MAIDSTONE MODEL ENGINEERING SOCIETY.

NEWSLETTER - Summer 1987.

* SUE'S SPOT *
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Welcome to the Newsletter and I apologise that a picture of my nearest and dearest is on the front cover but you can always keep it in the smallest room in the house in case of emergency.I start my chronicles of travels with our engine this issue,which I hope you will enjoy reading.Do remember, though, that this is a bird's eye view and technical data in my reports will be a bit lacking (rather like my brain, Adrian would say). The club nights lately have been mainly evening runs in a variety of guises and the one that raised the most comments was the Fancy Dress, especially with the turnout of sexy schoolgirls which had some of the men ready to let off steam, let alone the engines. The Open Day was a success as usual and I have never seen so many Ploughmans Lunches vanish so fast together with the rest of the sandwiches and gorgeous cakes provided by our members. The time put in by a hardworking few for the entertainment of so many deserves a special vote of thanks .I am proud that our Club can put on such a good show each year.

Enterprise has been doing her bit for the club this summer and occasionally showing off pulling four trolleys but not too often because we don't want it wor out too quickly! Whilst speaking of passenger hauling, I have been asked to mention that we all take a little more care in fuelling our engines particularly while standing on the track and on the run as coal is getting an expensive commodity these days and there is possibly enough scattered around Mote Park to provide enough power to light up Maidstone for a night. I know that I'm just as big a culprit as anyone! If anyone wants anything to do at any time I would mention that there is still a little bit of guard rail painting left from last year to be done and some strimming around the track to get rid of the weeds and thistles. Come winter this year it may be necessary to undertake some major track repairs and the committee will be giving this matter attention shortly.

So have you had your holidays? Had a good summer? One event we enjoyed this year, although nothing to do with trains, was the open air concert at Leeds Castle and I was wondering if other members of the club might like to make up a party to go next year, it is a nice outing and great fun. Perhaps you might let me know. Visited anywhere of interest that you would like to write about and brighten up the next issue of the newsletter? Now is the time to put it on paper before you forget although the closing date for the Christmas issue is Friday December 4th, it is never too early to let me have the article!

Some sad news to impart, for those who may not know. Our oldest member, Walter Scuse, died in April aged 95 and active almost to the last. He will be sadly missed in the world of model engineering. On a happier note, congratulations are in order to our vice chairman Peter Chislett, who was awarded a C.B.E. in the Queen's birthday honours list this year. Well done, we're all proud of you!

A reminder now for traffic controllers. I am not impressed by those few who shirked their duty this year (after all it is only once!) and could not be bothered to advise anyone so another track marshall could be appointed. Let this be a timely reminder for those who have yet to perform, and while I am having a moan, sometimes when we are public running or clearing up I feel there is an excess of word power and a distinct lack of man power where it is needed! Many hands make light work etc., and are appreciated.

So read on and I look forward to seeing you or hearing from you sometime.

All best wishes,

Sue

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An Articulated Locomotive of the 1860's.

By Andy Probyn.

Those of you who have been following my articles may be interested (relieved) to know that this is the last of the locomotives from our encyclopedia of 1860. Relief may be short lived however, as there are plenty more books worth delving into, all will be steam and rail orientated but not necessarily both at the same time.

There are two locomotives on the engraving in the book and it is the articulated 0-10-0 which interested us, however it is worth looking at the Neilson express as an indication of what a normal top link loco of the time looked like. What a giant our Austrian loco must of appeared, when a British heavy freight engine was just a simple 0-6-0. The description of the loco goes as follows:-

Plate 2, Fig 1, is an elevation of a ten wheel engine belonging to the Imperial and Royal Austrian State Railway Company, at whose works it was made, under the direction of Mr Haswell. It has a jointed carriage to enable it to pass round curves. The fore-carriage, which supports the mechanism and the front part of the boiler, has six wheels 3 feet 4 inches in diameter, with a wheelbase of 7 feet 4 inches. The after carriage, which supports the coal box, the tank, and the firebox end of the boiler, has four wheels 3 feet 4 inches in diameter, with a wheelbase of 7 feet 4 inches; the mean distance from the hind axle of the fore-carriage to the front axle of the after-carriage is 4 feet 9 inches; giving a mean total wheelbase of 19 feet 5 inches. The wheel bearings are outside the wheels; the cylinders are outside the bearings, and are of 18 1/2 inches in diameter and 25 inches stroke; the slide valve gear is inside the wheels.

The wheels are cast iron discs with cast steel tyres. The tank which is in two divisions, one at each side of the fire-box, holds about 5 tons of water; the coal box about 2 tons of fuel.

The grate measures somewhat more than 15 square feet in area; the firebox surface is about 80 square feet, the tube surface about 1260 square feet.

The boiler frame rests on the after-carriage by means of slides, which allow for sufficient change of position going round curves.

The engine weighs when full about 42 tons. It has been proved by experience to be capable of drawing 200 tons up an ascent of 1 in 40, with curves of 300 feet radius, at an average speed of about 10 miles an hour.

The most remarkable feature of this engine is the mechanism whereby motion is communicated from the wheels of the fore-carriage (which are directly driven by the engine) to those of the after-carriage, not withstanding the joint between them, and their relatively oblique position while the engine passes round curves.

In the following description the hind axle of the fore-carriage will be called 'the third axle', and the fore axle of the after-carriage 'the fourth axle'.

About two feet directly above the fourth axle is an axle which may be called 'the intermediate axle'. It is supported upon the fourth axle by two uprights, whose bearings are ball and socket joints, so that they admit those axles becoming oblique to each other horizontally.

The intermediate axle is kept exactly parallel to the third axle by means of a pair of sloping rods.

Each of those three axles have a pair of cranks on its ends, at right angles to each other. The cranks of the intermediate axle are connected with those of the third axle, and also with those of the fourth axle, by means of four connecting rods, all of which have ball and socket joints, and thus a uniform rotation is communicated from the wheels of the fore-carriage to those of the hind carriage in all their relative positions......

As you can see, a most interesting loco with a very unusual articulation system. A standard Austrian feature is the built in funnel on top of the boiler for filling when drained in freezing weather. The explanation of the articulation system is rather stilted and probably warrants a second look, we have a conventional twin cylinder set up driving three normal axles. The fourth and fifth axles are mounted on a bogie which surrounds the firebox and is able to move round it. It is the method of getting the drive from the fixed chassis to the movable bogie which is at the heart of the system. A layshaft or 'intermediate axle' is mounted right above the fourth axle and driven by side rods from the third axle. From here the drive is taken down to the fourth axle and on to the fifth. As the fourth axle moves under the layshaft the vertical rods take up the movement in the same way that a conventional rod accommodates the vertical movement between axles. I must admit that the ball and socket joints had me foxed for a while, however when the axles move the rods have to accommodate a high degree of misalignment and radiusing the crankpins allows this.

The layshaft is supported on arms of similar length to the coupling rods so as to maintain the geometry while taking the curves and the bogie is fixed to the chassis with a most substantial hinge which should prevent any twist between the two. In all a most ingenious and successful design and one which filled the bill for a good number of years. Someone once said that every play should have a beginning, a middle and an end, but not necessarily in that order. The same applies to articles I hope because this loco is really the end of the story and I shall now relate how this design came about. When the Austrian railways were being built the only way south over the Alps was through the Semmering pass. At just over 3000ft. this was the lowest pass but still entailed gradients of up to 1 in 40 and curves down to 220 yards radius over many miles of track. This was all very well, but in 1850 there was no locomotive available that would work an economic load over this line, so the Austrian railways did the same as the Liverpool and Manchester before and had a sort of 'up hill Rainhill' trial, offering a prize of 20,000 florins to the best design. Four locomotives were entered, and most interesting they were, with the first examples of the Fairlie and Mayer types of articulation, the predecessor of our Engarth locomotive and a rigid eight wheeler (the first in Europe). The eventual winner was the Engarth type loco, though it was quite different to the one described

LOCOMOTIVE.

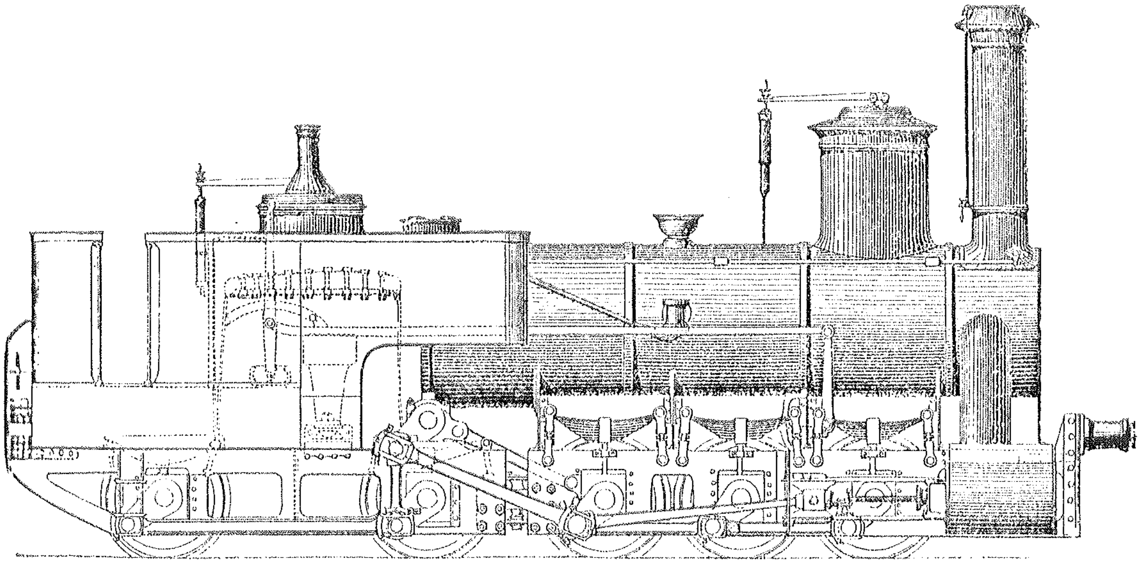

FIG. 1.—AUSTRIAN HEAVY TRAFFIC LOCOMOTIVE—ELEVATION.

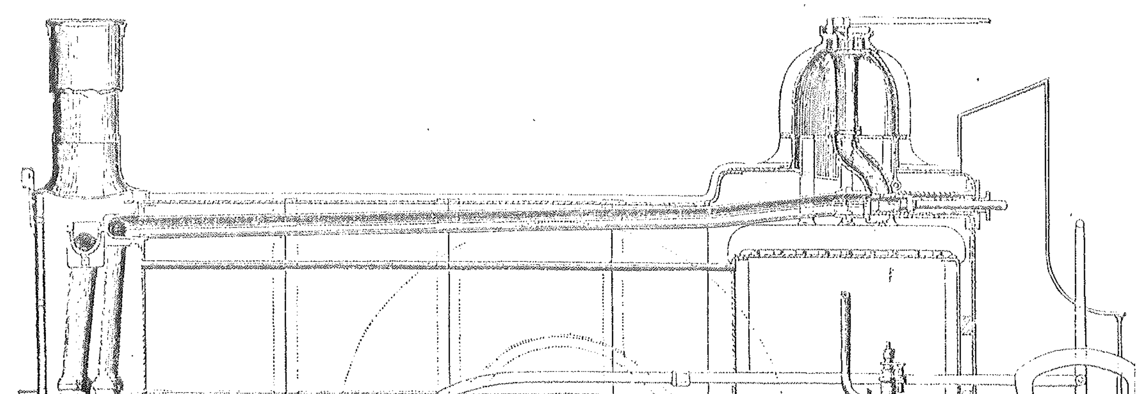

FIG. 2.—NEILSON'S EXPRESS LOCOMOTIVE—SECTIONAL ELEVATION.

earlier. The articulation was by chain and a six coupled power tender was used in place of the rear bogie. Although this loco won the prize, it was prone to breaking drive chains and was unsuitable for ordinary use on the line, it was not until Baron Engarth, departmental head in the ministry of industry, rebuilt the loco to the design described that a really workable loco evolved.

It is interesting to speculate as to why the rather unusual mechanical system won the day against the Mayer and Fairlie types which gained far more world wide success in later years. There were not many four cylinder locos around in the 1850's and steam production may have been a problem, certainly one of the locos was short of steam. Other weak links in the system were the flexible steam pipes which were not as trouble free as our modern counterparts. Even when the Mallett loco was invented some years later, one of its great advantages was that the flexible connections were only under low pressure steam exhausted from the rigid high pressure cylinders. There are other articulation systems using mechanical linkage rather than flexible steam pipes, but you have to lo k hard to find them. One was used by Heywood, where the sideways movement of the centre axle would turn the two outer axles round tight radius curves. I saw this used on long wheelbase trams in Amsterdam, though the centre axle was only used for steering, not load carrying. The German firm of Ornstein and Kopple used the same idea on the eight wheeled 'Feldbahn' locos of first war vintage and some Indian six wheelers, one of which is to be found in the Chalk Pits museum.

Even Greenly dabbled in articulation with a single Farlie 2-10-4 tank with Lutermoller axles on the outer drivers (gear drive to the outer wheels allowing more side play) and all that on 2 1/2" gauge. In the 1880's the Mexican Central Railway had some American built locos which looked like double Fairlies, but had the cylinders mounted on the loco chassis at each end with the drive transmitted through, and I quote, 'a complex system of rods' needless to say they were short lived.

The Engarth locomotives lived on in central Europe for many years, though many designs did away with the rods to the rear bogie, just using it as a sort of close coupled tender taking some of the locos weight. It can sometimes be a problem to know when a tank loco ends and a tender loco begins with these engines. I am not the only one to find this difficult as I have a pre-war spotters book which calls the L.M.S. 2-6-0 0-6-2 Garretts tank engines, in spite of having twice as many tenders as a normal loco. It is the Garretts that I hope to look at next, including one type to which to the best of my knowledge has never been built in either full size or model.

Since writing these notes, I have visited the Swiss transport museum in Lucerne. One of the oldest locomotives on show is an Engarth 0-4-6 tank and judging by postcards of it in steam is in working order. It has the front axle of the trailing bogie in front of the firebox and the back two axles behind, with the tanks, bunkers and footplate mounted on it in the usual Engarth style. It does not however have the drive taken to the wheels on the bogie, and it is difficult to see what the advantage is of this type of loco compared to say a conventional 0-4-2 with a four wheel tender.

"You cannot Scale Nature"

(or can you?)

By J.Ewins

L.B.S.C. seems to have been the first to have said "you cannot scale nature" at least in model engineering circles. No doubt this idea came to him intuitively as so much else did as a result of his lack of technical training. Others have tried to interpret the phrase in various ways with scant regard for the laws of physics. Professor Chaddock once said "You cannot scale nature-nature scales herself" which is a twist of words to which I find difficulty in ascribing any meaning. I think L.B.S.C's original concept must have been associated with his realisation that making models true to linear scale resulted in the indifferent performance put up by those models built to Greenly's ideas and that by moving away from strict scale in some parameters brought about greatly improved results. For instance Greenly used scale or under scale size cylinders with larger than scale boilers resulting in grates which were grossly under loaded and as a result inefficient. In fact because you cannot scale nature (in this instance), model grates even if made to scale are liable to be underloaded because the process of scaling down renders their area disproportionately large compared with other parameters. I built an engine to prove this (my 9F) and succeeded in doing so by hauling 89 kids at the Chingford track thus establishing a record as did David Shepherd's full size 9F. The point missed by most of our 'authorities' is that a model locomotive consists of two units, the boiler and the engine. For the whole to work well these two must be matched so that the demand on the boiler is sufficient to make it steam efficiently. The idea that a 'large lazy fire' is best, is wrong. A recent article in the Model Engineer endeavoured to show that an engine notched up to 20% would use only about one third the steam the same engine would use in full gear and would therefore be more efficient. This is the sort of error which it is all too easy to suffer if you don't actually make measurements to find out. With the majority of models, greater overall efficiency is obtained by running the engine-part less efficiently in order to load the boiler to greater efficiency. This is not just what I say off the top of my head, I have made the measurements and found out! You cannot scale nature (in this instance) because a lump of coal burning on a small grate must do so at the same rate as in the full size machine otherwise it will not attain the same temperature at which it burns efficiently. I know the temperature in a model fire is the same as in full size because I have measured it. There is no such thing as "scale temperature"

A similar situation exists in the erroneous concept of "scale pressure". K.N.Harris used to say that scale pressure for a 1" scale engine was 1/12th that of the prototype because if one made a true to scale dead-weight safety valve it would release at 1/12th prototype pressure. Had he followed the same argument in respect of a spring loaded valve he would have discovered that "scale pressure" was just the same as prototype pressure! Again, in another area we have the fallacious idea that copying the Swindon blast-pipe design criteria in a model produces the same advantages as S.O.Ell obtained on the Western engines. Ell took advantage of a fact of nature that the steam issuing from a converging blast nozzle could not be made to do so at a velocity greater than the speed of sound. This occurs when the back pressure behind the exhaust nozzle is approximately 10 p.s.i.g. and Ell so proportioned the blast arrangements that when sonic conditions were reached at the blast nozzle the grate was functioning at its limit. He described this as making the "front-end limit coincide with the grate limit". In models (because you cannot scale nature) the back pressure would need to be the same as in full size for sonic conditions. In other words the blast nozzle of the model would have to be so reduced that instead of usual back pressure of less than 1.0 p.s.i.g (I know because I have measured it), it would have to be nearer 10.0 p.s.i.g.- a pressure which would seriously hamper a engine working at 80 p.s.i.

Another aspect of model locomotive design which confounds those who adhere to full size criteria occurs where flow considerations demand special attention in full size to keep up efficiency. The flow of steam through ports and passages require in full size, large long travel valves with short streamlined passages. In a model, flow velocities are much lower (approximately scale) and passages much shorter (scale) that pressure drops fade into insignificance as the scale reduces. Again I have proved this by building a loco in which all the parameters espoused by the "authorities" are violated. This model is aptly called "Jimmy's Riddle" and I have never heard anyone complain about the way it goes. Perhaps they do behind my back in which case you are better placed than I to know! Nature plays a little trick on us here because the reduction in pressure drops alluded to above only holds up so long as the condition of the steam in both model and prototype is the same. Unless the model uses high superheat as on the prototype or has its engine in the smokebox as on the "Riddle" pressure drops will be large and big ports and passages necessary. Absence of sufficient superheat in a model causes the steam to become very 'wet' owing to the disproportionate loss of heat from the cylinders due to their surface area being so large compared with the steam passing through them. Wet steam needs a lot of forcing through apertures and passages. This effect is prevented in the 'Riddle' which has its cylinders in the smokebox. I have measured an efficiency of 3.8% at 80% cut-off with this engine under which conditions the boiler was working at 72% efficiency (flue gas temperature 350 deg C and CO^2 11%). How different it is on the track at I.M.L.E.C. where the only information you have is the speed and you have had to guess the load on an unknown track with unknown stock resistance! No wonder the results here are so variable with the same engine. Particularly when an unknown amount of slipping occurs (both insipient and manifest). If the wheels of a loco revolve 25% more than appropriate to the distance travelled then 25% of the work done by the engine is not recorded and the final efficiency figure will be 25% less. However I am getting away from scaling nature.

The recent disaster with the ferry at Zeebrugge brought to light a common procedure whereby nature is scaled. Viewers of the Tele will have seen a demonstration of a model of the ferry in a tank showing the bow wave reaching up to the open door at a speed corresponding to that of the real ferry at the time of the disaster. The scaling is done using an equation introduced by Froude which considers the dynamic similarity between model and full size and in this particular instance the gravitational effects on the water constituting the bow wave. If this is not scaling nature I don't what is! Other investigations are carried out in wind tunnels on scale model aircraft using equal Reynolds numbers as between model and prototype to predict the behaviour of a new aircraft before it is built. It is hardly likely that L.B.S.C. would have understood this process of scaling nature.

Miniature steam injectors are a case where you cannot scale nature because the thermodynamics demand steam and water velocities the same as in a full size component working against the same pressure. It is the one part of a steam loco which can be scaled down linearly and it will work. It is only when one gets down to very small injectors that boundary effects take over and departure from scale is necessary. At less than .010" dia delivery the flow is dominated by these boundary layer effects and they will not work at all (I know because I have tried it).

We see in the above a number of contradictions;- sometimes you can scale nature and sometimes you can't. This only goes to show how unwise blanket assertions are. As the immortal L.B.S.C. would have remarked, nuff said.

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§§§§§§§§§ CLUB TREK : THESE ARE THE VOYAGES OF THE L.N.E.R. ENTERPRISE
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§§§§§§§§§ Its five year mission : To boldly go where no locomotive has
§§§§§§§§§ gone before (well, I did warn you in the last newletter!)
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§§§§§§§§§ Club Date 25:4:87 Destination Welling.

This was our first trip to another place with our brand new L.N.E.R. V3 2-6-2 tank locomotive Enterprise. We left home with the engine safely ensconced in our even newer trailer (" Of course we don't need a trailer, it will fit in the car easily ," said my husband, scorning my suggestion a few months earlier) and headed for Welling Track. We arrived shortly before lunchtime at Falconwood with the sun peeping through the clouds and the trailer still with us. James was already there (Not Kirk as in Captain, but Ewins) and I scuttled off immediately for a few rounds on Jimmy's Riddle while Jim doubtless had one. If you've never been to Welling track I'll describe it in my own words (and hope I get invited back). It is located at the rear of a power sub station with imposing looking pylons standing warning of many megawatts in the background, and the track itself winds in and out of allotment gardens, with a straight run parallel with the British Rail line into Falconwood Station which enables the scale size trains to converse with the full size trains (not steam alas) as they pass each other. Welling's signal system wasn't out when we were there, and I feel this can sometimes be a good thing as often you get a better run with fewer hold ups. The Clark family (known as the vicar, the schoolgirl and the milkman of Fancy Dress Evening fame) arrived with their Indian monster Dholphur. After the engineer (with a poor Scots accent) attended to the Enterprise she beamed her way onto the track and I took the helm (only doing warp factor one on her first outing in a new world). The railway is a raised track, similar to ours and not too high so that you could step on to the ground in an emergency, even with my short legs, but fortunately this need did not occur and we all had a trouble free afternoon. An enjoyable time was had by all with welcome cups of tea despatched from their club house to keep the crew happy. So after a few hours we transported ourselves homewards, somewhat dirtier but well satisfied with our first mission.
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§§§§§§§§§ Club Date 16:5:87 Destination Sheppey.

This was the scene of the Southern Federation Spring Rally and it was a fine, breezy but cloudy day when we set off in the morning to find the track on the Isle of Sheppey. The track is a relatively new one running past a canal one side which is flanked by holiday chalets, and as you may gather not too far from the sea. At this gathering there were more Maidstone members than you usually get at Mote Park on a sunny summer Sunday afternoon, or even the A.G.M. and it was good to see the Club turn out in such force. Unfortunately, our time on the track was limited to half an hour this being due to passenger hauling, the signal system and trains coming on and off the track meaning also only half a dozen laps. To be fair we could have had another run later in the afternoon , perhaps we just went on at a busy time.There were a couple of trade stands, Gordon of Maidstone Engineering Services and Ron of Blackgates Engineering (can I have discount now after that plug) and Adrian rushed off to spend his pocket money like many a fellow there. There was even a TV showing the cup final tucked away somewhere and a few souls would surreptitiously disappear from time to time to check the score. I find that our hobby is divided between those who abhor sport in almost any shape or form (to Adrian a walk from the front door to the car is sufficient exercise) and those who are firm followers. But I digress. It was a sociable day at Sheppey.
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§§§§§§§§§ Club Date 6-7:6:87 Destination Harrow.

This was a weekend jaunt and the first night Enterprise had stayed away from her home base. This was also our first experience at camping in a tent. We set out on the Saturday morning, a two hour journey with our Secretary hauling his caravan and us following behind with the Enterprise tightly packed in the trailer and trying desperately to keep up. It was a relatively easy trip straight round the M25 and I successfully navigated the last part of the journey (most couples can have their best rows with one driving and the other map reading but for once I did alright). We were in a small minority of those staying overnight (like, um,four adults, two children in a caravan and a tent with two locos - just us from Maidstone) and positioned ourselves at the far end of the track, just inside the circuit so we could watch the world steam past at leisure and at our convenience (the caravan has its own loo). After a struggle worthy of being caught on video the tent was erected once Julia took charge, next to the caravan, but not before my nearest and dearest had told me off for being in the wrong place at the wrong time doing entirely the wrong thing. Now this weekend was particularly windy and it certainly cut across that field! After lunch in the luxury of the caravan we decided to steam up. Now Harrow and Wembley have a sophisticated looking signal and points system controlled by as many people as possible that can cram themselves into the signal box and look important (oops, better watch my step here!) rather than help in other ways to smooth the running. My sarcasm arises because we did not get a lot of assistance in getting the loco on the track, derailling several times as the track is ground level and multi gauge and we also had trouble finding a trolley. It was not so comfortable as driving at Mote Park, so if you think that is uncomfortable, try ground level! However it did not stop us having a nice play despite the gloomy clouds and gales. We retired quite early for the night to our tent, the wind still strong, a Harrow member chugging past on his loco late into the evening. As we lay in our sleeping bags wearing four layers of clothing the wind got even stronger, the tent started billowing and I started wondering if it would still be with us in the morning. It was, but needless to say we did not get a great deal of sleep (because of this, what were you thinking?!) as it rained as well during the night adding to the noise. Bleary-eyed we emerged soon after seven as the din emanating from the caravan indicated the boys were certainly awake, up and about and woe betide anyone who wasn't. A hearty breakfast was followed by a last long run before too many of the Sunday crowds arrived. We did some passenger hauling which involved playing with their turntable system to turn round, this was fun. There was certainly more people there on the Sunday than the Saturday, probably because the sun came out (but only when we were packing up!) and there seemed to be more going on. It was a good weekend and I was sorry to come home.
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More next issue (unless I get deluged by articles or requests not to continue!) Enterprise treks to Brighton & Hove's Silver Anniversary, the Canvey Island Open Day and more.
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NEW MEMBERS

Please welcome to the society:

Anthony Coppins of Maidstone who is interested in 5" gauge locomotives and traction engines;

Nigel Dodd of Snodland who is building a 5" gauge Springbok;

Roy Hills of Gillingham who is interested in model boats and steam locomotives.