there is no chatter - the material tends to tear every now and then, leaving micro grooves about a thou deep. Coolant doesn't always help. With external turning you can get over it with emery cloth and such like but that isn't an option for bores.

In the event I achieved a reasonable finish by boring, leaving just 0.003 to 0.004 inch on diameter to be ground out. Die grinders are not designed to be bolted down rigidly but rely on the cushioning effect of hands to reduce bearing shock loads. Mine was old but hadn't had much use; I thought it worth a try, with maximum lubrication from the air line (**photo 16**). I used a 35mm mounted wheel and dressed it frequently to remove glaze. The best finish was obtained by working only in the right to left direction using the self-act at 0.0036 inch per rev. Accuracy was within about 0.0005 inch from end to end but there were unpredictable variations along each bore and from one cylinder to the next; I put these down to too many degrees of flexure in the whole set-up, from the lathe carriage right through to the die grinder spindle.



15 *Finished cylinders. Note the valve housings set at 3 degrees to the main axis. The weld is almost invisible. The copper jackets will bond to the brass flanges.*

Incidentally, people make a lot of fuss about grinding grit getting on to slideways and ruining them. In practice, if the wheel is going at the right speed and is dressed somewhere else (like outside) there shouldn't be any grit. I tested this idea by collecting a lot of the black grime accumulating in one cylinder, swirling it around with petrol in a test tube and then drawing it up the side of the tube with a magnet on the outside. Any grit would be left behind at the bottom. There wasn't a trace. All the stuff that looked like grit was steel. Things still need cleaning down, of course, but the chuck seems to collect most of the

muck and can't be protected. After a couple of days of this my lathe is quite unharmed.

Honing was carried out using one of the cheap, three-leg self-centring tools available from our suppliers. It took a long time to remove any significant metal at all; great patience was needed. It was tempting to crank up the speed and put on maximum pressure but I found this made no difference to the cutting rate. Frequent measurements were taken with the bore gauge until all cylinders were more or less in agreement within about 0.0005 inch. The final criss-cross patterning was done with fresh stones and a slow speed cordless drill.

Each cylinder was then hydraulically tested for leaks up to about 100psi. Luckily none were found.

The final job will be to plug the small alignment holes and then to paint the exteriors that will be in contact with cooling water with a tough epoxy mastic to prevent corrosion.

Before making the copper jackets I intend to get on with pistons and valves in order to reach a point where the cylinders require less handling. All that will be the subject of the next article, meanwhile **photo 17** shows progress to date.



16 *Set-up for internal grinding. Note the ball race fitted to the steady. This was set accurately to the lathe axis and dowed to the steady so it could be removed and replaced as necessary during operations.*



17 *The engine taking shape.*

ME



Keith Dickinson constructs a clock driven by means of neodymium magnets.



Eight-Day Table Clock

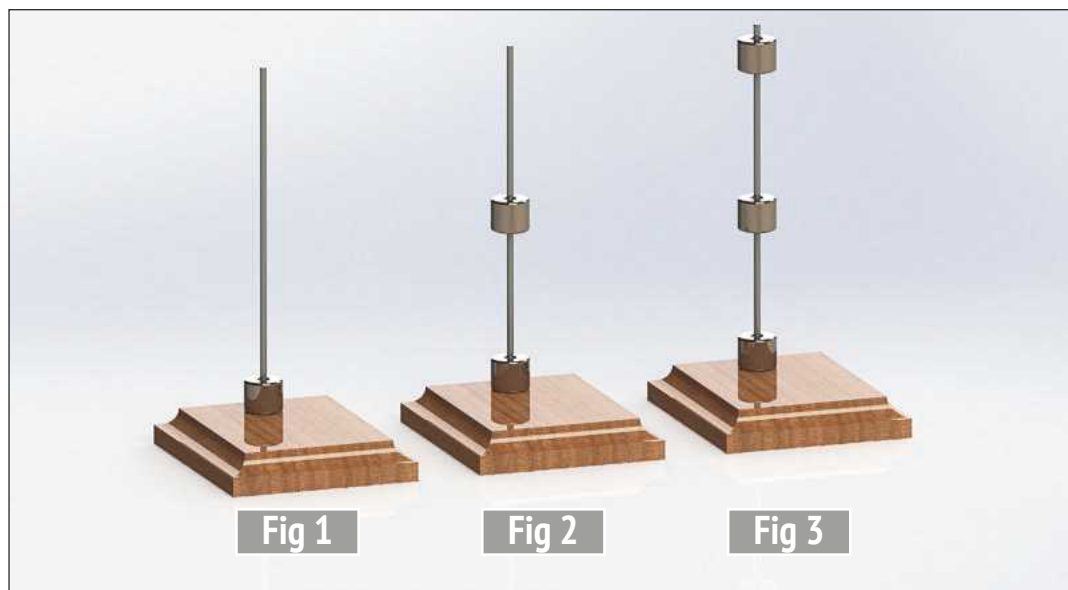
*The completed clock.
The article describes the
mechanism that drives it.*

The story of this clock started after spending a few evenings researching neodymium magnets. There are several companies advertising them on the Internet and I shall provide a couple of links to follow at [ref 1](#).

Neodymium magnets are the most widely used type of rare-earth magnet. They are made from an alloy of neodymium, iron and boron and are permanent. About 97% of the rare earth is mined in China. The magnets are sintered into a shape and then nickel plated. They can be purchased in many strengths and N52 is the most powerful.

The object of this article was not to write a 'how to build' series. I wanted to write about how I started from scratch to design and build a magnetic clock. There are photographs of the finished clock as well as bits of the clock which are there for interest. There is also a short 20 second video you can watch ([ref 2](#)).

I started by purchasing 5 magnets to do some experimental work. The magnets arrived by post in a cardboard box; inside the box each magnet was in a separate plastic container and all the magnets were attracted together. A word of warning here, the magnets are brittle and are very strong. If you hold apart two magnets that are attracting each other and slowly bring them together, as the distance reduces a point will be reached where they will suddenly snap together. If flesh gets trapped in-between it will cause damage. These magnets are incredibly powerful! If two magnets collide then almost certainly they will chip and fragments can fly off. It is best to store them securely in a wooded block with recessed holes bored to hold each magnet such that they cannot collide or jump out and cause havoc. If you do end up with two magnets stuck together then it is impossible to pull them apart by hand. By holding them over the edge of the bench they may be slid apart but even this is difficult.



I first decided to start with the magnets in repel. Two magnets will repel if similar poles are held together - N-N or S-S. The following experiment takes a few minutes to put together and is fun. Have a go even if you are not into clock making. The rod was 6mm diameter and about 300mm long. The magnets used were 30mm diameter, 25mm high with a 6.5mm central hole. Don't forget they are powerful magnets!

Figure 1 shows a simple wooden block into which

are 'in repel' so push each other apart - but gravity is pushing down. The system will be balanced or in equilibrium when the gravitational force pushing the upper one down is exactly equal to the force pushing the magnets apart. If you try and force the top magnet down it will be easy at first but become increasingly difficult and if you can push down with roughly 40Kg force then the two magnets will touch. In **fig 2** the top magnet has north facing down therefore south is facing up.

both spaces so the travel will be doubled.

The magnets will be able to spin quite freely on the rod.

Companies that supply magnets usually also have available a calculator to give information on their magnets' properties. On the one I used you first selected which type of magnet; in this case neodymium, then the strength, which for me was N52.

Now, somewhere in the calculator software will be a part where you can insert the distance between two magnets. You can input information on whether they are in repel or attract. Select 'attract'. Finally hit 'go' and a generated force should be displayed.

You need to watch the units. I always use millimetre kilogram.

To understand the true nature of these magnets and start the design of a clock drive mechanism I drew a force/ distance graph. By putting into the calculator a series of distances - 5mm, 10mm, 15mm, 20mm and so on - their relative force can be displayed in a simple line graph. I used Excel but there is free software on the Internet and you can even buy graph paper in supermarkets.

The graph shown (**fig 4**) is a force/ distance graph. Looking at the blue graph, it shows the relationship between two magnets. If the magnets are held 20mm apart then the repelling force between them

These magnets are incredibly powerful! If two magnets collide then almost certainly they will chip and fragments can fly off. It is best to store them securely in a wooded block with recessed holes bored to hold each magnet such that they cannot collide or jump out and cause havoc.

is fitted a non-magnetic, stainless steel rod. I used stainless steel but brass or aluminium would do for this experiment. A neodymium type N52 magnet is resting at the bottom of the rod. It has the north face pointing upwards.

If you now place a second magnet as shown in **fig 2** with north down, it will be suspended in mid-air and in equilibrium. The two magnets

In **fig 3** a third magnet with south facing down is slid onto the rod. The magnets will be suspended in equilibrium with slightly different gaps between them. The lowest magnet will be supporting the top two but the middle magnet will only need to support just the upper magnet. If you now press down the top magnet you will still need 40Kg force to close them but you will need to close

will be about 5Kg. If you hold them about 10mm apart then the force between them will be about 10Kg. To totally close the distance between them, then you will need about 40Kg force.

Look at the nature of the force. The closer the magnets are, the greater the repelling force becomes. The line of the graph is neither straight nor horizontal. The response is not linear and the non-linearity increases as the distance between the magnets closes.

Referring to the graph again, the pink line show what will happen if five magnets or four magnet pairs were used. The total compression force remains the same, that is 40Kg force to close the magnets together but the total distance through which the magnets move is now around 80mm. That is four times that of two magnets.

Figure 5 shows five magnets on a rod with a collar at the top fixed on with a grub screw. A weight is fixed at the lower end of the rod. The rod is free to slide up and down. Again, the system is in equilibrium. The weight is pulling down, due to gravity but the magnets are all repelling each other, N-N S-S N-N S-S and supplying the equal and opposite reaction.

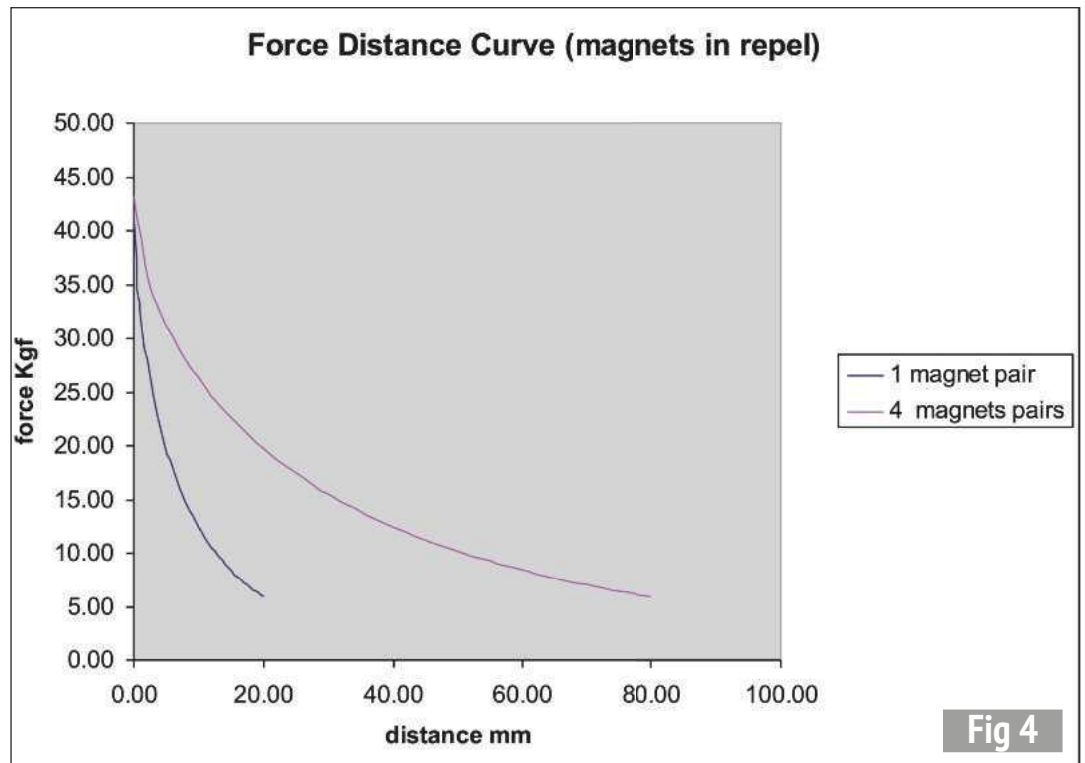
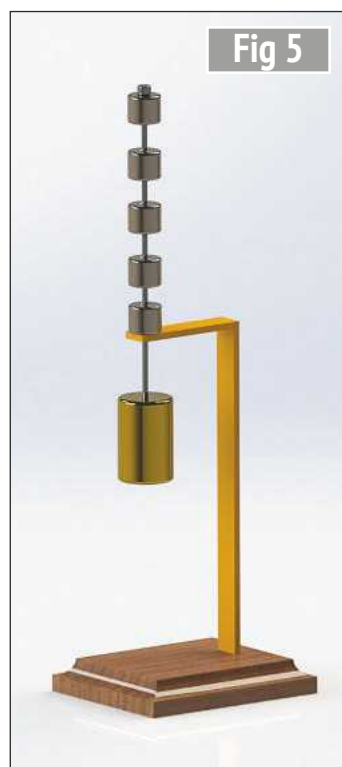


Fig 4

The magnets are much closer together now due to the heavy weight. The spaces between the magnets are now very similar. The middle three magnets can be spun on the rod, they are only fixed in the vertical axis. We now have a magnetic spring-mass system.

The magnetic spring has a few properties that need modifying before it can be

used to drive a clock. The forces are very high - tens of kilograms - and they act over a small distance. The opposite would have been more useful. I wanted a smooth linear force that acted over a large distance. The force also acts vertically and would need to be converted into a rotary action.

The next task was to design a method to convert the

vertical action to rotary.

I discovered a solution one day while out walking. The jib of a crane with its pulley system was the clue.

When using a block and tackle, say, to lift a car engine, a heavy weight can be lifted quite easily by pulling on a chain or rope. In the diagram (**fig 6**) the weight W can be lifted by pulling the line marked 'pull'.

The force pulling needed to lift the weight is only half that of the weight but for every metre the weight is lifted, the line must be pulled two. As there are two lines supporting the weight, so the mechanical

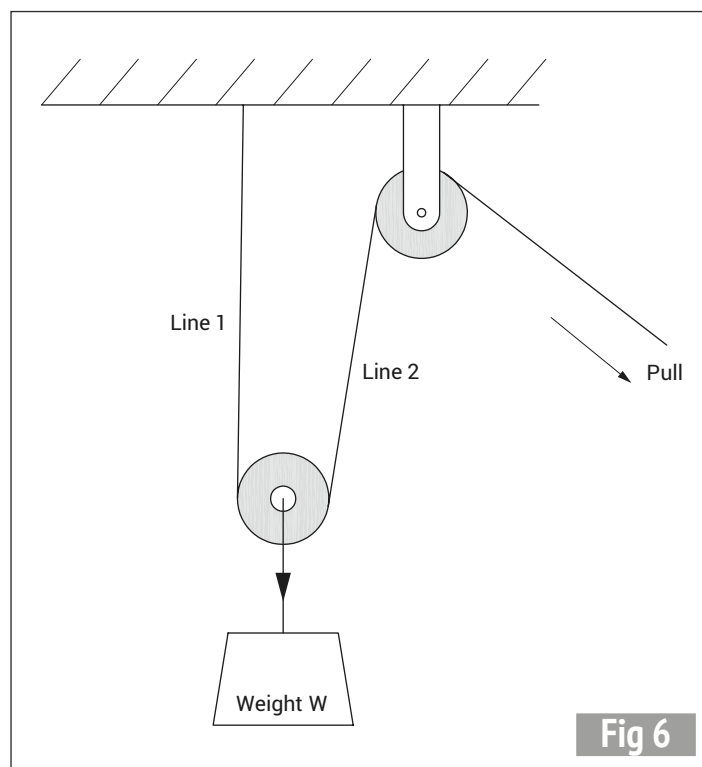


Fig 6

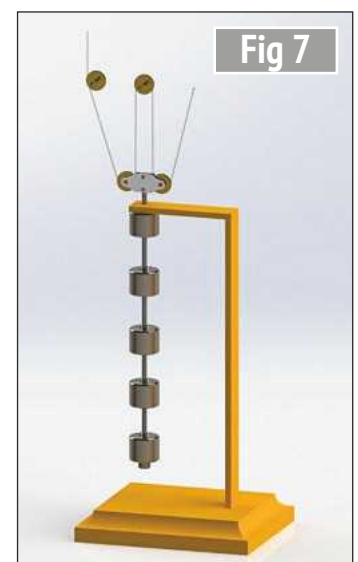
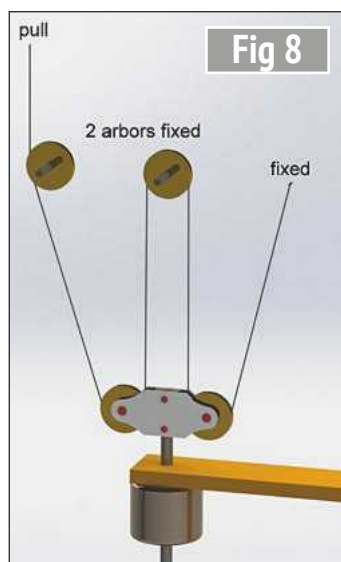


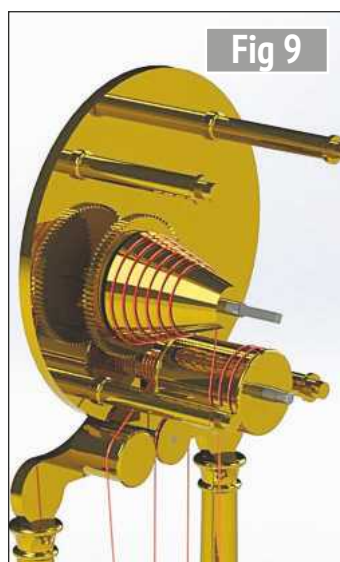
Fig 7



advantage is two. An important thing to notice here is that line 1 and line 2 carry the weight between them.

Figures 7 and 8 describe my final solution. The line marked pull in fig 8 closes the powerful magnet system with an easy and smooth action. The pulley system has four lines so has a mechanical advantage of 4. The line force is reduced by this factor, which is very important for the line selection.

Figure 9 shows how the pulley system was arranged into the actual clock. The line from the magnet pulley system is wound round the small



end of a barrel. The large end of the barrel feeds a fusée. Incidentally there is of course another mechanical advantage through the barrel.

The fusée is put there to linearise the force coming from the magnets via the barrel - but more of that latter. On the right-hand side of the fusée - which is the front of the clock - is a winding square which is used to wind up the clock. At the back of the clock is another winding square from the barrel. This is deliberately put at the back and out of the way. It allows the line to be fed into the pulley system when

The next task was to design a method to convert the vertical action to rotary. I discovered a solution one day while out walking. The jib of a crane with its pulley system was the clue.

assembling the clock and is essential for setting up the fusée. Again, more on that later.

Figure 10 shows a force distance graph for four pairs of magnets or five magnets in repel. When the distance between the magnets is zero, the magnet pairs are touching. The force repelling them apart is around 45Kg F. To the right-hand end of the graph, where the distance between the magnets is getting greater, the force reduces and, of course, eventually will become zero. In a practical system, the right-hand end is not only limited by the space available to locate the magnets but by the simple fact that the available force developed is so small that it becomes useless. For that reason, five magnets seemed to be the limit.

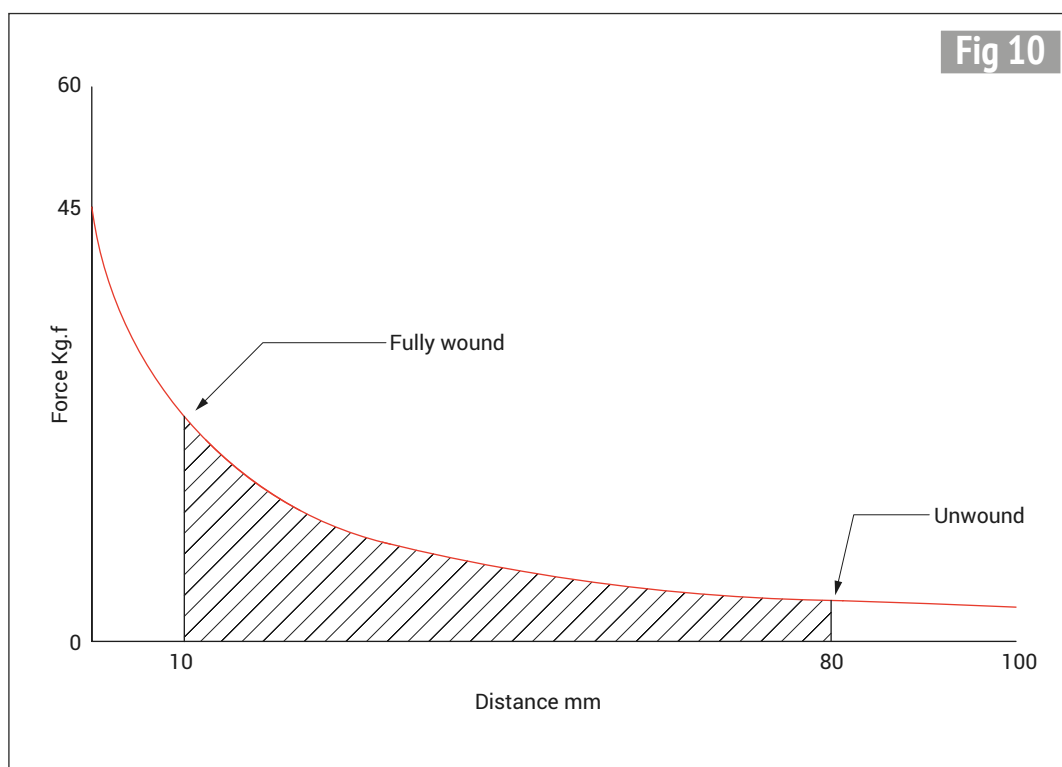
On the left-hand end dealing with the large force generated is troublesome. In addition to all this is the problem of non-linearity of the forces

developed by the magnets. Figure 10 shows how a limited range of the graph was chosen. This area was chosen because it avoided the large non-linearity of the left end of the graph but did not use too much of the right (low force) end. Shown on the graph are the fully wound and unwound limits.

The duration of a clock is the time taken for the clock to run from fully wound to unwound. I decided on eight days. Looking again at the graph in fig 10 reveals more information. The area under the curve, between the fully wound and unwound state, is the work done by the magnets. If you divide the work done in the selected area by its distance, in this case 70mm, then you have the average force available for the duration of the clock. That is assuming the fusée is performing perfectly.

Designing and machining the fusée was a problem. Correcting the non-linearity of the magnets required the fusée to be very curved and was difficult to machine. I cut myself some slack here and reasoned that providing the large and small ends of the fusée were correct in diameter, then the bit between, even if it was a cone shape, would have a large correction factor. Curving it to the best I could do gave me the practical fusée. I used a 'fusée iron' to stop any over winding in the finished clock.

●To be continued.



REFERENCES

1. www.kjmagnetics.com/calculator.asp An excellent site for calculating forces.
2. www.kjmagnetics.com/neomaginfo.asp Hours of reading here.
3. www.youtube.com/watch?v=6wRR_6cwbTU

Grampian Transport Museum

Roger Backhouse visits Aberdeenshire's flagship museum of historic vehicles.



West Aberdeenshire is better known for farming, forestry and fishing but engineering interest is rarely far away. The small town of Alford boasts two fascinating museum collections.

G rampian Transport Museum is a professionally presented collection, mostly of restored road vehicles, near the town's former railway station (photo 1). What you see, should you pay a visit, may not be exactly as described here as around a third of the exhibition is changed annually during the closed winter months. Many exhibits come from private individuals and other museums.



Grampian Transport Museum entrance.



Large gasworks had their own railways. This Barclay tank worked at Aberdeen.



Barclay tank engine maker's plate.

Many exhibits are in good condition but museum policy is not to interfere with anything original if it can be avoided. For example, they would never paint over original paintwork. Many items displayed may have been restored by owners.

There's an extensive records library not generally open to the public but the museum tries to help with specific requests. On site is a



Locomotive models in the museum though the maker is unknown.



Nicely made Tich model. The museum will hold an exhibition of engineering miniatures in 2017.



Foster Wellington steam tractor made for the War Department but not used until 1922. It hauled peat in Aberdeenshire.

Collection Centre, part owned by the Aberdeen & District Transport Preservation Trust. Their buses are stored in their section of the building and are sometimes out for events, but don't form part of the museum.

Railways

Outside is a former Aberdeen gasworks 0-4-0 tank engine made by Barclays of Kilmarnock in 1926 displayed as a static exhibit. Another museum engine is currently loaned to the Royal Deeside Railway to operate services on their short line (photos 2 and 3).

Model locomotives inside (photo 4) include a nicely made Tich model (photo 5) but the makers are not known. The Museum will be holding an exhibition of Engineering Miniatures throughout 2017.

Steam power

Just outside the museum is the Birkhall Engine, a Marshall portable made in 1942 and used to power a Balmoral Estates sawmill. An engine that didn't use imported fuel suited wartime conditions. Though still steamed on Sunday afternoons it is difficult to photograph due to fencing.

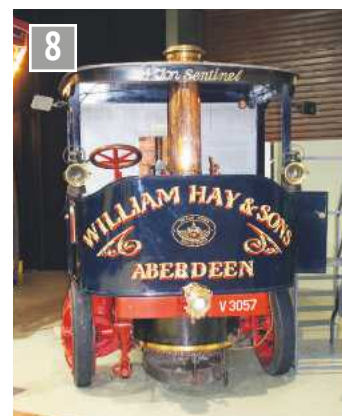
Inside there is a Foster traction engine built during the First World War for a War Department order but not used (photo 6). This Wellington compound was designed for one man operation. From 1922 it was used in Aberdeenshire to haul peat.

Another with WD origins is the McLaren 10hp traction engine made in Leeds. After the Armistice, Pat Collins bought and converted it to a showman's engine, the largest in Britain weighing 25 tons and aptly named *Goliath*. It worked until 1958 when bought for preservation and is currently on loan to the museum (photo 7).

In 1905 Alley and MacLellan started building undertype steam wagons in Glasgow under the Sentinel trade name. The museum's example was built in 1914 and is both the oldest and only surviving Scottish made Sentinel as



Goliath is the largest traction engine preserved. Made by McLaren in Leeds for First World War service but converted by Pat Collins to a showmans engine.



The oldest Sentinel steam lorry preserved and the only one built in Scotland. This worked at Inverurie until 1945.



Driving a Sentinel must have been hot work!



Shand Mason Village Pattern steam fire engine, made in 1904.



This fire engine was used at the Great North of Scotland Railway's works at Inverurie.



An amazing machine built by a local postman in 1897. The Craigievar Express used a steam engine from a local sawmill and a boiler obtained via Exchange and Mart!

production later moved to Shrewsbury. This worked at Inverurie until 1945 and was restored in preservation (photos 8 and 9). As with many exhibits the cab is open to visitors - driving was hot work.

The Great North of Scotland Railway had its locomotive works at Inverurie. With so much wooden rolling stock it needed a steam fire engine, made by Shand Mason in

London to their Village Pattern small pump design in 1904. This exhibit is on loan from Glasgow Museums.

One of the most remarkable machines is the *Craigievar Express*, a three wheel steam carriage built between 1895 and 1897. Its creator, Andrew Lawson, was a full time local postman. He bought the engine from a local sawmill and the vertical boiler via

an advert in *Exchange and Mart*. Restored by M. A. Smith of Surrey it completed the Brighton run for steam vehicles in 1971. 'Postie' Lawson also built his own home and was one of the first locals to generate hydroelectricity (photo 12). (It's hoped to be able to bring readers a more detailed article about this amazing man and his machine in the future.)

Trams

The Aberdeen tram displayed is the only survivor. Built as a horse drawn vehicle in the late 19th Century, it was converted to electric traction round 1902 but then restored as a horse tram in 1922 to celebrate the anniversary of trams in Aberdeen (**photo 13**).

At Cruden Bay the Great North of Scotland Railway built a large hotel and golf course, with a 3 foot 6 inch gauge tramway to the station, the most northerly electric tramway in Britain. The hotel was demolished after the Second World War but the golf course remains and its history is described in an excellent video. There's a beautifully restored tramcar here; note the space for goods and luggage (**photos 14 and 15**). It also has pieces of the other car.

Mortier dance organ

During your visit you may be serenaded by a Mortier dance organ, built in Belgium. Relatively few were exported. Though similar to fairground organs, as their name suggests, they were used indoors in dance halls. Control is via punched cards, a system that originating with the Jacquard loom (**photos 16 and 17**).

On the road

Stage coaches were used relatively late in Scotland, linking communities with stations. The *Hero* coach of 1847, displayed here, ran between Beattock station and Dumfries. This lightweight triumph of coachbuilding appropriately stands on a stone sett roadway, for granite quarrying was a major Aberdeenshire industry (**photo 18**). Many British streets were paved with granite setts (**photo 19**).

A Romany caravan is another horse drawn vehicle and there are miniature examples of the wheelwrights' work made by Duncan Downie of Kemnay (**photo 20**).

Scottish blacksmith, Kirkpatrick Macmillan pioneered the bicycle. He built

and rode a remarkable treadle machine (replicas are to be found in Dumfries Museum). Historic bicycles here range from 'ordinaries' and early safety cycles to more modern racing bikes (**photo 21**).

Motor vehicles

The earliest car displayed is a Coventry made Daimler of 1900 exported to South Africa. Originally built with tiller steering it had front and rear radiators to cope with a warmer climate (**photo 22**).

Many classic car restorers dream of a 'barn find' and



Early Aberdeen horse drawn tram converted to electricity and then back to horse power for the system's anniversary.



Cruden Bay tram on 3 foot 6 inch gauge linked the station and the golf course for the Great North of Scotland Railway, Britain's most northerly electric tram.



Cruden Bay tram interior - note space for luggage and goods.



This Belgian Mortier dance organ is played during visits. A rarity in the UK.



Music is controlled via a Jacquard punched card system.



Stage coaches were often used in Scotland after their disappearance elsewhere, linking towns and cities with stations. The Hero linked Dumfries and Moffat for a time.



Granite road setts were one of Aberdeenshire's major exports.

there's one here; a Durant laid up after a back axle failure in 1959, shown much as it could have been found (**photo 23**).

Few motoring collections lack a Model T Ford and that displayed in this museum was made as a baker's van and used in Kirkaldy (**photo 24**).

Displays emphasise Scottish car makers. Scotland has been home to 27 motor manufacturers, though not all building at the same time. Major car builders included Arrol-Johnston, Albion and Argyll.

William Arrol, civil engineer of the Forth Bridge, joined with locomotive engineer George Johnson creating one of Scotland's leading car firms. Arrol-Johnston dogcarts were made from 1896-1905 using an opposed twin engine with four pistons. This dogcart was made in 1902 (**photo 25**). Later the firm developed a 15.9 HP car pioneering the use of front brakes in 1909. After mergers, the firm eventually closed in 1931.

Albion had the longest life making cars from 1900 in Scotstoun, Glasgow, but came to specialise in commercial vehicles until final closure in 1972. Their output is represented by a 1907 A3, 16 HP motor lorry bought by the Duke of Sutherland and fitted with a Shand Mason steam fire pump for use on his Dunrobin Estate. The Duke was one of the first men in Scotland to use a motorised fire appliance (**photo 26**).

The saddest story was that of the Argyll Motor Company. Their vast new factory at Alexandria opened in 1906 ready for large scale production. When the founder, Alex Govan died soon after, sales never reached the factory's capacity and the firm suffered financial problems until collapse in 1914. Their range is represented with a 14/16 HP bought by Luke White, MP for Buckrose, now preserved with every detail including the 'Stepney Wheel' used to fix on the outside of a punctured tyre (**photo 27**).

●To be continued.



A model of wheelwrighting made by Duncan Downie of Kemnay.



Selection of early bicycles - the museum has a good display.



Coventry built Daimler of 1900 exported to South Africa, the oldest car in the museum.



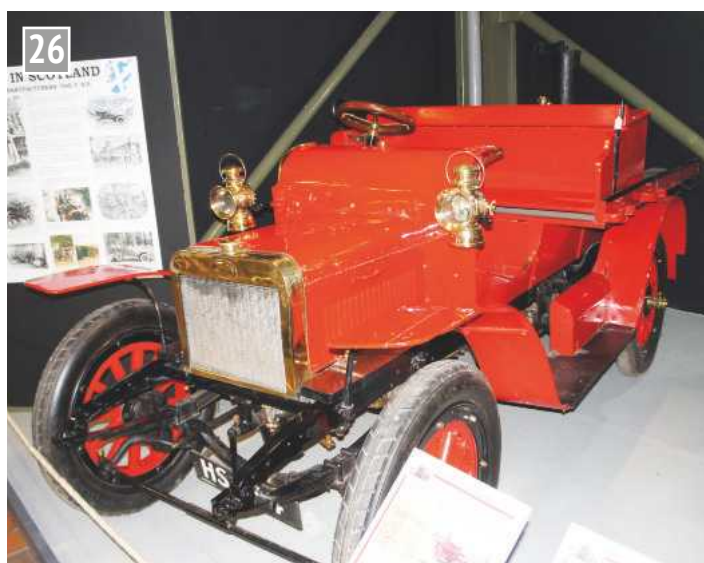
A true barn find. After breaking a back axle this Durant was laid up for years.



No motor museum is complete without a Model T Ford; this 1902 vehicle worked as baker's van in Kirkaldy.



Scottish made Arrol-Johnston dog cart of 1902 with an opposed piston, two cylinder engine. Dog carts remained popular in Scotland longer than elsewhere.



An Albion made truck of 1907, built for use as a fire engine on the Duke of Sutherland's Dunrobin estate.



Argyll 14/16HP; once owned by an MP. The firm anticipated mass production but it never came and the large factory closed in 1914.

Spherical Turning!



The first ball turning attachment.



A flat is machined on the left side of the post to provide clearance next to the job.

This article was first published in Maritzburg Matters, the newsletter of the Pietermaritzburg Model Engineering Society.

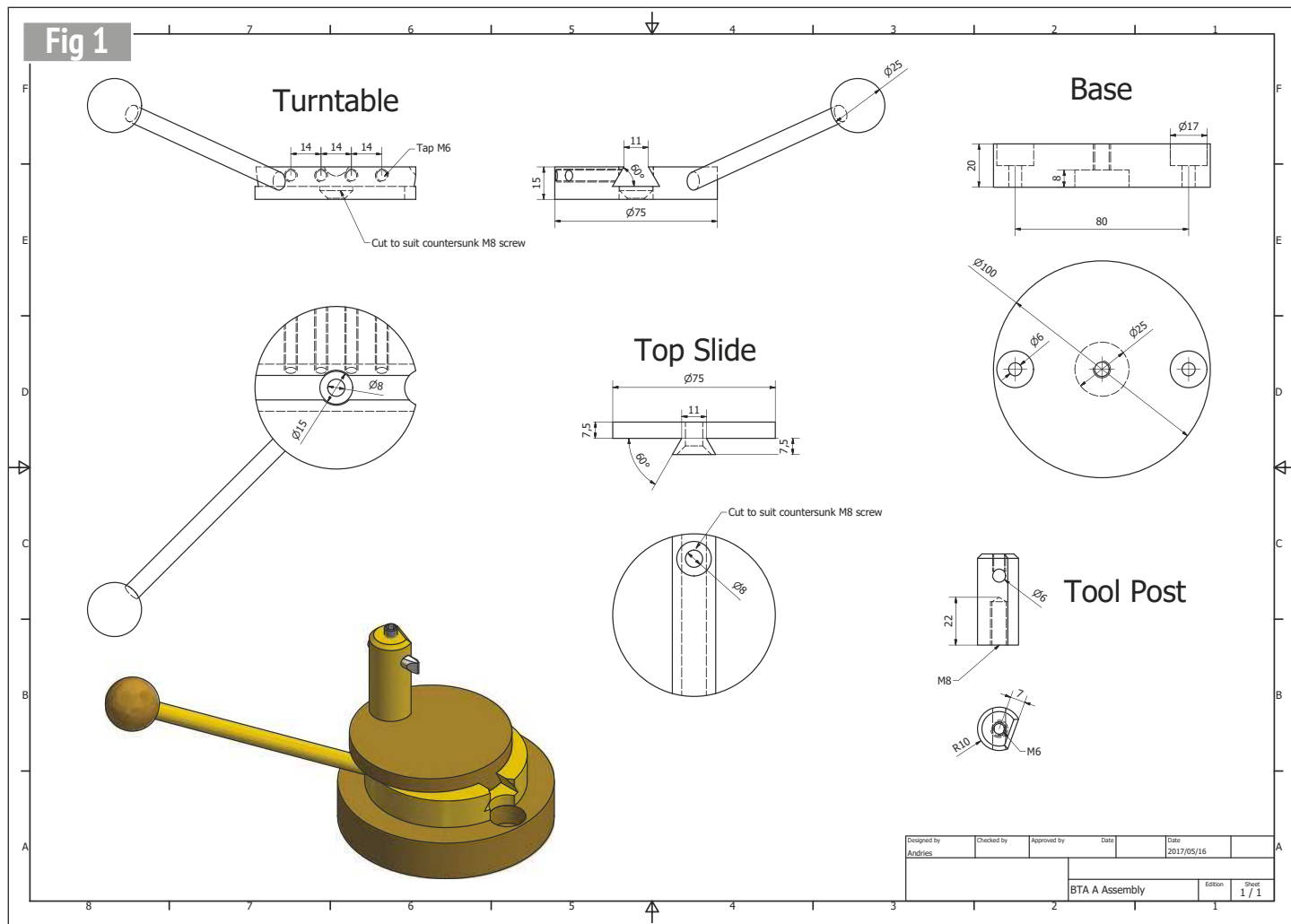
Often, over the years, I have wished that I had a ball turning attachment. After having had a look at numerous designs for this attachment, I eventually

decided on my own with ideas drawn from some others.

Attachment No. 1

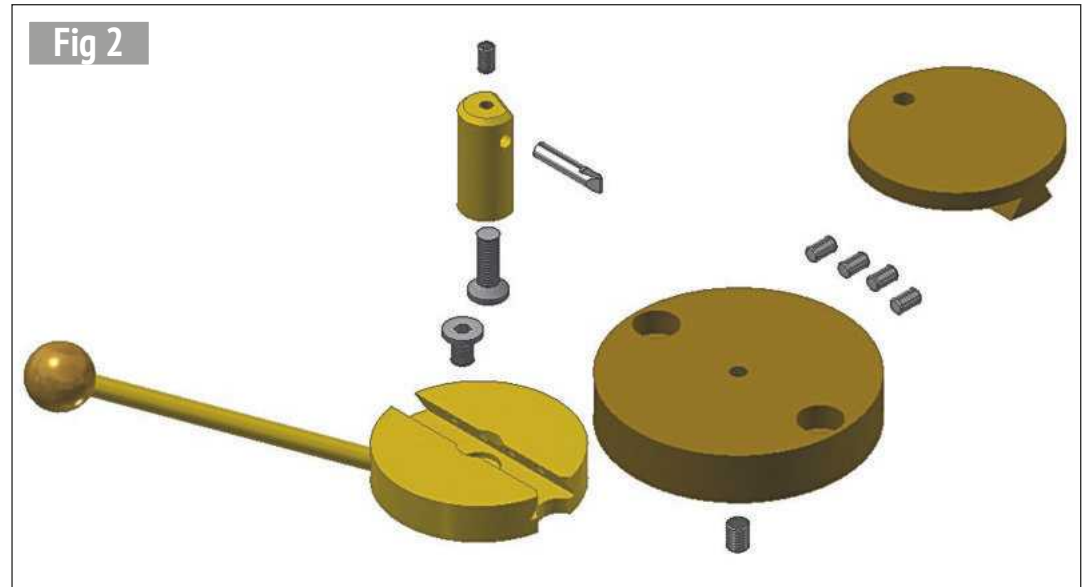
I wanted to be able to turn a complete ball as well as to be

able to do external as well as internal radii. Ideally, I wanted to have one that fitted into the toolpost so that it could be used as a universal design; unfortunately this is not really



feasible for small lathes! As shown in the photos (photos 1 and 2) and drawings (figs 1 and 2), I used three discs of steel; one as a mounting base, the second as the rotating stage with the female dovetail and the third as the mounting for the toolpost as well as the male dovetail. The dimensions of these were supposed to be designed to be able to replace the compound slide on my lathe. Unfortunately, this placed the tool so far back on my lathe that I decided to drill and tap two new mounting holes in the saddle in front of the compound slide. This means that if anyone would like to build one, the thickness of these components is not important at all - make them with whatever material you have! The dovetail can be locked with any of a selection of four grub screws.

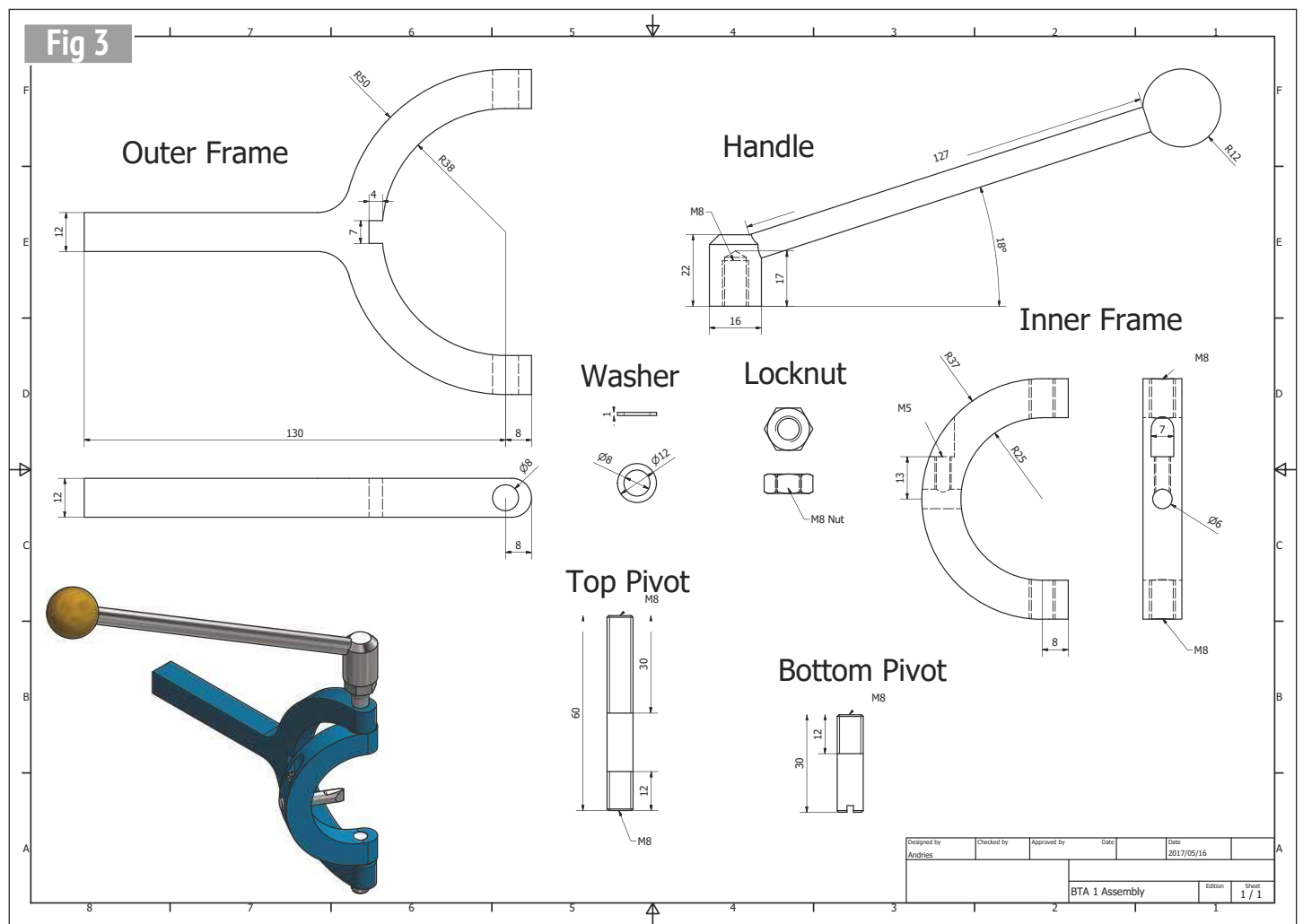
The dovetails quite often scare many potential builders away because of the difficulty



in making them, together with the cost of cutters, but they can very easily be 'fabricated' by making the male and the two sides of the female as separate pieces and then screwing them on with counter bored cap screws. They can also be welded.

The 'turntable' is screwed to the base with a countersunk cap screw and is locked with a grub screw against the end. This seems to work very well and may be easier than a lock nut. A nut can easily be used as long as the bottom of the hole is counter bored.

The tool post itself I decided to make so that it could rotate as the machining angles are quite difficult to determine, as well as needing the versatility when doing internal radii. This also allows for it to be shimmed to be able to accurately set tool height, as



well as making much better use of materials and ease of manufacture. I chose to use a round section tool because I wanted to be able to rotate it; it is also easier to fit! A flat is machined on the left side of the post to provide clearance next to the job when turning 'behind' the ball. The 'turntable' should be a reasonable diameter for stability and also for radius adjustment. It doesn't actually need to be round, as long as there is room for adjustment. The handle for the operation is screwed in at approximately 15 degrees to allow for a decent amount of clearance for your knuckles!

In all, I am very happy with the way it works, there is no chatter and it is capable of fairly robust cuts, bigger than I would normally make! The ball handle on the lever in the photo was the first turned with this attachment!

(Incidentally, the small block under the attachment, in the pics, is just to eliminate the glare!)

Attachment No. 2

Another ball turning attachment! Amazing as it may be, I never seem to learn from the 'lessons learned' in the workshop and elsewhere! Some time ago I had published an article on a ball turning attachment that I had made, for a specific spherical bearing that I had been contracted to make. That is the attachment described above. This was almost the 'b-all and end-all' of ball turning attachments as it could do a wide range of sizes - concave and convex - as well as being easy to use. It certainly does work very well!

When I was asked recently if I could turn an accurate radius on a copper electrode, I cheerfully agreed to do it. To cut a long story short, the attachment couldn't get close enough to the chuck as the bulk of the body of the attachment couldn't fit under the chuck! I suppose that a holder could have been made to hold the electrode further away, but the



Component parts of attachment No. 2.

job was needed urgently so another plan was made.

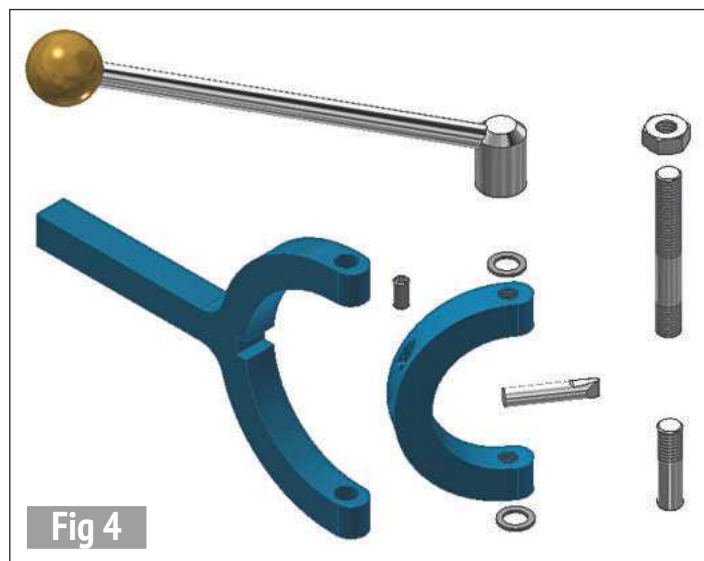
This set me to thinking about a better design. In the original, above, I was intent on having an attachment that would be able to tackle any job; this certainly works, but not close to the chuck. After looking at numerous alternatives, I had to reconcile myself to the fact that we never get one tool that can do everything. Why had I not remembered that little piece of wisdom?!

The second attachment also works very well and can get very close to the chuck. It can't, however, do a whole lot more than cutting a convex surface. It is made from a piece a scrap twelve millimetre plate (**photo 3** and **figs 3** and **4**). This fits into the toolpost and is much simpler to set up. It is capable of a radius up to 25mm and can get down to very small dimensions although the tool starts overhanging quite a lot. A smaller capacity, interchangeable inner frame, would solve that, should it become a problem.

A much easier build would have been one that also fits into the toolpost, but that is horizontal and would cut 'over the top' of the job. There are some very nice looking designs on the Internet. One uses a boring head with its adjustability all built in. I didn't use this design as the thrust from the cutting operation would have been directed directly/horizontally at the tool post, which would tend to cause the toolpost to rotate, instead of the conventional downwards/vertical thrust onto the toolpost.



Showing the tool clamping screw.



I used a bandsaw to do all of the basic cutting but other methods can also be used. The saw cuts were cleaned up with a file and emery tape.

One tip that might be useful is to drill the holes for the pivot bolts before the cutting is finalized. This allows for all of the holes to be concentric and ensures a smooth operation. Remember that the holes in the inner frame are to be a tapping size!

The pivots are bolts with a shank that are screwed tightly into the inner 'hoop', the excess thread is then cut off (**photo 4**). The heads are also removed, the lower one is shortened to allow for a screw driver slot. The upper one, which had a much longer shank, had the head removed and a thread cut to accommodate the handle boss with a lock nut. The handle needs to be sufficiently long to ensure a stable action whilst turning.

The tool is a round section to simplify manufacture, it is clamped by a grub screw



The completed ball turner.

drilled and tapped vertically into the inner frame. This allows for sufficient material for a medium length screw as well as eliminating any protuberances (**photo 5**).

The drawings suit my small Chinese lathe; the dimensions can, however, be altered to suit any size of ball, situation and size of lathe.

ME

The Barclay Well Tanks of the Great War

PART 25

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



Continued from p.784
M.E. 4561, 26 May 2017

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



The author's painting of Douglas at Pendre in the 1980s.

Steam chests

Back now to the cylinders of *Douglas* and you should currently have a chassis, with cylinders connected to the con rods etc. Next, we will need the fabricated steam chests (fig 75).

I note in passing that there is a subtle difference in the steam chests of the 0-4-0 and the WDLR 0-6-0 engines. The outside of the 0-4-0 steam chest has a vertical face,

square to the valve face, whereas the 0-6-0 follows the line of the outside face of the cylinders and is therefore some $\frac{5}{16}$ inch wider and at a slight angle to the valve face. **Photograph 112** shows an 0-4-0 chest during refurbishment. As I will be making the slightly different chests for the 0-6-0, the accompanying **photos 113** and **114** show steam chests with the inclined face. They

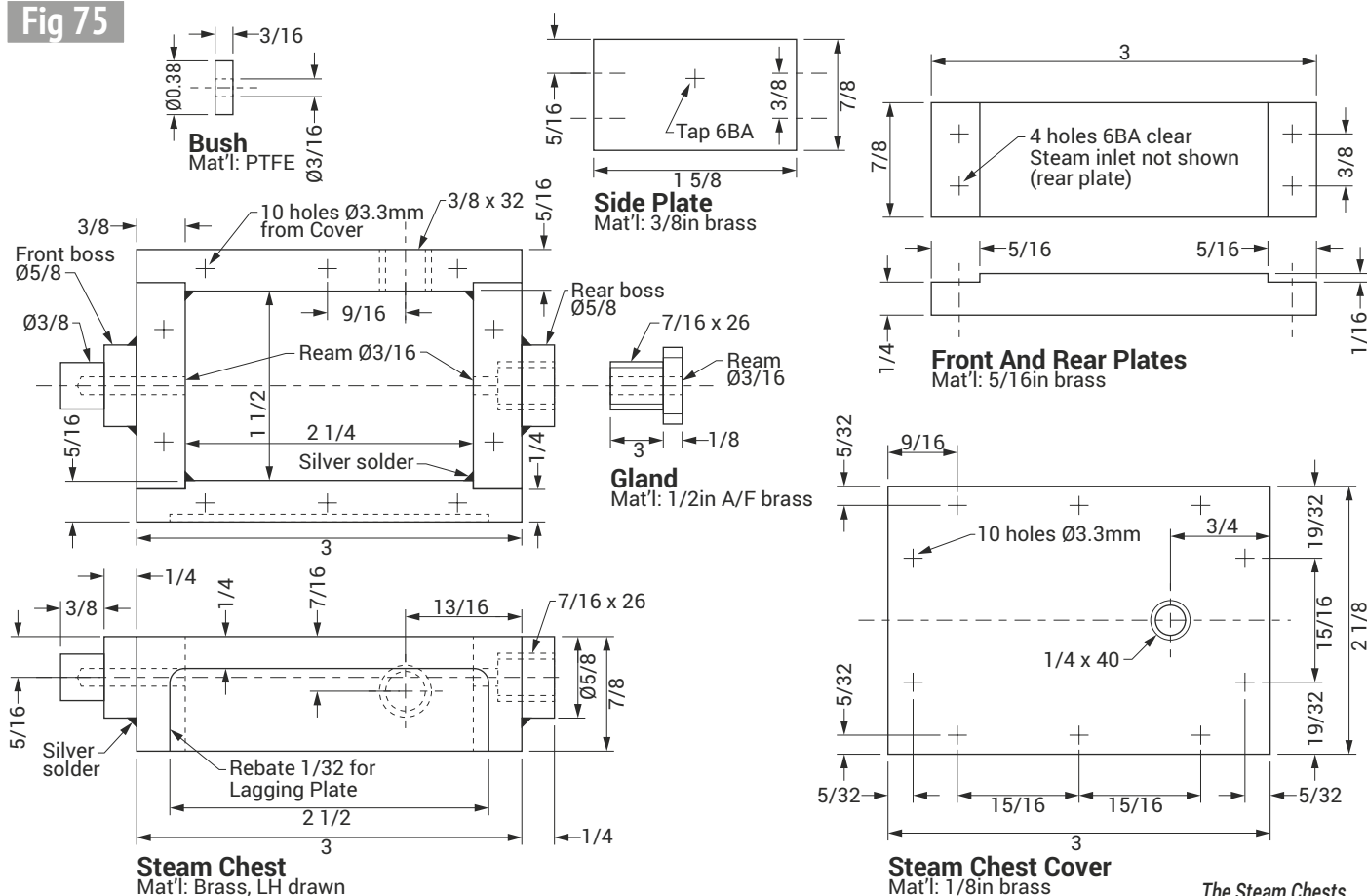


Steam chest on the 0-4-0.



Components ready for silver soldering.

Fig 75



The Steam Chests

114



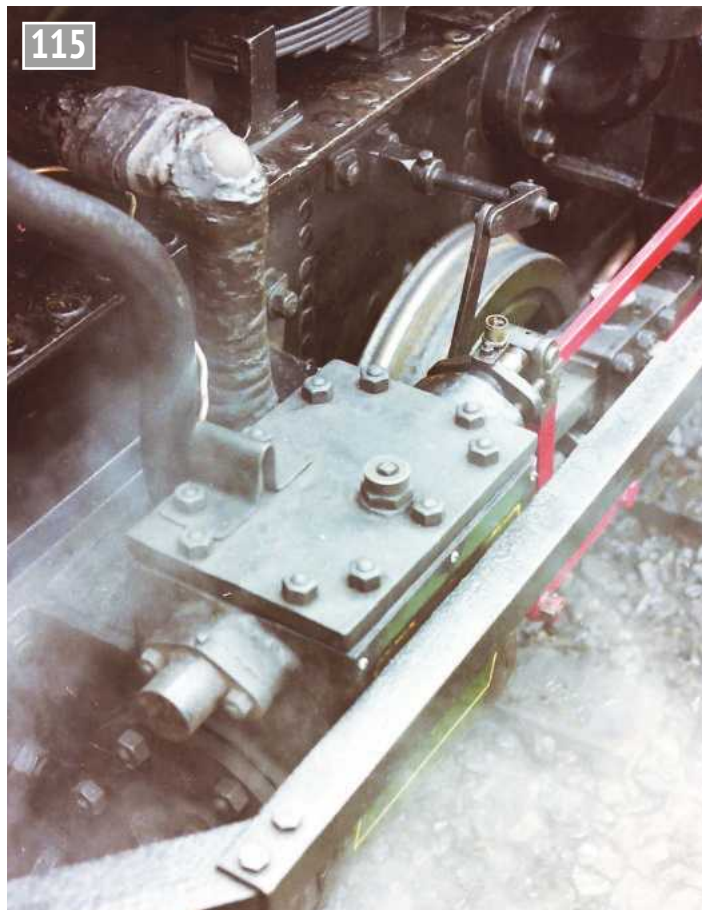
Soldered steam chest.

also have two bosses; one for the oil pump and one for the displacement lubricator. The displacement lubricators are similar to that shown in photo 109 (along with a tallow cock on the front cylinder cover) but should have a screw-down valve as opposed to a taper plug – these will be dealt with

later, as one will be needed on the regulator for *Douglas*. In photo 114 one steam chest is sat on an embryo cylinder for the 0-6-0.

The studs are made from $1/8$ inch diameter stainless rod with 5BA threads. When making the base and middle gaskets ensure that cut-outs

115



Left hand cylinder of Douglas on the Tallylyn.

are allowed for the steam chest drain holes.

As mentioned earlier, on the full sized Barclay engines the steam chests are integral with the cylinders (with cast in steam ports and passageways which greatly simplifies the machining). This form of construction would be very difficult to carry out using fabrication techniques. On these approximately fifth scale engines the port face is a separate valve plate and this does make the job of machining the ports and passageways somewhat simpler. The correct, oval glands for the steam chests (and the rear covers which are not shown) can be seen in **photo 115**; along with the blanked off hole where the original tallow cocks were fitted. Also, the lagged steam pipe and unlagged exhaust pipe, the front section of the running iron and the cross shaft for the drain cock linkage can be seen.

The steam chest sandwich

The inlet porting in the valve block, beneath the valve plate, consists of two milled slots and a $\frac{1}{4}$ inch deep hole at each end. This hole is drilled $\frac{3}{8}$ inch from the edge of the block to provide a good sealing area for the gasket. Note that the studs for the steam chests and cover continue through the valve plate into the valve block and make a sandwich with the three gaskets. To ensure a good seal between the valve block and valve plate, gasket cement should be used on the bottom gasket. This is not so important on the steam chest gaskets as a leak in this position would be obvious.

The $\frac{1}{8}$ inch thick valve plate (refer back to fig 53, *M.E.* issue 4539) has the three ports - steam inlets to each end of the cylinder and the exhaust port - milled through the full depth. It also has a drain hole at each end corresponding to the drain holes in the cylinder block for the centre drain cock.

Milling the ports is always a tricky operation, particularly when connecting the steam

inlets from the steam chest to the cylinder ends. With these fabricated cylinder blocks, however, the port face is a lot easier to machine and get spot on correct. If something goes wrong it's no problem to start again with a new piece of $\frac{1}{8}$ inch brass plate. Start the milling operation by carefully drilling holes, slightly undersize, at the top and bottom of the ports - this will leave rounded ends to the ports but this will be of very little consequence, compared with a square finish as shown on the drawings.

Fabricating the steam chests

The steam chest could be milled from big chunks of brass but the best way is to cut out four pieces and silver-solder them together, along with the steam gland and opposite extension for the end of the valve rod (fig 75). Note that an allowance should be made on the bolting faces to allow for a finishing cut after silver soldering.

To make the steam chests you will need $\frac{1}{8}$, $\frac{5}{16}$ and $\frac{3}{8}$ inch thick brass plate. Mill the edges on their short sides to form rebates, as shown in fig 75. This will make assembly easier as well as providing a stronger joint. Once items such as these are silver soldered together the joints are as strong as the base metal. With copper alloys, however, things do need to be in the right place during soldering as the silver alloy can dissolve some of the base metal and, consequently, the re-melting temperature of the alloy may increase. For this reason it's a good idea to screw component parts together with brass screws before soldering. Right and left hand chests are required as the face of each chest is recessed for the cylinder lagging plates. The steam inlet at the rear of the chest is off-set from the centreline to the rear.

The front and rear plates are drilled 6BA clear and these holes are spotted through



My refurbished cylinders in situ.

into the end plates, which are then tapped 6BA. Fit these together with 6BA, brass, countersunk head screws, which will hold things in place during the silver soldering operation. Another option, of course, would be to use the time-honoured, LBSC method and bind it all together with rusty iron wire. Photograph 113 shows one of the chests screwed together ready for soldering.

Before soldering it will also be necessary to fit the valve rod bosses. These are turned up from $\frac{5}{8}$ inch diameter brass rod, but the holes are not drilled/tapped at this stage. Provide a $\frac{1}{8}$ inch diameter stub on the end of each boss for soldering (these are not shown in fig 75) and this stub can be fitted into a corresponding $\frac{1}{8}$ inch locating hole drilled in the end plate. Note that the chests are handed, therefore care should be taken when fitting the gland and tail bosses and also with drilling the steam inlet.

Once the assemblies are soldered they can be treated as castings and the valve rod holes and gland seatings are then machined in one setting in the lathe. Set each soldered assembly up in the four jaw chuck with the steam gland running in a fixed centre, centre and drill the gland and valve guide bosses through with a centring drill, counterbore for the gland and cut the thread, holding the

tap in the tailstock. It may be necessary to make up special extension pieces for the drill and reamer when machining the front end of the chest. Note that it is only necessary to machine the two bosses internally for the valve rods and the two bolting faces of the chests - the exterior of the steam chests can be cleaned up with a file. Drill and tap the steam inlet holes $\frac{3}{8}$ inch x 32 tpi in each chest as shown on the drawing. Finally, skim the bolting faces of the chests in the mill reducing the height to $\frac{7}{8}$ inch.

Chest covers

The covers are made from $\frac{1}{8}$ inch brass plate. Drill and tap the covers $\frac{1}{4}$ inch x 40 tpi to take the oil pump non-return valves. Alternatively, for the 'posh' job, a boss can be silver soldered into the cover which raises the non-return valve about $\frac{1}{16}$ inch above the cover - this is not shown on fig 75. Make it from a piece of $\frac{1}{2}$ inch brass rod. Turn down a $\frac{1}{8}$ inch length to $\frac{3}{8}$ inch diameter, centre and drill 5.3mm diameter and tap $\frac{1}{4}$ inch x 40tpi. Part off a $\frac{5}{16}$ inch length, which will provide a $\frac{1}{16}$ inch boss $\frac{1}{2}$ inch in diameter. Drill a $\frac{3}{8}$ inch diameter hole in the cover in the position shown in fig 75 and silver solder in place.

Photograph 116 shows my refurbished cylinders mounted with motion bracket, slide bars and steam inlet manifold.

●To be continued.

Slaidburn Steam and Vintage Vehicle Display

Colin M. Harris visits an informal steam gathering in the heart of Bowland.



Phil Moston at the controls of Foster compound agricultural engine, No. 12539, Winnie of 1910.

High in the Lancashire hills, above Clitheroe, lies the historic and unspoilt village of Slaidburn, noted among walkers for the beauty of the surrounding area

and among steam enthusiasts for a special weekend in June - the Steam and Vintage Vehicle Display held at the unusually named village pub, the Hark to Bounty.

This event began in 1980 when local resident Mr. David McNamee parked his steam roller outside the Hark to Bounty whilst he enjoyed a drink inside. It raised such interest that the following year it was joined by a Clayton & Shuttleworth agricultural engine owned by a long time friend, Mr. George Coles, which had steamed to the event on an epic two-day journey from Manchester. As the years went by more and more engines and crews met up annually on this June weekend to join

David and celebrate what had quickly become an event. Now it is firmly established on the steam rally calendar and has raised over £40,000 to support village charities.

The 2017 event saw six full-size road steam engines gather along with two miniature engines and an horizontal mill engine and boiler brought on the back of a lorry by Geoff Baker of the Anson Steam Museum from Poynton in Cheshire. There were two Sentinel steam waggons, both built in 1934; Nos. 9003 owned by Peter Wareing of Wrea Green and 9086 owned by Hugh Winterbottom of Moorside, Oldham. The Sentinels had each arrived



From the Anson Engine Museum, Poynton, this horizontal mill engine complete with vertical boiler is regularly displayed at Lancashire and Cheshire rallies by Geoff Baker.



A view of the pub car park as the rain showers gave way to a little brightness. In the foreground is the Foster, Winnie and Sentinel No. 9086.

under their own steam on the Friday afternoon. A Foster agricultural engine No. 12539 of 1910 brought along by Phil Moston, Alan Porter's Burrell road roller No. 3535 of 1913 and the aforementioned Clayton & Shuttleworth agricultural engine No. 46059, also of 1913 were joined by and an Aveling & Porter road roller No. 8794 of 1917 owned by Brian Allison and Sons of Whixall, Salop.

The field behind the Hark to Bounty held a large collection of classic tractors, classic cars and commercial vehicles which included a Morris 1100 saloon brought

all the way from Holland! There were stalls selling hand-made clogs, locally sourced food and crafts and some enterprising school pupils had opened their garage in the village and were selling excellent home-made lemonade and chocolates.

Sentinel 9086 had travelled the 50 miles or so from Oldham under its own steam. The drive home on the Sunday afternoon, however, proved interesting. A very short part of their journey, near Rochdale, involved some motorway but while traversing this stretch they lost an exhaust valve cap and so stopped to retrieve



A few of the classic cars and lorries displayed in the field.



Evan Allison with the family's 1917 Aveling roller passes the honey coloured stone pub, typical of all the village buildings.

it. Unbeknown to the crew, a short while earlier, some well-meaning motorist had reported a 'lorry on fire on the

motorway' and while they were at a stand on the hard-shoulder two fire engines rushed to the scene ready to extinguish them!! Following a brief explanation of the workings of a steam lorry, and some chuckles, the brigade returned to base.

The main beneficiary of this year's display at Salidburn was the village school, the Brennand's Endowed Primary School which presently has 50 pupils. And that pub's unusual name ...? Apparently, the pub, built in the 13th Century, was named 'The Dog' until one day in 1875 when the local squire - who was also the parson and who kept a pack of hunting hounds - was leading a drinking party within. Outside, the hounds began to bark and howl and above them all could be heard the Squire's favourite dog, Bounty, which led the Squire to the cry, "Hark to Bounty!", and the name stuck.



Hugh Winterbottom's Sentinel No. 9086 heads home over Waddington Fell after an enjoyable weekend in this wonderful Lancashire landscape.

Locomotives Built for Display PART 7

Some construction ideas from **Robert Hobbs** who completed a non-steaming Hiellan Lassie.



Continued from p.565
M.E. 4558, 14 April 2017

Over last Christmas and the New Year we were treated to several programmes on the television covering the restoration and travels of the locomotive, *Flying Scotsman* so it was not difficult to make the decision, put off earlier, on the choice of the colour scheme for the Lassie; BR Green and Black it is, which is a fitting tribute to this famous locomotive. Let's hope my preparation and painting skills are up to the task. At least now the tender and bogie wheels will not need re-painting and the six main driving wheels can be painted in black gloss Humbrol enamel to match. **Photograph 103** shows the

painted drive train and the quality of these old castings are reflected in the sharpness of the balance weights and the very delicately spoked wheels.

Last time we had nearly sorted out the reach rods, the lifting arms and the reverser shafts; these are shown, loosely assembled with split pins and bolts in their bearing blocks and support frame, in **photo 104**. There are packing pieces fitted between the motion brackets and the main frames because the brackets were found to be under size causing the linkages to foul the connecting rods. The main reach rod was made from 5mm mild steel rod cut to size

and shaped to fit between the link arm and the screw reverser. **Photographs 105** and **106** show the two ends of the main reach rod.

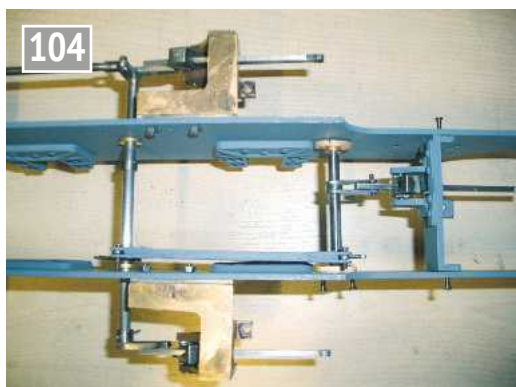
Following on from the disaster with the height of the running boards, the cab spectacle plate was remade from 18 swg galvanised steel and is shown loosely fitted to the cab sides in **photo 107**. The spectacle plate was made in two sections with a simple fish plate connection in the centre at the top, thus enabling the cab to be easily positioned or removed without fouling the boiler paintwork. Roof support rails have been fitted to the top of each side and the roof shaped and re-rolled to suit the new profile of the raised cab. The cab sides will be bolted to the running boards and the roof made easily removable by using pins through holes in the top rails.

Photograph 108 shows the spectacle plate riveted to the front flanges of the cab sides. The brass window frames have been fitted to the cab sides and the spectacle plate and the two assemblies are shown sprayed in grey etch primer.

The smoke deflectors were fitted with riveted-on flanges which will attach them to the running boards and the grab rails positioned relative to the boiler hand rail height. The tops of the smoke deflectors are secured to the smokebox by screwing the grab rail stanchions into a spacer, made from 5mm mild steel bar and tapped 8BA. These spacers are secured on the outside of the smokebox by an 8BA bolt fitted from the



Main drive wheels painted.



Reverse shafts, lift and link arms.



Front of reach rod.



Cab end of reach rod.

inside. **Photograph 109** shows this neat solution. While the frame and boiler was set up horizontally on the bench, the position of the holes for the main hand rail stanchions were determined using a scribing block, ensuring that the positions of the stanchions did not clash with those of the boiler bands or the steam dome. The holes were drilled and tapped 8BA direct into the boiler shell because the boiler will be painted and left unclad.

Photograph 110 shows the holes for the regulator valve retaining screws and the chimney fixing rivet holes drilled in their respective positions and **photo 111** shows the regulator valve assembly in position within the boiler; note the milled slot for the steam dome mounting ring in the regulator body. **Photograph 112** shows the holes drilled around the firebox/ boiler joint to take a row of dummy rivets and a similar row of holes drilled for the rivets which will be used to finish off the back plate joint on assembly.

Locomotive painting

Painting is now under way with many items being etch primed, rubbed down and primed again as we have progressed through the build. The main frames were finished with Halfords spray matt black on the outer faces and red primer between the frames; to my view this colour red looks more appropriate than a strong gloss finish. The inner faces were sprayed first and left to dry and harden for several days and, when checked, they were found to needed a couple of touch-ups in the areas around the horn castings. When these repair areas were fully hardened the inside was masked off with low tack masking tape and the outer faces of the frames sprayed matt black. Careful masking and trimming the tape to edges and corners with a sharp scalpel is well worth the effort, ensuring that, when spraying, the paint



Cab roof and new spectacle plate.



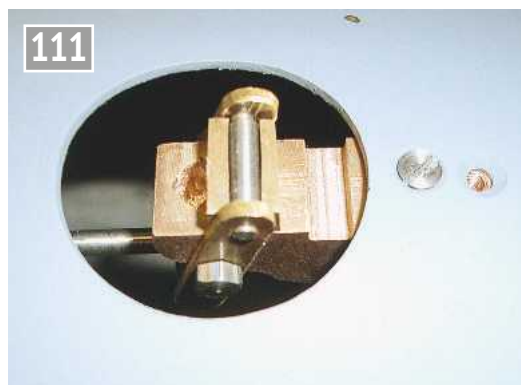
Riveted cab with window frames attached.



Smoke deflectors with spacers and fixing angle.



Chimney and regulator fixing holes in boiler and smokebox.



Regulator in situ.



Rivet holes in fire box and back plate.



Main frames painted.



Main frames painted.

goes where intended and establishes crisp edges.

Photographs 113 and 114 show the painted frames. The motion brackets were brush painted with Humbrol gloss black, as are the flutes of the coupling and connecting rod (**photo 115**). The smoke deflectors, smokebox,

chimney, saddle and door were finished with Halfords spray satin black which provides a useful contrast to the matt black finish used on the main frames and the running boards. **Photograph 116** shows these items grouped together whilst **photo 117** shows the two running boards; on the

right hand one the cut out for the main reach rod can just be seen. The two outside and the



Motion brackets, coupling and connecting rods painted.



Satin black paint finish on smokebox items.



Matt black finish on running boards.

inside cylinder assemblies are shown in **photo 118** and have been spray painted matt black prior to their assembly with the main frames.

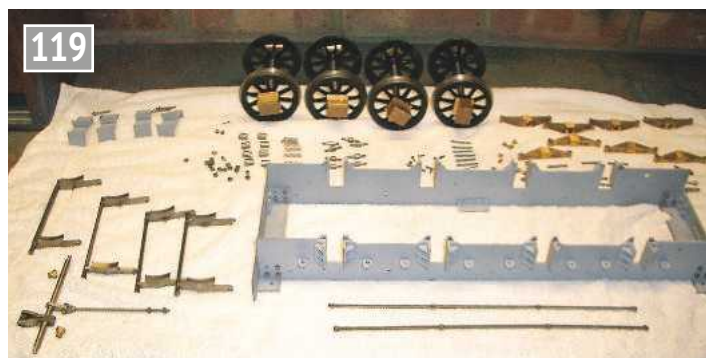
Painting the tender

The tender was dismantled and surprisingly the number of components exceeded 230 excluding nuts, bolts

and washers. **Photograph 119** gives some idea of the multitude of items. The frames, steps, brake hangers, pull rods, dummy springs and



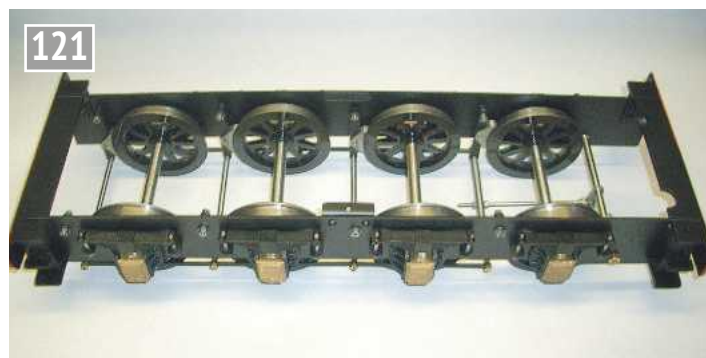
Painted cylinder assemblies.



Disassembled tender.



Main components prior to assembly.



Assembled Chassis.



Dummy Coal.



Tender assembly side /top view.

sole plate were sprayed matt black and are shown in **photo 120** prior to re-assembly. The chassis was assembled with the axleboxes left as cast to give some definition to a rather drab looking, low slung tender (**photo 121**). The dummy coal was made from gravel, fixed to a shaped wooden board with PVA adhesive and sprayed matt black (**photo 122**). The tender body was riveted and bolted in its final configuration, having been loosely assembled earlier. A final coat of primer blended in the fixings and after a careful rub down with wet and dry, the tender body

was sprayed with several light coats of green with, again, careful rubbing down between each coat. The body shell was mounted on the chassis and the re-assembled tender is shown in **photos 123** and **124**.

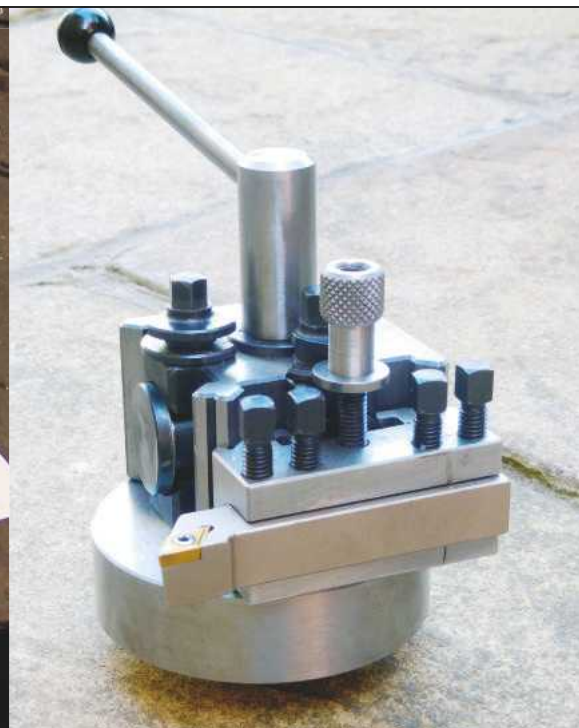
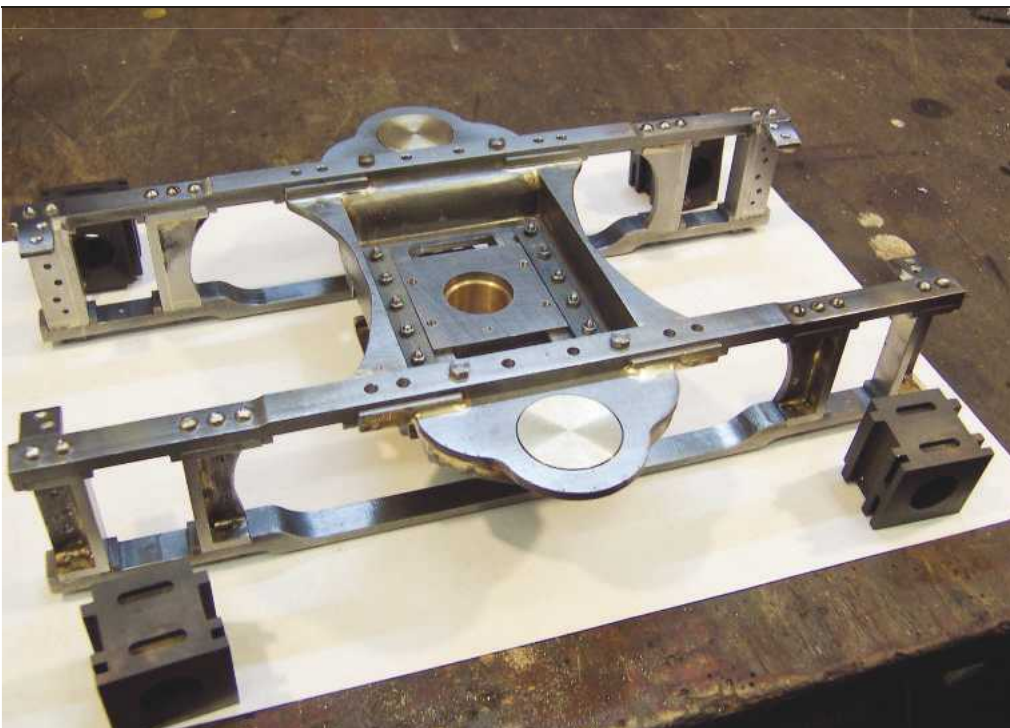
With the tender painted and assembled, this looks to be a good point to finish this section. The next and concluding part in this series will cover the painting and assembly of the locomotive with detail fittings being added, and finally the locomotive coupled to the tender, thus completing the Lassie.

● To be continued.



Tender assembly rear view.

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- Fabricating an LMS Pacific Bogie
- Foundry Pouring Crucible
- Ferrabee Pillar Engine
- Grampian Transport Museum
- Quick-Change 16mm turning tools on a Myford 7 Lathe
- Garrett 4CD in 6 inch scale
- Bolton Tram
- Make an Eagle Oil Can



Content may be subject to change.

ON SALE 4 AUGUST 2017

More Space in the Playroom

PART 3

Mick Knights gives some practical advice as he extends his garden workshop.



I can see several eyes rolling skyward and thinking, what on earth has this got to do with model engineering? Well, I would suggest that it has everything to do with it, as one of the most important aspects of our hobby is to have a workshop that will fit the space available and be of a size that's comfortable and easy to work in without having to move essential pieces of equipment in order to reach the machine or bench space required to complete the next stage of a project.

Continued from p.43
M.E. 4563, 23 June 2017



Inside the sanctuary.

Roof

Now for the roof. A friend suggested that I use glass fibre for the covering, which I looked into online. GRP (glass reinforced plastic) would appear to be the way forward as it has a life of thirty years plus, but - and there's always a but - it doesn't look like it's suitable for anything other than a completely new roof and one that is constructed in

a specific way, not the joining of an old and new roof that is the case here. For anyone building a complete workshop from scratch, however, I would definitely recommend exploring the possibility of using GRP as a roof covering.

I will be using heavy duty roofing felt rather than the standard roofing felt used for garden sheds and the like. It does work out about £20.0 a



The Sterling board roof.



First piece of felt in position.



New meets old.



Using a straight edge to guide the Stanley knife.



Fully insulated extension.



Substantial bench frame work.

roll more expensive, but the felt I covered the original workshop roof with fourteen years ago is still completely serviceable, although it is showing a few creases, which I'll attend to once the new felt is secured. The roof itself is constructed using 16mm thick Sterling board secured to 50 x 75mm roofing joists, again with 40mm deck screws (**photo 28**). Roofing felt usually comes in 10m rolls and so cut into three 3.3m lengths will easily cover the 8 foot wide roof. Roofing felt is notoriously fragile and will easily tear if mishandled. Copious amounts of roofing felt adhesive should be applied to the roof directly beneath a joint and to the plain, ungritted jointing strip on one side of the felt. It's a good idea to have a good supply of disposable gloves as the thick, black adhesive gets everywhere and takes some removing from unprotected hands (**photo 29**). When the second piece of felt is in position and tight up to the edge of the jointing face the two are permanently secured to the roof by nailing a length of treated roofing baton along the length of the joint.

When the new felt was laid and secured with batons the overhanging flaps have to be trimmed and gently eased tight to the front and rear faces of the workshop, then secured with roofing tacks. Again, copious amounts of felt adhesive should be applied to the overlapping joints. It's a good idea to add roofing batons to permanently fix the felt to the sides of the workshop. I tend to over engineer this by using treated gravel boards.

To extend the life of the original felt a generous coat of 'roofing emulsion' was applied to all the old felt (**photo 30**). This is truly wondrous stuff and being water based is easily applied with a paint brush, but quickly dries to a hard and waterproof surface. Depending on where you purchase it, it is also inexpensive; I got a 5 litre pot from Toolstation for £11.43, half of which was all that was required to generously cover all the old felt.



Flooring panel worktops.



Plenty of storage beneath the benches.



Order comes to the workshop.



Space beneath the bench used to store medium length stock.

Interior

That pretty much wraps up the exterior work so now it's time to finish off the inside of the extension, which may be of more general interest to the majority of readers.

I used 25mm thick Recticel insulation, which comes in 8 x 4 foot sheets, of which I need four to fully insulate the walls and roof. These were £14.24 each inc. VAT, so if you were only considering insulating your current workshop the cost is not exorbitant. The only real way of cutting the insulation to size is with a sharp Stanley knife. I always use a thin straightedge to guide the blade's travel - in this case a length of 30mm angle iron is ideal. Without a guide the blade will go its own sweet way through the soft insulation (**photo 31**).

Each piece should be cut

a little on the plus side to give just enough to allow the panel to be tapped into position using a block of wood and the trusty rubber mallet. **Photograph 32** shows the insulating panels pushed home. Any small gaps between the insulation panels and the timber construction can easily be filled by pressing small off-cuts of insulation into the gaps with your fingers.

With the extension partly panelled a substantial framework of 50 x 75mm timbers was constructed as a base for the bench tops. For extra strength and stability the uprights and cross beams were screwed to the stud work frames with 80mm long deck screws (**photo 33**). As I don't envisage doing any hammering or any other kinds of impact work on these bench tops, chipboard flooring panels are

the cheap and easy option to use, as two 2.4m x 61cm x 18mm thick panels were only £21.48 and plenty left over to be used as heavy duty shelving (**photo 34**). If work benches are to be used for heavy work then two layers of 12mm ply-board screwed together would be the better option.

Fitting out

Now for the final fitting out and moving in. I did splash out a bit on the two sets of shelving supports and brackets; £45.96 at Screwfix to be exact, but as they are so easily adjustable to take any future use into account I thought it worthwhile (**photos 35 and 36**). I fabricated the movable power hacksaw stand (pictured in photo 36) back in 2010 in order to store it out of the way when not in use. Four screw jacks lift the wheels clear of the floor when the



Corner space utilised to store small diameter stock.



Longer lengths stored and easily accessible.



Heavy duty shelves.

saw is in use thus preventing it from visiting all parts of the shed when cutting through larger diameter bar stock. The drawings and method for its construction were published in *MEW* issue 167.

I have tried to keep all my stock material easily to hand but, over the years, this has proved impossible in the confines of the old 8 x 12 foot workshop so some of the bigger pieces have been stuffed into any available space and forgotten about. Now, though, everything can be stored in one area. All small diameter and medium lengths of bar are stowed beneath the bench on two 400 x 400mm heavy duty shelving brackets, again from Screwfix at £10.99 a pair (**photo 37**). Of course, if you have a welding capacity, these are easily fabricated. All the time my knees allow me to access this particular storage area there shouldn't be any problems, but I do foresee the day when this rack may have to be moved to a higher position!

Shorter bar ends are now stored in the corner on the bench top and held together in another heavy duty shelving bracket, this time the 300 x 300mm version (**photo 38**). While the other bracket of the pair is used to contain longer lengths, a small cut-out allows easy removal (**photo 39**). Last but by no means least, the

bench top off cuts are used for heavy duty shelving (**photo 40**).

Well that pretty much wraps it up. I hope it has given a few enterprising readers something to think about and perhaps carry out some improvements to their own sanctuary. There was just one other thing, since embarking on this project I have acquired the little bench top CNC lathe that's been top of my wish list for several years. This nice little version appeared on a well know online auction site (**photo 41**) and if you're all particularly lucky (and, of course, if our editor agrees) you might be able to follow my adventures in



New extension, new toy!

getting to know the machine, control and 2D design software, as I already have a

few enhancements in mind! (Was that a groan I heard from the back... ?)

ME

EXTENSION PROJECT FINAL COSTINGS	
Concrete blocks, building sand and cement	£50.20 (Local builders' merchant.)
All base, stud work and roofing timber, plus three sheets of flooring grade chip board	£211.83 (Jewsons)
All brackets, joist hangers, fixings and screws	£52.80 (Screwfix)
90 x Feather edge cladding board	£108.00
Roofing materials	
Two sheets of Stirling board	£28.88
10m heavy duty felt + adhesive	£68.67 (Local builders' merchant)
TOTAL	£520.38
Optional extras	
4 x Recicel insulation sheets	£47.48
4 x 6mm ply board	£71.74
6 x 50 x 75 timbers (bench frame)	£24.05
TOTAL	£143.27



Maxitrak Coronation 747, as purchased.



Finished side view.

Coronation Refinements

Bob Perkins applies some TLC to a battery electric locomotive, with a view to encouraging his grandchildren into the hobby.



On a visit to our local club running day with my grandchildren, we were kindly offered the use of a 5 inch gauge battery powered locomotive. What quickly became apparent was that with a little on board supervision and guidance, the children were soon able to take the controls of this and drive. After several laps of the track they were driving like veterans and having a great time.

Reflecting on this, a couple of things came to mind. One was the benefit of having a locomotive that you could, almost, just roll up and run and secondly what a great way to get the kids involved! It was something that, at their young ages they could join in, get their

hands on and participate with, rather than just watch from the track side. And, who knows, this hopefully may spark an interest that will give them as much pleasure as it gives me.

Following a chat later in the week with a fellow club member of the Westland and Yeovil District Model Engineering Society, the opportunity presented itself for me to acquire my own battery locomotive and I subsequently found myself the owner of a 5 inch gauge Maxitrak Coronation, Number 747 (photo 1).

A potted history

The Coronation was based on the North British Locomotive Company (NBL) D2700 diesel

hydraulic shunters built in the early 50's. The NBL Company was based in Glasgow and was formed in 1903 out of the merger of Neilson, Reid and Company, Dübs and Company and Sharp Stewart Limited. The NBL Company finally went into liquidation in 1962. The Mark 1 diesel shunter design was produced as one of their first efforts in diesel locomotive manufacture. They had a Davey Paxman engine and a Voith hydraulic transmission which was built by NBL under licence. Paxman, now MAN Diesel and Voith still respectively manufacture diesel engines and transmissions.

D2700 was the first of a locomotive class commissioned by British Railways and entered service in July 1953, with another seven built between 1953 and 1956. D2700 was withdrawn in November 1963 and scrapped in November 1964. BR withdrew and scrapped their remaining few 2700s in the late sixties as part of its standardisation policy. **Photograph 2** shows the original D2700 at Darlington works perhaps waiting its turn. A coupling rod has been removed and can be seen on the frame.



NB/BR Class D2/1 0-4-0 Shunter No. D2700 at Darlington Works 1963. (Photo taken 21/07/1963 by Howie Milburn.)



BR Locomotive poster.

The locomotive appears in this 1950s British rail poster (photo 3) showing a selection of their locomotives and it can be seen from the poster that the locomotives are still predominately steam.

The design was popular with private operators and there is an example of a NBL Mark 1 diesel shunter, *Tiger* in the Scottish Railway Preservation Society museum. The Maxitrak Coronation construction manual provides the following detail on the NBL D2700 livery. 'Originally they were in black livery with red buffer beams and the early 'lion over the wheel' crest. From 1957/8 all the classes were renumbered D2700/7. The Livery was changed to BR Green with red buffer beams and coupling rods. The cab end carries diagonal yellow and black wasp stripes rising to a central point, full height between buffer beam and roof. The bonnet carries the same stripes on the radiator surround including the horizontal extensions along the radiator side. Hand rails are picked out in white with newer 'totem' type BR crest on the cab side above the number.'

The Maxitrak Coronations were designed by Andy Probyn. They first appeared in 1983 and remained in production for twenty years. During its production, the initial black livery was later changed to green and there was also a Swiss livery produced. Originally, they had a basic resistance type control system with an electronic control system becoming available first as an optional extra and then as standard on later models. Other changes in design and developments included changes from aluminium or white metal to resin mouldings.

Coronation 747 is a later version in the BR green livery and electronic control system, but with metal castings. It was supplied as a kit of parts and 747 came to me with its original construction manual which contains notes that have presumably been added by the original constructor and some



Control panel.



Chassis connection.



Spade connectors.



Battery and Armstrong connectors.

subsequent comments and details of post construction modifications. The construction manual contains some detailed instructions on assembling, finishing, driving and maintaining the locomotive.

Initial inspection

On initial inspection, the locomotive appeared to be in reasonable condition and the overall quality of the build was very good. However, it was clearly suffering from the effects of many years of running, transportation, modification and storage. There were some holes in the centre of the bonnet vent panel where someone, at some stage in its history, had fitted something that was no longer there. I later found out from its previous owner that this was a 'face'. There was also an extension to the back of the cab roof, perhaps to provide some additional protection for the driving controls. The pictures that I had of the locomotive and the construction manual showed a ladder on the side and there were no signs of this ever being fitted. The wheels and motion gear were free to

turn and there was no sign of wear in the moving parts. The manual showed a cab internal panel which was missing.

From an electrical perspective, the locomotive was untidy; the wiring, crimps and battery connectors would all require attention (photos 4, 5 and 6). From a positive aspect, it had an electronic control system fitted and there was no sign of corrosion or over heating on the PCB. I spent a short time replacing a couple of cables and connectors, raised it up on blocks, connected a battery and flicked on the MCB. The locomotive ran in forwards and reverse direction and I was able to vary the speed in both directions. The knob on the speed control pot had been replaced with a metal lever, which I would need to replace. At both low and high speed the brake switch stopped the motor dead. There was, according to the manual, a 'working horn / loud' with its associated relay and fuse. Some of the lights were missing or loose and lights had been added to the back and inside of the cab. There had been the additions

of an ammeter and a 'bicycle' speedometer. Some of the lights did not work, but the horn definitely worked!

Overall, though, I was really pleased. My hope was that 747 would not require too much time or financial input, which my initial inspection confirmed. The next step was to complete a quick basic tidy up of the wiring and take it around the club track to see how it performed mechanically and electrically in anger. I was interested to see how the electronic speed control and brake worked under load before considering my next steps, which would hopefully not include replacing the control system. I removed the speedo and the ammeter, replaced some cables, remade a number of crimps and noted that at some point I would need to replace all of the wiring. I disconnected the lighting circuit as one of the bonnet lights was detached and loose inside which was causing some sparking when they were switched on.

The construction manual referred to the battery as follows 'A battery 9½ inches long x 8½ inches high x 5½

inches wide is needed to power your locomotive. The size of the battery is common to small Ford and Honda cars (35-40 amp hours' capacity, flat terminals preferred)'. Due to the size of lead acid car batteries thirty plus years on, my attempts to find a suitable battery of these maximum dimensions produced limited options. I looked at the options for dry cell batteries which are more suited to this application. Lucas supply a suitable 42Ah dry cell battery with a screw terminal connection (LSLC42-12) which is recommended for similar applications and equipment. I had some 10Ah batteries and two of these just fitted for length, width and height. I made a frame from aluminium angle to locate these securely, as per the 'Law of Sod', the battery well in the chassis was millimetres too narrow to accommodate them. I would connect these in parallel to give a 20Ah capacity. I taped the batteries together, soldered the terminals together in a parallel configuration and terminated them with an Armstrong connector (**photo 7**). This would make them quick and easy to connect and disconnect.

Taking four charged batteries would give me a 40Ah capacity and batteries could be easily swapped in minutes. I made up a cable so that all of these could be connected and charged together out of the locomotive.

Track test

With the temporary and minor modifications and repairs previously detailed, I took 747 to the October track running day. I took both of the battery assemblies in order to get an idea of their duration during a typical running day and to check that both worked. It took around ten minutes to unload and be on the track and running. The direction control worked and functioned well in both directions. The speed controller gave good control at low speed and controlled

747, with just myself and two passengers around the turns and positive and negative gradients of the track. The brake was remarkably efficient, slowing 747 to a near stop if fully applied and reducing speed gradually if applied in short bursts. The brakes on the driving trolley were needed to bring 747 to a total stop. One battery lasted for the two hours of running and I swapped over to the second battery for the final fifteen minutes just to ensure that it worked. I oiled all the moving parts before running as per the instruction manual and it ran smoothly throughout, perhaps suffering a little from not having a heavy lead acid battery on board. I could, if required, fill the original battery well with additional ballast weight but would not plan to do this at this stage. I checked the wheel and coupling rod bushes at the end of running and all were fine. I was pleased with the performance and was now confident that I had made a sound purchase and met my initial aim of not having to replace any major mechanical or electrical components.

Next steps

I wanted to refurbish 747 and carry out some minor improvements and modifications, whilst at the same time being sympathetic to its original design, finishes and heritage. With regard to refurbishment and modification of the control systems, I planned the following:

- to replace all of the original internal wiring and connections;
- to replace the Horn switch with a sprung toggle to match the style of the existing original control panel switches and replace and secure the relay and fuse which was currently floating to the chassis;
- to replace the speed control knob;
- to replace all the lamps and associated wiring and I will consider using LEDs for this;

- to install a battery condition monitor.

Refurbishment of the body would include;

- filling in the holes in the bonnet vent panel and replacing the missing conduits for the lights;
- making and fitting a ladder;
- refitting the dummy horn to the left-hand side of the bonnet;
- relocating the Maxitrak 747 locomotive number badge from the side to the rear of the cab;
- removing the 'ON' 'OFF' engraved laminate labels from the drag beam;
- filling a hole in the control panel;
- stripping and repainting all surfaces, wasp stripes and detailing;
- fitting new insignia and number transfers.

Monitoring the battery

I wanted to be able to monitor the condition of the battery, as this would be key to maximising '747s' performance whilst in use. As mentioned previously I had removed the ammeter that was connected in the battery circuit, as on its own this did not provide any useful information on the overall battery condition. I looked at the options for both analogue and digital voltmeters, combined voltage and shunt connected current monitors and various battery condition indicators. I did not want to fit something that would detract too much from the authenticity or heritage of '747' and I felt that the size and appearance of many of these excluded their use. I selected a battery level indicator supplied by Gammatronix Ltd. electronics store.

This is a 10mm tri-colour LED that illuminates in different colours and flashes to indicate the battery condition at the following levels.

green	yellow	yell flash	yell fast flash	red	red flash	red fast flash
12.1v	11.8v	11.5v	11.2v	11.0v	10.7v	<10.7v

A green LED had been fitted on the control panel which is connected to the MCB and is functioning as an 'ON' indicator. The selected battery condition indicator would provide the opportunity to replace this rather than add another indicator. Because of the characteristics of lead acid batteries, as the battery performance reduces, the terminal voltage will reduce whilst the load is applied. When the load is removed the terminal voltage could rise to above 12 volts again. This device will provide both 'MCB on/off' indication and an indication of the 'on load' battery condition. According to the technical specification it also had the benefit of being 'monsoon proof'!

My experience of the indicator in practice with a freshly charged battery is that the indicator will alternate between green and yellow, which is speed, load and gradient dependant. After around an hour and a half this changes from ranging between green and yellow fast flash with the occasional red on the 1:100 slope with speed up. At this point I tend to swap the batteries over.

General wiring

As mentioned earlier the core of the motor and ancillary electrical controls worked, so all I planned to do with this was tidy them. This included replacing the switches for the lights and horn, relocating the horn relay and replacing various cables, crimps and connectors. I repainted the control panel and replaced the switch labels.

Once the body is fitted there is a view of the battery cables and connector through the cab windows. There should be a cab interior panel but this was missing. I shaped, painted and fitted a piece of aluminium sheet to replace this.

Lighting

There had been a lamp with a red lens fitted to the back and another on the inside of the cab. I removed these and their associated wiring and connectors, as I had no plans to replace these. I had previously removed the lights and wiring from the front as these were causing some sparking when switched on. The only remaining component on the body was the jack socket and this was loose. The dummy conduits that connected the front lamps were missing and the die-cast lamp bodies were in a poor condition so I decided to remake and replace these. I made the lamp bodies from $\frac{1}{4}$ inch square brass bar stock and the conduits with $\frac{1}{16}$ inch diameter brass rod. I replaced all of the original lights with 12v bi-pin lamps, soldered cables to the pins and insulated them with heat shrink sleeve. These would be held into the lamp bodies with a small dot of superglue at the back once I had painted the finished assembly. The cables would then be passed through the holes in the front of the radiator and the lamps secured with nuts on the back (**photos 8 and 9**).

The lamps are controlled by a toggle switch on the control panel. The connection to the lamps is made via a jack plug that is mounted on the chassis and a mating socket mounted on the body. Care has to be taken when fitting the body to ensure that these are aligned. The positive and negative lamp cables are joined together in a twin connector behind the radiator and this in turn is connected by a small twin cable to the jack socket.

Handrails

As part of the preparation for painting I removed all of the handrails. The short handrails on the cab came off easily and could be cleaned up and re-used. The long rails running along the side of the bonnet came off less easily and would need to be replaced. These were held in place with small

split pins passing through holes in the bonnet. I would replace both of these using $\frac{1}{16}$ inch brass rod. I also used this to make the ladder, which would be soldered to the right-hand side handrail. I estimated the dimensions and form of the ladder from photos and sketched out a template on a piece of board. I left enough length in the vertical parts of the ladder so I could bend the bottom after construction. I cut the pieces of brass to length and pinned them firmly to the board with drawing pins. The joints were given a liberal application of plumber's flux and soft soldered using a large soldering iron (**photo 10**).

Once the joints had set I removed it from the board, cleaned the flux residue off and fitted it to the side of the bonnet with some new split pins. I bent the ends of the ladder inwards and trimmed them to length, marked the body and drilled two $\frac{1}{16}$ inch holes for these to fit into. The ends of the original hand rails on 747 were bent around and went through holes in the bonnet. This looked untidy and photos of other Coronations showed these terminating

around the front of the bonnet and another split pin through the end hole. I bent the handrails to match the curve of the bonnet, trimmed them and secured them with a split pin. Currently the rod handrails were loose in the split pins and I wanted to secure the assemblies for painting as I planned to paint these and fit them after I had painted the body. I eased the handrails in the split pins slightly, applied some adhesive and reset their positions. After this had cured I removed them and, along with the handrails I had taken off the cab, prepared them and painted them for fitting later (**photo 11**).

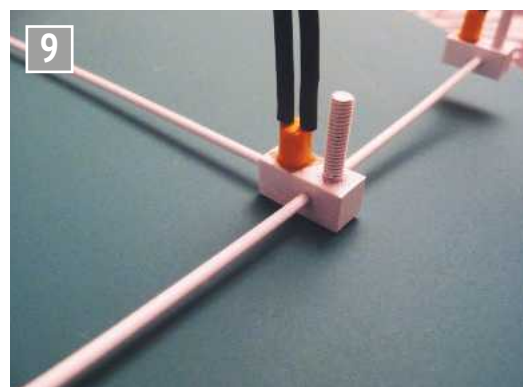
Painting

I split the painting of the body and chassis into two parts. As mentioned previously I had removed all of the handrails. I carefully removed the Maxitrak 747 locomotive number badge from the side of the cab, refitted it to the rear of the cab and filled in the holes where I had previously removed lights and holes in the radiator. The dummy horn had been fitted to centre of the bonnet. Images and the construction manual showed this fitted to the left-

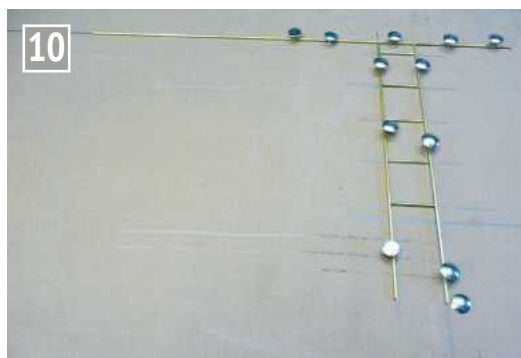
hand side of the bonnet, so I straightened the bracket and relocated it. I removed the cab roof which was held in place with self-tapping screws. I wanted to hide the roof fixings as once fitted I could not see any reason that I would need to remove it again. I tapped these to 4BA and countersunk the roof to accommodate their heads. These would be filled and smoothed once the roof was finally fitted. I knocked out a few dents and prepared the roof for re-fitting and painting. Whilst the roof was off I took the opportunity to replace the Perspex windows, some of which were damaged and some of which were missing. These were replaced with some 3mm Perspex which was glued in place and then framed on the inside with black insulation tape. Once installed I covered the outside of these with masking tape to protect them from damage and paint over-spray. I refitted the roof and filled and smoothed over the screw heads. I then spent several hours using a mixture of fine wet and dry paper, sanding pads and softer green abrasive pads preparing the body for painting. Using



Lamps.



Lamp detail.



Ladder construction.



Completed ladder.

a combination of masking tape and Humbrol Maskol, I masked the handrails that I had refitted to the front of the cab - as these would be difficult to fit later without damaging the finished paint work - the Maxitrak 747 locomotive number badge and the radiator grills. I then sprayed everything with grey primer. After leaving this for a couple of days to harden, I masked off the cab roof and back and the bonnet, which were all areas that were not having a green finish. The remaining areas were then sprayed green (**photo 12**). Again, after leaving this for a couple of days I masked over the green and spent several hours masking off the black areas for the wasp stripes on the bonnet and rear of the cab (**photo 13**). I had studied several Coronation images and actual locomotive images of wasp stripes for guidance and the final pattern of the stripes reflects a combination of these, but one that I felt looked right for the scale and shape of the radiator. Once masked I then sprayed these areas yellow. I spent another couple of hours removing this masking and masking over the yellow areas. I then sprayed the remaining primed areas, including the roof, black. I removed the remaining masking tape and touched up some small areas where the yellow and black paint had bled under the masking tape (**photo 14**).

Weathering

The BR logo decal and the D2700 locomotive number needed to be replaced as they were damaged beyond rescue and it would have been impossible to protect or mask them through the painting process. The BR Lion & Wheel (Ferret & Dartboard) decals came from Fox Transfers. The locomotive number is made of individual 15mm high BICC vinyl letters and numbers that I bought from eBay. I had photographed and taken measurements of these before removing them as part of the preparation of the body for painting.



Green body.

In researching the locomotive colour scheme and wasp stripe patterns, the majority of the images I looked at were of 0-4-0 and 0-6-0 diesel shunters in their working environments. Their general appearance was that of weathered, grimy, well-worn work horses. Rather than turning 747 out in a crisp new livery I decided that I would try to recreate some elements of this appearance in an attempt to improve the realism of the model. I had no experience of using these techniques so turned to the Internet where there are many video tutorials and information sources from both manufacturers and independent model makers. These covered a range of model genres from aircraft to goblins. I found several locomotive and rolling stock videos which were in OO gauge, nothing quite on 5 inch gauge. My assessment of these was that they contained some excellent demonstrations of both the techniques and products used. The overall appearance of some effects may be less detailed in a larger scale. The products, applications techniques and mixing ratios would be suitable in the larger scale but I would need to consider the volumes required. All of the items in the videos were based upon plastic or metal models so material compatibility should be okay, however none of the models were intended to be used out of doors, or were working models with moving parts. Clearly the chassis has moving wheels and coupling rods that



Masked cab back.

will sustain some natural wear and tear in use and require oiling as part of routinely running 747.

For weathering material, I turned to the excellent range of products supplied by Humbrol. I used a blend of green and rust colour wash to pick out and highlight the detail between the engine panels and doors. After some experimentation, I used a thinned blend of black and rust colour wash to pick out and define the rivet heads on the bonnet and cabs and create some streaking from some of these. I thinned this further and applied around the louvers and further thinned this to provide a general overall dirty appearance. Using thinners and green and rust washes I blended this to provide some contrast areas and streaks. I

had painted the hand rails and ladder white as a base. I then used Polished Steel Metalcote to simulate some general paint chipped areas and tread wear on the ladder. Once this had dried it buffed the areas with a cotton bud to produce the polished metal effect. I then used a thinned rust wash to highlight some of joint and bracket detail and added some black wash and more thinners to provide an overall dirty effect. I used the same effect on the front lights and conduits.

The under chassis, wheels and coupling rods already had the main elements of the finish that I was trying to achieve from running, handling and lubricating the moving parts. There were some areas where the existing black paint was



Completed cab back.



Finished front view.

missing so I touched these in with some matt dark grey enamel paint. Once this was dry I blended these into the surrounding areas of black paint with a very fine abrasive pad. I then used a thinned blend of black and rust colour wash to further blend these areas together. The coupling rods had been painted red and again showed some realistic signs of wear and tear, in particular around the ends. I gave these a light rub over with a fine abrasive pad to remove the gloss sheen from the paint and applied some black and rust colour wash.

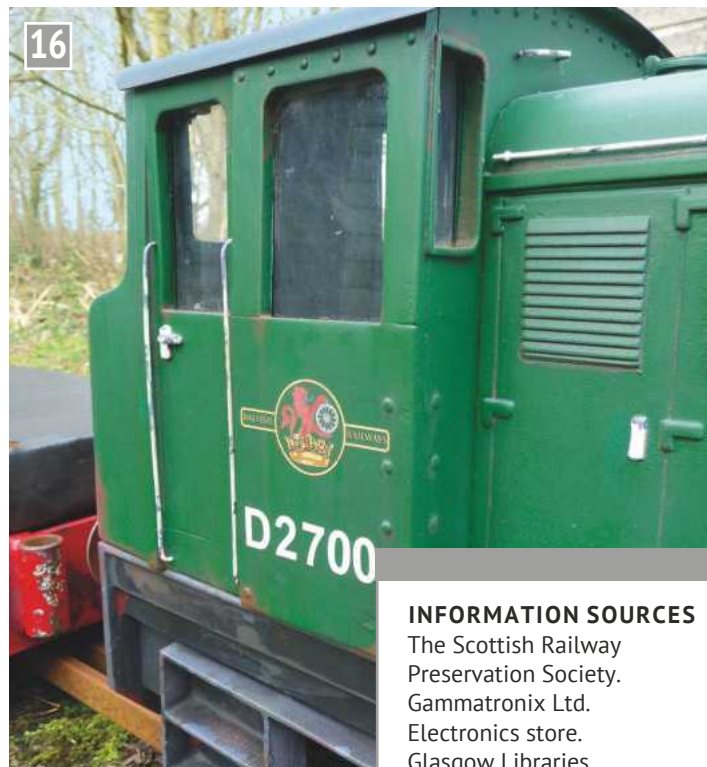
I removed the engraved laminate 'ON' 'OFF' labels from the drag beam and cleaned up the area. As with the area under the chassis, I touched in the chipped areas, blended them into the surrounding areas and applied an overall weathering wash, created some larger more heavily rusted and soiled areas and used a darker wash to pick out the rivet heads.

Although treating as two halves, I had applied the paint effects to the body whilst it was still on the chassis. This enabled me to blend the two elements together, producing

some rusting effects that started on the body and continued onto the chassis.

Once I was happy with the finished result I sprayed over the body and chassis with matt varnish. This improved the overall weathered finish and will provide some protection.

Photographs 15, 16, and 17 show the finished locomotive from various sides.



Finished cab view.

I have run 747 on several track days both during and after completing the work on it and it has proven to be reliable.

The most recent outing ended up with the horn and light switches being snapped off whilst unloading from the car, so the next phase of the project will be a transit case!

ME

INFORMATION SOURCES

The Scottish Railway Preservation Society.
Gammatronix Ltd.
Electronics store.
Glasgow Libraries.
Fox Transfers.
Humbrol.
Maidstone Engineering.
Maxitrak owners club - www.moc.org.uk
Maxitrak Coronation construction manual.
Maxitrak Locomotive List.
Maxitrak website - www.maxitrak.com
National Railway Museum.
Westlands and District
Model Engineering Society - www.wydmes.org.uk



Finished rear view.

No Boiler Test Required!

A Sentinel steam waggon that doesn't need coal or water from Ian's Electric Engines Ltd.

Having owned several miniature live steam traction engines, Ian Jones came up with the idea of building electric powered traction engines when his two children were very small and he became concerned that young children and hot engines, with lots of moving parts, were not very compatible. He consequently built two electric engines, which he has successfully rallied for a number of years.

In response to the considerable level of interest and enquiries that these engines have attracted, Ian has recently set up a limited company - **Ian's Electric Engines Limited** - which produces body kits for electric powered vintage and steam outline miniature road vehicles.

The company's first product is a body kit for a 3 inch scale Sentinel steam waggon, which fits onto the chassis of a Shoprider Sovereign 4 mobility scooter (which is supplied by the customer). The kit can be built as a miniature ride-on lorry, using the new steering and seat pad provided, or you can retain the original mobility scooter seat and steering to create a fantastic looking mobility scooter conversion, which would be great for getting around a steam rally.

The kit comes as a complete set of factory built, laser cut and welded steel parts, with most of the major components pre-assembled, ready to bolt straight onto the mobility scooter chassis. All parts are powder coated with a choice of cab colours: blue, green or red, together with a choice of either a black or silver boiler. The kits also include realistic sound and smoke units.

At around 5 feet long, the finished Sentinel is small enough to fit into the back of most family cars with



Ian's children, Thomas and Abbie take a ride on the electric Sentinel.

the seats down, but it has also been designed to take advantage of the two part chassis of the mobility scooter, which means that it can be lifted, stored and transported in smaller sections.

With good batteries on a full charge, the original mobility scooter has a range of about 20 miles, so these Sentinels should have enough power to last you for a full day at a steam rally.

As they are powered by electric, they are low maintenance and are very simple to drive. They are also environmentally friendly and can even be used safely indoors!

The electric Sentinel consequently provides an ideal, practical and affordable route into the world of steam for beginners and for those who don't have the time, skill

or funds to build or run a live steam engine. They are also proving to be popular with people who already run live steam engines, or have recently given them up due to mobility issues, but who now want something that is easier to run and maintain.

The kits are produced in small batches and the first batch of 24 is selling quickly at the introductory price £1,750, but subsequent batches may be subject to a price increase, so if you want one, think about acting quickly.

For more information please contact Ian Jones at **ians.electric.engines@gmail.com**

Tel. 07947 076988 or visit his website: **www.ians-electric-engines.co.uk** which has a link to the company's YouTube channel, where you can view a video brochure and clips of the engine in operation.

ME



Ready to go, a Polly 4 on the steaming bays.



Owned by Bournemouth member, Peter Burton, in LSWR mode.



A very early Polly, believed to be the third one, built by Bob Devereux of Bournemouth. The members of the host society did not steam their engines so as to give the visitors the freedom of the track.



Brynn, a very competent young driver waits to start at the station.

The Versatility of Polly

Mick Baker reports on the Polly Owners' Group event at Bournemouth's Littledown Railway.



On 20th May 2017 the Polly Owners Group, no strangers to the Littledown Railway of the Bournemouth and District Society of Model Engineers, came to the track to hold their Annual General Meeting and Spring Rally. Thirteen visiting locomotives arrived - one of which was not from the Polly stable - and Bournemouth members brought another four.

As the pictures show, Polly locomotives, all emanating from the same basic components, can be finished in any style to the taste of the builder. A high standard of craftsmanship was on display and the finish on some of these locomotives was immaculate.

The availability of kits to build locomotives has been a great boost to the model engineering hobby and has brought in many

people who lack the time or the know-how to build a model from scratch.

The weather was not really up to 'Sunny South' standards, being overcast with the odd shower but nothing could dampen the spirits. The visitors had the free run of the track and were at liberty to organise their running as they pleased.

All the locomotives performed without a problem - surely a testament to their basic design and the care taken of them by their owners.

After a good session running the day concluded with a very popular barbeque. I hope this selection of photos gives a flavour of the day that was enjoyed by all.

ME



Out in the country, is there a better way to spend an afternoon?

Polly locomotives can be finished in any style to the taste of the builder. A high standard of craftsmanship was on display and the finish on some of these locomotives was immaculate.



Neil Mortimer's lovely Vale of Rheidol locomotive, Dolgoch.



Polly 5 in brass, brought and driven by Andy Clark.



A very nice Prairie tank belonging to Pete Wallace on the long, curving incline with the lake in the background.



Richard Emery's 2-6-0T in GWR guise undergoing some running repairs. The motion was removed and the pony truck and front coupled wheels dropped. All was repaired and the locomotive ran very well later.



Under clear signals climbing through the trees towards the station. The driver looks very happy.



No. 6152 enters the station having just crossed the 'bendy beam' which gives access to the steaming bays to the left and the siding to the right.

No. 5, a 2-6-0 tender engine brought by Richard and Pat Taylor from Bromsgrove.

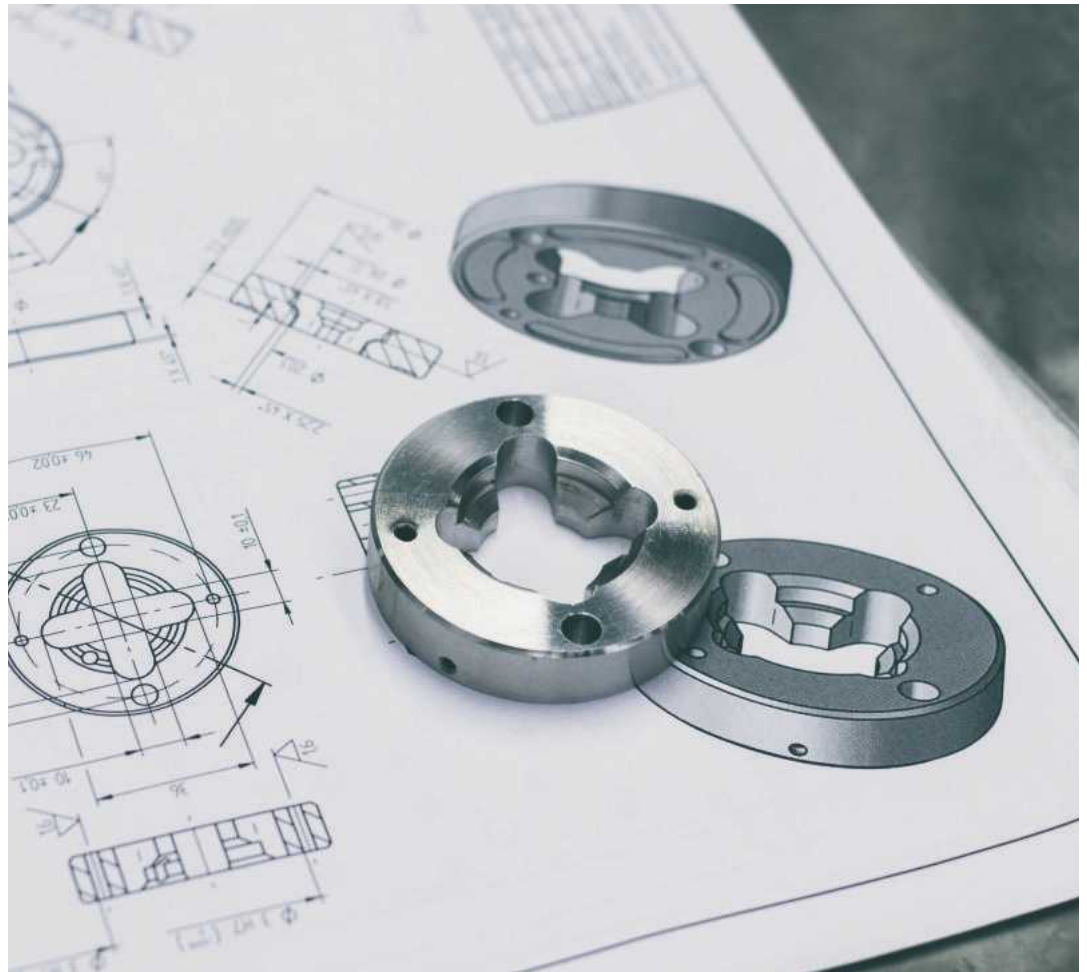


A CNC Beginner's Experience PART 11

Peter King's continuing narrative of a CNC learner driver; a few lessons learned during 'hands-on' operations.



Continued from p.503
M.E. 4557, 31 March 2017



I hope the advice that follows, in the form of a series of short articles, is helpful to those starting out with CNC in the workshop. I aim to assist in understanding any problems and lead you, eventually, to satisfactory operation of your CNC machinery.

I have previously mentioned the use of aluminium sacrificial plates on which to mount machining jobs as a protection for the machine table. These will acquire a lot of shallow grooves from end mills and not so shallow pits from drills. Inevitably some of these blemishes will have small burrs thrown up by the tools. These burrs will

have to be removed in order to allow work to be securely mounted. Minor burrs can be removed with a good sharp 'spoon' scraper but, eventually, when the surface looks like a 'moonscape' more rigorous methods must be undertaken. I use a large six flute 1.25 inch (32mm) end mill mounted in an ER40 collet holder with a 3 Morse shank. This is spun at about 750 rpm with a 0.002 inch (0.050mm) cut with an approximately 3.00 inch (75mm) per minute feed for the first cut – and lots of suds! Examination of the plate afterwards will show whether another cut is required; the deciding factor is whether there are enough 'lands' to support the work. If the 'craters' are too big and the 'lands' too small, then several cuts may be required to get

the 'lands' bigger and 'craters' smaller. Eventually, after many re-cuts the plate gets too thin – it bends under load if, like mine, it has a clearance underneath because it has 'feet' at each end – and it has then to be retired.

Whilst again on the subject of sacrificial plates, another useful dodge (mentioned before) that is easier with CNC is to hold an awkward job by using a sub-plate as a jig. A sub-plate can be prepared after it has been clamped to the main sacrificial plate by using part of a CAD drawing, being used to prepare a program for machining, to create registers to match a mostly pre-machined job. Tapped holes can also often be put in place for clamps to hold the work either around the edge or down 'through' holes in the



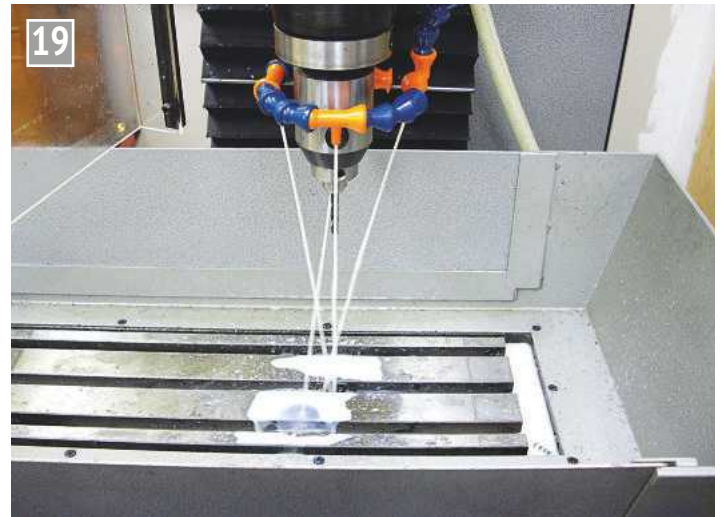
A single jet Loc-line suds hose.

job. A typical job would be the second pocketing operation on the side of a con-rod that has been profiled, pocketed and the 'big' and 'little' ends finished on the first side. With the finished bosses on the ends of the first side fitting into registers and with bolts through the bearing holes, the second side can be pocketed and finished with high accuracy. **Do remember to increase/check safety clearance in the Z axis to clear the bolts.**

A job that needs doing quite frequently is clearing under the sacrificial plate as this space gets packed with chippings. These must not be left for too long as the combination of a cast-iron table/ aluminium plate /suds and mixed chippings sets up electro-corrosion plus rust! The easily accessible parts of the table also get a vast build-up of chippings which, if steel, can be removed with one of the many magnetic devices made for the purpose. The real nuisance chippings are aluminium as they have to be swept clear. If you have a 'wet and dry' workshop vacuum cleaner this will do a excellent job.

A modification I carried out on the KX3, after much thought, was as a result of the table flooding because the drain hose adaptor in the table restricted the suds flow back to the tank. The very square-on intake edges and

rough internal shape of the hose adaptor was setting up some sort of 'cavitation' (?) which severely restricted the flow. I removed and set up the adaptor in one of my lathes and fed in a 1/8 inch BSPT taper reamer which, at near full depth, cleared the base of the outer threads by a suitable amount. The adaptor was reversed and the operation repeated, then a Z drill was passed through, removing two small steps and creating a clean, smooth venturi. The threaded end was then bell mouthed and rounded in the lathe with the aid of a Noga (deburring tool) and a scraper to remove the sharp edge. The change in flow was quite remarkable and the suds level lowered by about 12mm. It also meant that the increased flow sucked some chips down to the tank but there has always got to be some drawback. Again, one of those



Multiple jets give a flush action.

magnetic swarf collectors poked about in the tank swiftly gathered up the steel swarf. If you can acquire a defunct unit from a microwave cooker, extract the ring magnet and tie a short length of stout cord to it. This, when dropped into the tank with the cord over the edge, attracts nearly all the steel swarf and can be extracted and cleaned down from time to time. This short circuits the pump from circulating the swarf back to the table.

I also fitted a 'Loc-line multi nozzle suds delivery ring to the Z housing; this was initially with four small nozzles, which does a better job in some circumstances of removing chips from the work than one jet alone (photo 18). I will, at some future time, mount the 'ring' on the actual arbour bearing housing so that the jets are better aligned on the tool end. So far this has

audibly reduced the amount of chip re-cutting as there is a better flush action (photo 19). It also confirmed why the Tech machine had much the same arrangement – though that delivered rather more suds than my machine can as it literally blasted the chips away! The Loc-line is still very stiff, which is why the jets are not yet well aligned; they do, however, move chips better than the previous arrangement. For removal of swarf from deeper recesses, however, I found that a two nozzle arrangement was better – but there is a bit of splashing! The two nozzle arrangement – depending on the job – is sometimes better with the nozzles at 90 degrees and sometimes better at 180 degrees to each other.

●To be continued.

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CLUB NEWS

Geoff Theasby reports on the latest news from the Clubs.



We entertained a friend for dinner last night, who enquired after my recent activities.

'I've been to an early steam engines conference.'

'When was this?'

'(deadpan) About 1714.'

(Gales of laughter.)

I can't help it; it's like having a straight man.

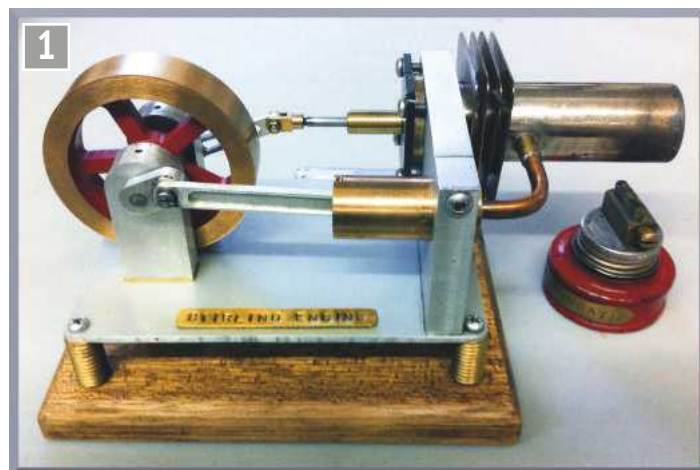
Sure as night follows day.

The scene: a bar in

Rotherham. Everyone is quietly watching the racing, or indulging in erudite philosophical discourse, as one does. Then, the doors swing open and a young man dashes in.

'Look out! Big Bill's coming!'

Everyone watches the door. Then a shadow falls across the room as a veritable man-mountain heaves himself, with heavy tread, up to the bar. 'Pint o' Best!' he demands. Downs it in one go, watched by the nervous barman who said, 'Do you want another pint?' 'No thanks' said the hulk, 'Big Bill's coming!' All this is by way of saying 'farewell' to my beloved Ground Zeppelin, gone to Volvo Valhalla, that great scrapyard in the sky, to become an aircraft carrier (without any other help, perhaps), razor blades or a new XC90. It was due for a full service and cam belt etc. change, it was running roughly and the head gasket was leaking. This would cost much more to rectify than it was worth. I can't complain,



Stirling engine by Jim McKie at BCSME. (Photo courtesy of Paul Ohannesian.)

I bought it ten years ago, got my money's worth and it never failed an MOT!

In this issue, no sparks, (without) fire, hot wheels, good company, luxury? two domes, two locomotives and a pre-war show.

I visited Bolton Steam Museum, as I had never been but heard much about it. A long day but worth it. The first person I met was Neil Carney, who is not unknown i' these parts. This is a wonderful place, with examples of stationary steam engines, all working and beautifully restored. I find that I have not saved any of my photographs from this visit, no doubt due to digititis. Chiz!

To the first of the photos this time: Jim McKie's Stirling engine, (M.E. 4564) is rather well made (photo 1) and a full picture of Paul Ohannesian's

'Phantom' (photo 2), as discussed in M.E. 4560, from British Columbia Society of Model Engineers.

Bradford Model Engineering Society's *Monthly Bulletin*, May, says that the Spring Auction began with members being informed that the new 12-sided £1 coin was not so made as to be difficult to forge but to enable a spanner to extract it from model engineers' wallets. This seemed to be proved when great reluctance to spend seemed to be a feature of the evening, all the round ones staying where they were! An electronic stethoscope then sold, slowly but only after the Auctioneer demonstrated it on himself to prove he was still alive... A large quantity of 27mm twist drills sold to him too, so if you need this highly unusual sized drill... (Once, at a radio club auction I bid for a



Paul's 'Phantom' BCSME. (Photo courtesy of Paul Ohannesian.)

box of miniature radio valves. They turned out to be almost useless EB91 double diodes - Geoff.) Road Vehicle News describes the origin of the track laying machine, patented in 1904 by Richard Hornsby Ltd. of Grantham. Failing to convince the military, they sold the design to an American company which became Caterpillar. Paul Whitfield didn't realise that a four jaw, self centring chuck will also hold hex bar and octagonal chisel steel as well as round stock, so why isn't one a standard fitment on a lathe?

W. www.bradfordmes.co.uk

Visiting the Doncaster Exhibition, I spoke to John Brandrick from the **Old Locomotive Committee** and I expressed surprise that there was still much to be learned by study of this machine. John said that there were several mysteries, including why a contemporary model had the Buddicom valve gear, which was invented *after* the original locomotive was built... The Todd, Kitson and Laird makers' plate is rectangular but how perfect if it were oval? Then the *Lion* would have a little egg on it!!! Their publication, *Lionsheart*, April, describes Dave Forrest's work on the cylinders and motion. This is much easier to assemble outside the frames but the front axle impedes its insertion into the chassis. A removable axle was designed by

Desmond Hill (*Lionsheart* No. 40 in 1996) which solves this problem. Dave also produced connecting rods using the correct square-headed bolts (**photo 3**). Dave's workshop is in a state of pristine cleanliness! John Hawley visited New Zealand, noting the disruption caused by last November's 'quake and bush fires, etc. John says KiwiRail must be losing a fortune until the tracks are reinstated. The roads fared no better. On his return to the UK, he travelled around England over several days and was pleased to note that all his trains ran 'to time' within seconds; credit where it is due! John Brandrick received a query from a man tracing his family history, having found an 1849 sampler of a two-domed locomotive, *Oak*, driven by the embroiderer's father. Enquiries other than those concerning *Lion* are not normally undertaken but, intrigued, John began his researches. So far, no joy, especially at the NRM which claimed it was a child's inaccurate drawing. The thing is, it is a quite recognisable representation of a Shepherd and Todd/Fenton and Craven/E.B. Wilson 0-4-2 of that period, some of which did have two domes. (Or possibly one by Benjamin Hick or Laird and Co.) OLCO, having visited 'Ally Pally' and Oldham (N.A.M.E.) exhibitions thus far this year, the former will not be returned to because of some quite rude and unreasonable treatment from one of the organisers. Norman Barber writes, concerning Editor, John Hawley's previous remarks on newsletter editing programs, that Word isn't satisfactory and Publisher was too expensive at £100 but he recommends Serif Page Plus II for only £10. (I tried Serif products once and couldn't get on with them at all - Geoff.)

W. www.lionlocomotive.co.uk

Northern Districts Model Engineering Society May-June newsletter, *Steam Lines*, report the best ever April running day and that Phase 1 of the garden railway is complete, with seven storage roads and

a continuous circuit. John Shugg tells a cautionary tale, the moral of which is, don't correct an apparently 'fast' clock, without first checking that your own watch is still going! Phill Gibbons raises a query, i.e. when running his 0-6-0 O&K with a spark arrestor chimney that collected no ash, why was the smokebox up to the blast nozzle with cinders? The dimensions of smokebox and chimney are correct, except that the tube diameter to length ratio of the chimney top is $\frac{1}{8}$ inch greater. The blast pipe is $\frac{1}{8}$ of the cylinder bore. The Lake Macquarie AALS convention was a success, although some day trippers tried to enter for free. Secretary, Robert Ogden conducted a blitz on the Saturday, challenging those without a badge and collected A\$1500! Bob Brown has developed the 'Wombat' project. Starting with a 5 inch gauge Bala, then enlarged to the $7\frac{1}{4}$ inch gauge Swampy. He was then commissioned to build a 5 inch gauge version. A later $7\frac{1}{4}$ inch version, *Wombat II* is being produced by Ron Collins and Steve Reeves, to appear in Australian Model Engineer. Standard fittings will be used where possible and the dome is 3-D printed, then painted. W. www.ndmes.net

Ryedale Society of Model Engineers' April *Monthly Newsletter* reports fun and games at the April meeting. Firing up his 5 inch gauge 14xx, Linden almost set fire to the steaming bays. Alex, owner of 'tiniest locomotive present', his daughter's $3\frac{1}{2}$ inch gauge Tich, saved the day by appropriating the incendiary materials for its firebox. Later, at the end of the day, Alex demonstrated the advantage of a small locomotive for ashpan cleaning: hold upside down and shake!

W. www.rsme.org.uk

Southampton Society of Model Engineers' Summer newsletter tells us that a siding from the GL track is to be built to enable disabled visitors to board a specially designed new car. Civil Engineering

has been undertaken, using a hired digger. The seven wheelbarrows and 20 workers were soon overwhelmed so a dump truck was also hired, fast! Thirty tonnes were moved from 'here' to 'there' and the holes will be filled with building materials. Several cables, not on the plan, were uncovered; some were severed, to no-one's apparent dismay but a plan was hatched to convert the signalling connections to radio, controlling the same semaphore signals.

W. www.southamptonme.org

The Blower, May, from **Grimsby and Cleethorpes Model Engineering Society** features Steve Cooper's review of Spalding Show. The G&C stand was as good as before but was one of the more prominent, since the trade stands were fewer. Steve noticed because he spent less than expected! A talk by Martin Reed on Science and Maths, said it all began with the Greeks esp. Euclid (so why are they in such a mess now?). Our current numbering system arrived via Arabia and the Moors in Spain, from about 1200AD. And now, Little and Large - or Dignity and Impudence (cough). Four $7\frac{1}{4}$ inch gauge Britannias are in build (plus a $7\frac{1}{4}$ *Flying Scotsman*) and a few photographs of these were followed by a short item on the '12 inches to the foot' versions (for 'those who can't tell their Britannias from their elbows', says Editor, Neil Chamberlain.)

W. www.gcmes.co.uk

Port Bay Express, from **Portarlinton Bayside Miniature Railway** claims that matters are proceeding well, passenger numbers are increasing, rabbit numbers are decreasing but what is this cartoon of a man shaking moths and spiders from an empty sack? Is it a bird? Is it a plane? No, it's the Editor with nothing to print!

W. www.miniaure railway.com.au

GMES News, Spring, from **Guildford Model Engineering Society** reports that their 50th Annual Show is being planned



Lion con rods OLCO Doncaster.



Kleine Koppel, Doncaster.

and Editor, Trevor Combes says that the club is attracting many visitors on running days by the use of Facebook and Mumsnet and now the problem is that there are not enough Indians to do the necessary work - and not enough Chiefs either! New steel tyres were fitted to the Society's 7¼ inch gauge Bagnall, Pixie, Bryan Finch reports. In the process, each is warmed up to 600 degrees C (dark blue) by blowtorch, then dropped or tapped on to the prepared cast iron centre and cooled with compressed air. Job done in an hour! Roger Curtis tried insulating his Jones Goods boiler with ¼ inch plywood, steamed to make it pliable. The first attempt failed but by using several sheets of veneer, it worked! Mike Wheelwright gave a talk on the LMS Coronation class locomotives, 'a design nobody asked for' but which everybody liked.

W. www.gmes.org.uk

A further interesting exhibit at Doncaster was this 5 inch gauge 0-4-0 rack locomotive, *Kleine Koppel*, to a Ken Swan design (photo 4) and this Atkinson Uniflow tractor (photo 5). I didn't know that Atkinson made steam wagons. *The Prospectus*, May, from **Reading Society of Model Engineers**, reports, in Dawson's Diary (President, Les Dawson), that the Young Engineers (with a little help) have timed their Polly chassis to run on compressed air.

Some YEs have been offered apprenticeships, no doubt helped by being members of RSME. '61249', by virtue of his business connections, helpful advice exchanged, especially via the Bluebell Railway, was privileged to be invited thereto on the occasion of *Flying Scotsman's* visit, riding in the GNR General Manager's carriage with such luminaries as Bill McAlpine, Sir Peter Hendy, David Shepherd, the Lord Lieutenant of Sussex and the Chief Engineer of the RH&DR, who brought their own *Tornado* to display. 'Wolverton Pug' went to Australia and Japan on a two month trip. The (unfavourable) comparison



Graham Sadler's Atkinson steam tractor, Doncaster.

between the Australian XPT 'First Class' of NSW Railways and the Shinkansen is stark!

W. www.prospectparkrailway.co.uk

Bill Phillips' double headed locomotives *Gazelle* and *Mad(ge)* from **Ottawa Valley Live Steamers and Model Engineers** is shown in photo 6. *Conrod*, May, from **Otago Model Engineering Society** says that a recent talk on 3-D printing covered its use in dentistry. (Gosh! First, boiler domes, now teeth. That's something to chew on...) People have been busy in the workshop, boat group, scale railway (knitting machine hooks make ideal couplers for N Gauge).

Andrew Nicolson reviewed the Woodland Scenics track cleaning kit. This uses a 3-D (aaargh!) mobile head unit with a variety of cleaning pads. A photograph taken at the 1937 show illustrates that a wide variety of disciplines was being followed even then. There were no big models and I think I spot a Myford lathe in the background.

W. www.omes.org.nz

And finally: Schrodinger's emoticon :):

Contact:
geofftheasby@gmail.com



Bill Phillips' double header, *Gazelle* and *Mad(ge)* from *Blast Pipe*. (Photo courtesy of Murray McKenzie.)

JULY

- 18 Chesterfield & District MES.** Evening running from 6pm. Contact Ian Blackburn: 01909 562458.
- 18 Grimsby & Cleethorpes MES.** General monthly meeting, 7.30pm. Contact Dave Smith: 01507 605901.
- 18 Nottingham SMEE.** Visit to Valley Rd. Steamers. Contact Pete Towle: 0115 987 9865.
- 18 Model Steam Road Vehicle Soc.** Club meeting. Quiz Night. Village Hall, Longford, Gloucester. Contact Richard England: 01452617057.
www.msrvs.co.uk
- 19 Bristol SMEE.** Model Aircraft on the table. Contact Dave Gray: 01275 857746.
- 19 Leeds SMEE.** Summer evening steam-up. 12.30 until late. Contact Geoff Shackleton: 01977 798138.
- 19 Salisbury DMES.** Picnic evening. Contact Jonathan Maxwell: 01722 320848.
- 21/22 Frimley & Ascot LC.** Open weekend, 12 noon - 4pm. (Some public running). Contact John Evans: 01276 34970.
- 21 Rochdale SMEE.** General Meeting Castleton Community Centre, Rochdale. 7pm. Contact Len Uff: 0161 928 5012.
- 21 Stockport DSME.** Track night. Contact Dave Waggett: 0161 430 8963.
- 22 Chesterfield & District MES.** Club running day. Contact Ian Blackburn: 01909 562458.
- 22 Saffron Walden DSME.** Warship Day for visiting 5 and 7½in. gauge Warship Class locomotives. Contact Jack Setterfield: 01843 852165.
- 22 Worthing & District SME.** Public running, Fire Station Open Day. Contact Ian Aitken: 07500 611166.
- 23 Bedford MES.** Public running. Contact 07498 869902 or b.walton@bedfordmes.co.uk
- 23 Bradford MES.** Diesel Day from 10am. Northcliffe Railway. Contact: Russ Coppin, 07815 048999.
- 23 Cardiff MES.** Public running at Heath Park. 1 - 5pm. Contact Rob Matthews: 02920 255000.
- 23 Grimsby & Cleethorpes MES.** Public running, noon - 4pm. Waltham Windmill site. Contact Dave Smith: 01507 605901.
- 23 Wolverhampton DMES.** Public running at Baggeridge Min. Rly. 1 - 5pm. Contact Ian Priest: 01384 287571.
- 23 Worthing & District SME.** Contact Ian Aitken: 07500 611166.
- 24-27 Vale of Rheidol Railway.** Driver for a Fiver. Footplate experience days. Contact: 01970 625819.
- 26 Grimsby & Cleethorpes MES.** Summer Holiday running, noon - 4pm. Waltham Windmill site. Contact Dave Smith: 01507 605901.
- 26 Vale of Rheidol Railway.** Summer evening train. Contact: 01970 625819.
- 27 Sutton MEC.** Afternoon running from noon. Contact Jo Milan: 01737 352686.
- 27 Worthing & District SME.** Public running, 2 - 5pm. Club meeting. Topic t.b.c. Contact Ian Aitken: 07500 611166.
- 30 Grimsby & Cleethorpes MES.** Public running, noon - 4pm. Waltham Windmill site. Contact Dave Smith: 01507 605901.

- 30 Welling DMES.** Public Running 2 - 5pm. (Behind Falconwood Elec Sub stn.) Contact Martin Thompson: 01689 851413.
- 30 Wolverhampton DMES.** Public running at Baggeridge Min. Rly. 1 - 5pm. Contact Ian Priest: 01384 287571.
- 31 Vale of Rheidol Railway.** Driver for a Fiver. Footplate experience days. Contact: 01970 625819.

AUGUST

- 1 South Cheshire MES.** Stuart Hart: Potty Pot Pouri. Contact Stuart Daw: 01782 767587.
- 1-3 Vale of Rheidol Railway.** Driver for a Fiver. Footplate experience days. Contact: 01970 625819.
- 2 Bedford MES.** Public running. Contact 07498 869902.
- 2 Bradford MES.** Evening steam up and Social from 7.30pm. Contact: Russ Coppin, 07815 048999.
- 2 Bristol SMEE.** Mike Ackerman: Early Years in the Nuclear Industry. Contact Dave Gray: 01275 857746.
- 2 Chesterfield & District MES.** Club running day. Contact Ian Blackburn: 01909 562458.
- 2 Grimsby & Cleethorpes MES.** Summer Holiday running, noon - 4pm. Waltham Windmill site. Contact Dave Smith: 01507 605901.
- 2 Vale of Rheidol Railway.** Summer evening train. Contact: 01970 625819.
- 3 Sutton MEC.** Bits & Pieces night. Contact Jo Milan: 01737 352686.
- 6 Ellenroad Engine House,** Elizabethan Way, Milnrow, Rochdale. Engines in Steam, 11am - 4pm. Enquiries: 01706 881952.
- 6 Grimsby & Cleethorpes MES.** Public running, noon - 4pm. Waltham Windmill site. Contact Dave Smith: 01507 605901.
- 4 Chesterfield & District MES.** Public Summer Holidays Running, 12 noon - 3pm. Contact Ian Blackburn: 01909 562458.
- 4 North London SME.** BBQ at Colney Heath. Contact: Ian Johnston on 0208 449 0693.
- 4 Rochdale SMEE.** Tony Finn: The History of the Lathe. Castleton Community Centre, 7pm. Contact Len Uff: 0161 928 5012.
- 4 Stockport DSME.** Bits & pieces. Contact Dave Waggett: 0161 430 8963.
- 5 Tiverton & District MES.** Running Day at Rackenford track. Contact Bob Evenett: 01884 252691.
- 5 Vale of Rheidol Railway.** Summer evening train. Contact: 01970 625819.
- 6 Basingstoke DMES.** Public running at the Viables Craft Centre. 11am - 4pm. Contact: Austin Lewis: 01256 764765.
- 6 Frimley & Ascot LC.** Public running, 11am - 5pm. Contact John Evans: 01276 34970.
- 6 NW Leicestershire SME.** Members and visitors steam up. Contact Den Swain: 01530 412048.
- 6 Plymouth MSLS.** Public running at Goodwin Park. Contact Malcolm Preen: 01752 778083.
- 7 Lancaster & Morecambe MES.** Informal meeting. (Public running every Sunday.) Contact Mike Glegg: 01995 606767.



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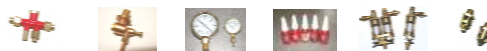
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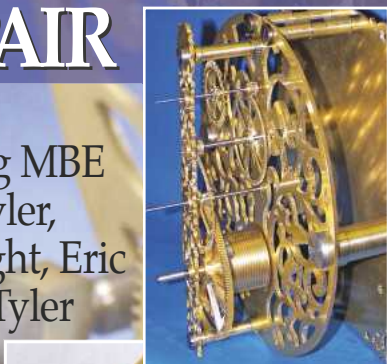
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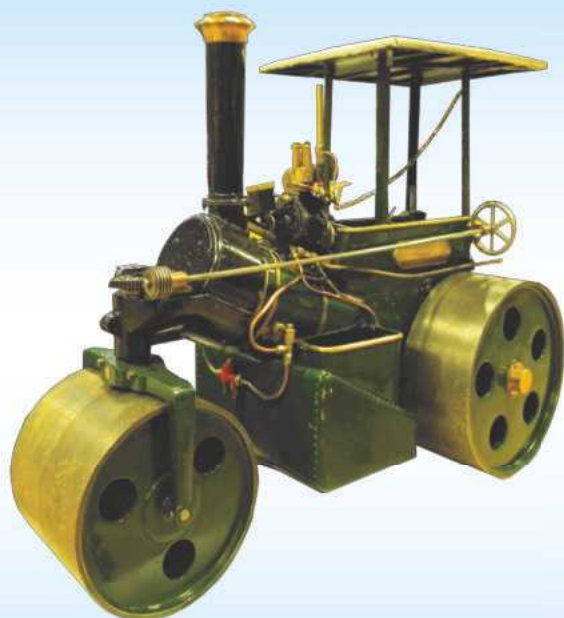


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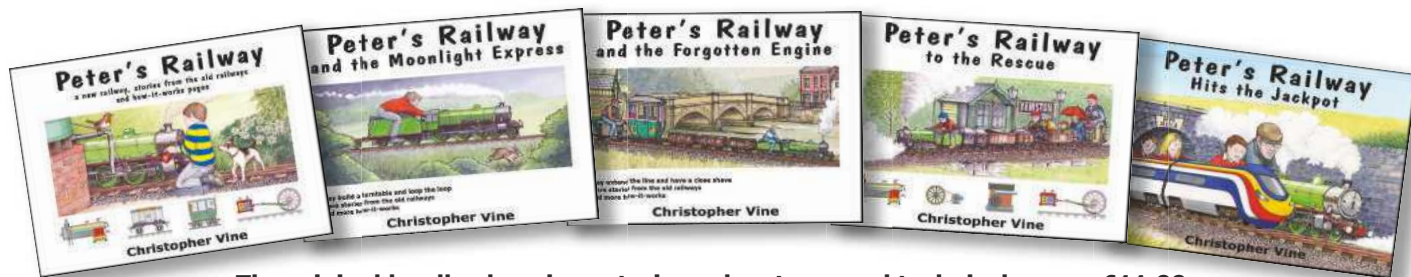
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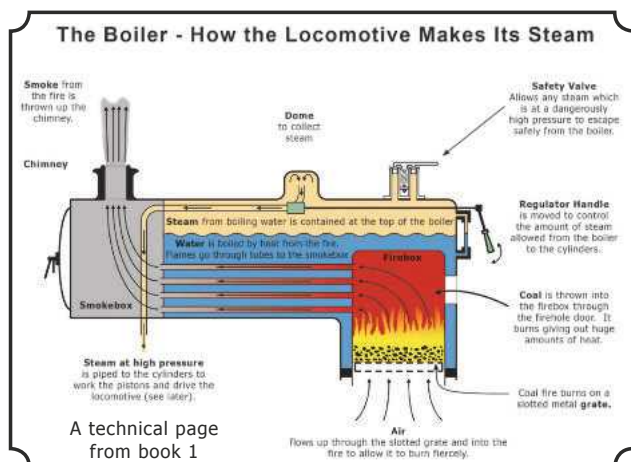
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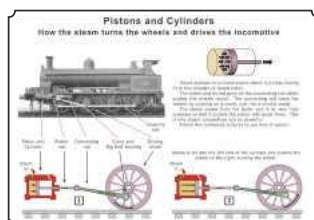
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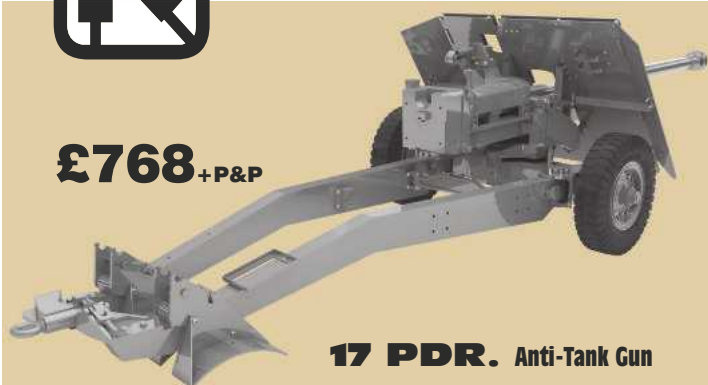
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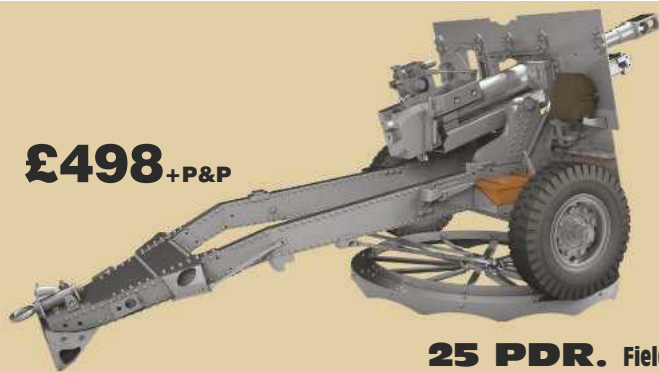
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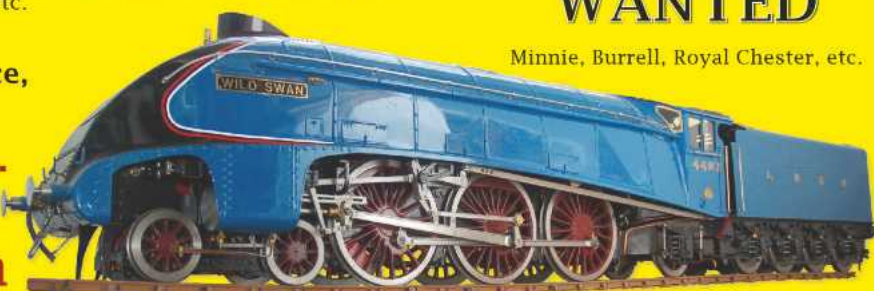
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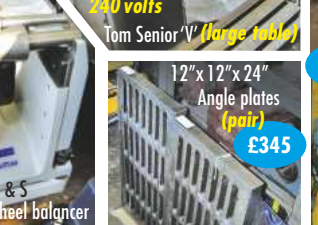
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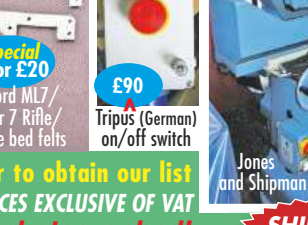
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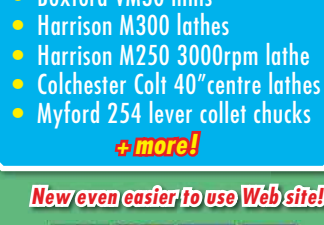
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