Flatpack Coach Kits & What I Do To Them - By Tony Seal

This article is not really designed to be read on its own, more to follow as you make your own coach. It will be a blow by blow account cramming in as much information as possible.

I have made approaching 500 coaches or npcs types over the past 20 years or so, but I am still looking to improve the product. To me, your modeling prowess should progress as you practice your hobby.

I have not been asked to build any kits of prototypes that came after nationalisation, nor any for Scottish pre-group, otherwise I have covered most other railways stock, including narrow gauge. It makes no odds to me the principles are the same. If I am teaching my granny to suck eggs all well and good. But if you don't agree with what I am saying do let the editor know, he will be most pleased to receive your submissions. Equally if you know of methods that are easier, cheaper or superior, let us all know. Where I give dimensions of say 1, 1½ mm etc, do not take too literally I tend to do these by eye, on the assumption that, if it looks right, it is right.

The coach I have chosen to build is a pre-grouping, therefore panelled, corridor tri-compo brake lav. This covers as many types as possible within one coach. Also this type of coach was used for through services to other railways. The working that this particular coach was used on, Bournemouth-Manchester- Bradford, covers three of the Big Four. Diag 409 was a LSWR example and later most of them were incorporated in sets, as they were superceded by more modern designs. During the course of this article I will endeavour to cover all the other variations, such as, bow ended, bow roofed, non-panelled, Pullman, non-corridor and angle iron trussed underframes.

First Steps

Yes the old clichés still apply, arm yourself with a decent photograph and if possible a plan, at least this will give an idea of the finished product.

Buying Your Kit

Several sources come to mind. The Society has an ever lessening number of kits as new, but when the secondhand sales team restock, you can pick up some old Mallard SECR/ GWR kits from
Terry Smallpiece, still very useful if a little old technology. These are usually sides, ends & floor in one piece types. A couple of tips with these, unless told differently in the kit notes, all bend lines are on the inside. Use a scriber to deepen any folds you think might cause problems in bending. I do this until the line shows through, do not use a scalpel/ craft knife, all you will do is part the pieces, and there is no need for this. Even having done this I still use bending bars to ensure the bend is in the right place. Mine are a couple of ¼ " square brass 10" long, with a hole drilled either end to take a nut and bolt. I clamp the whole assembly in a vice so that there are three pressure points to hold the thing steady and tight. So the sequence for building these is:

Tumblehome
Drill holes
Bends
Start Soldering

Worsley Works' floorpans have intermittent holes and tabs where bends are needed, and can be turned over very easily. I use these with the P.C. and LSWR cross country coaches as well as Alan's.

Best Buys

"5522" kits, if you can find them, are the best I've put together so far, with Bill Bedford's and
Finney & Smith's, a close second. Worsley Works comes next; Alan has produced well over 400 types by now. The Gresleys made for Peter White are also very good, as are Andy Mullins' Branchline kits. The ones you *do not* want are any MTK kits, especially Gresleys (how you get over and under etching on the same side I'll never understand) or Bulleids (correct height but over length and windows too large!!). The other one to avoid is the old GWR Autocoach, I don't think the etching medium was ever cleaned off these, consequently the process is <u>still</u> going on, holes appear in all sorts of places. I must admit to a

bias towards suppliers who provide spare parts on their frets, such as droplights, door vents, steps etc. A lot of these are bend up types, which I prefer, as there is less soldering to do.

Examine Your Kit

You would be surprised how many are wrong in some respects. Windows where there shouldn't be any, or in the wrong place (MTK again) Footsteps on ends that did not have them and the converse, Panels the wrong size and in the wrong place. Even different length sides. I had one kit from a supplier, who shall be nameless, for a van that had never seen the light of day in 12" to 1', the sides were totally wrong. When challenged, his reply was that no 4 mm modellers had ever complained!!!

Bill Bedford's kits come in different guises i.e., sides only, body kit or whole coach. Know what you are getting when you order. Worsley Works types are similar but you can talk to Alan face to face to find out what you need. He will sell you sides & ends solely, with a floor, with a roof etc. Make sure all the bits are there, he has been known to forget the droplights/ buffer beams occasionally. As a rider to this don't forget that coaches come in widths from 7'9" - 9'3" so you do need the right width floor pan.

One other thing about Bill Bedford's sides, "They are made from 8 thou brass so are "designed to be built around a solid box of other material", his words not mine. However I did build a 5 thou Silver Jubilee set of his by the methods I normally use, you just have to be a bit more careful not to put your fingernail through the brass.

There is a leaflet called "Building Coaches the COMET Way", Alan will let you have a copy. I agree with the first three paragraphs, after that, we go our separate ways. Don't get me wrong, there is nothing wrong with the Comet way, I just prefer mine. Anyway I won't convert any died in the wool Comet modellers. I was taught to use a soldering iron as an apprentice aircraft electrician, not a plumber, therefore I use resin cored solder and no separate flux. Resin cored has the correct amount of flux already so does not need overkill, and you don't have to scrub your coach afterwards. I've never used solder paint either. The other big difference is that I *always* put the roof on last. I don't like screwing coaches together, and leaving the sides to flop about, independent of the floor. I prefer everything as rigid as possible. All soldered up, and the roof Superglued to the body after all the internals are done. This way the fitting of most parts is easier and neater. You will see my reasoning as we go along.

So To This Kit

Two slight problems with this one, there are no bolections around the quarterlights, which gives a rather wide-eyed look and the beading at the extreme end, away from the brake end has been extended to the bottom of the side. This one is easily solved with a flat needle file, with the side held on a firm surface. The file I used just fitted between the lower waist beading and the bottom rail. The bolection problem is a little more difficult, Ian Smith soldered a piece of wire inside the aperture of every quarterlight on a couple of his coaches, good luck. An alternative would be to solder spare droplights in place and file them back to the correct profile, this would make glazing easier as a whole compartment could be done at once, but what of the corridor side, so I've decided to live with it. Alan tells me that future LSWR kits he produces will have the quarterlights smaller, by virtue of beading where the bolections would be. One thing I have to say at this point is that any criticisms I make have been brought to the attention of the guilty parties. In a constructive and caring way, I hope.

Bits & Pieces

Whatever your company or prototype, you will need to buy various additives to complete the model depending on who supplied the kit. In my case the kit comes with sides, ends, droplights and floor, which includes solebars & footboards.

Roof

An excellent plastic moulded one for LSWR use is supplied by the South Wilts group in the person of Vic Freemantle, this is superior to the Society one, as the profile is wrong. One word of caution, the Wilts roof is designed to fit 8' wide coaches but will stretch to 8'6" with a little work.

This roof will fit any flattened ellipse type including SECR, some LNWR, Midland, NSR, all Scottish lines and most pre-grouping LNER companies. Other roofs available are the Society Maunsell ones which are correct. The GWR B Set one is also useful and of course Worsleys' extruded aluminium version. Occasional problems occur with these, in that they can come slightly narrow. The width I get over by placing the roof on the floor, rounded side down, putting a piece of plywood on top and standing on it until the correct width is reached. After this process it is essential to check the sides are parallel and above all not bowed. Although the latter is a distinct advantage when making MTK Gresleys! The other useful bit is that you have a moulded cantrail which gives a nice clean line twixt side and roof. The down side is that anything like a covering to represent canvas and rainstrips, have to be stuck on with Superglue etc, whereas with a plastic roof MEK does the trick far easier.

Bogies

There are three types of these in use.

1 The old all white metal method which often doesn't give any compensation.

2 The 3SMR etched fret to which you attach cosmetic sides, some compensation.

3 The all singing all dancing MJT CCU's.

If you use autocouplers, the third option will be rather a waste, but I will explain the differences and how to build them as we come to it. The sideframes are available from the Society, Bruce Hoyle & 3 SMR depending on prototype. If going for option 1, the stretchers are RR2 in the Society list.
Andy Mullins kits, come with a similar bogie fret to the 3SMR type, with instructions for the making thereof.

Wheels

As I write this the Keen Maygib ones are unobtainable, but I am assured by Andy Green that a substitute is on the way. Pin point axles running in bearing cups, to me, are essential. I have some Jackson wheels with domed axles, which I am in the process of upgrading. In the tender wheel packets from Keen Maygib you will find two axles, I use the stub end ones for my tenders, which leaves the pinpoint ones spare, however these are thinner than the Jackson type. If you can get hold of some old household single strand wiring the insulation, in either red or black, is a nice fit in a Jackson wheel once you take out the fibre insert. A drop of Superglue applied while holding the wheel set in a back-back gauge will hold it all together.

Bearings

These can be either KM or Slater's with equal facility. Although Slater's in MJT's need care as the top hat brim is quite narrow and in 3 SMR's some distortion of the frames is required, they don't go as far in. Incidentally if you are into 6 Wheel coaches, I can recommend the West Midlands swinging chassis, sold by Iain Stewart, equally the ones supplied with the Finney & Smith kits also work well.

White Metal Parts

Battery boxes or gas cylinders, buffers, dynamos, vacuum cylinders, corridor connections, whether British Standard or Pullman, queenposts (SECR) and roof furniture are available from the Society, Bruce Hoyle, 3 SMR and in the case of battery boxes also from Worsley Works. Check your prototype and choose accordingly. LSWR buffers and battery boxes are also available from John Bateman.

Consumables

Styrene sheet, strip, brass wire, superglue, paints ,sprays, lining & lettering MEK etc. MEK actually stands for Methyl Ethyl Ketone and is used as an industrial cleaner, somewhat cheaper than the stuff supplied by the model trade. Nuts bolts and washers should also be made available. Terry Smallpiece will supply the latter.

Superglue

The best way I've found to buy this stuff is in 20g bottles of low viscosity. Unscrew the lid, prise out the dropper, without piercing it, and use a piece of wire, or similar, to dispense the liquid. Mine is soldered to the smallest instrument screwdriver to give a degree of control. Replace the dropper and lid ASAP. Reverse the discarded lid of a spray can and place your bottle inside. If it now gets knocked, it won't go over, just slide. My cutting mat is permanently attached to my bench, you find out the hard way. Also keep the bottle in the fridge, it won't harm anything once the dropper and lid are replaced securely, tell them I said so. It will keep for longer this way.

Tools

Everybody has their favourite set of, so I won't go into mine here but mention them as we proceed. The main tool of course is the soldering iron. Never less than 25Watt and preferably 50. My personal one is an Antex 660TC temperature controlled soldering station set at 325 degree C. Not cheap I know but well worth the investment. Use the smallest bit possible for a neat job. If the solder doesn't flow as required, up the size of the solder bit, don't raise the temperature, that way lays bit burnout. The best iron I ever owned was a Weller temp controlled one, but I left it on for 48 hours and it didn't do it a lot of good. When soldering you need a barrier between the iron and the workbench. For this I use a piece of 5 ply wood, which also serves me as a drillblock. The size is not essential, a piece of 5"x 6" or more will do. Placed on top of my cutting mat, ready to use. The solder I recommend is 20 Standard Wire Gauge, 18 at a push, 60/40 tin/lead. A word about your working environment. Do not use a carpet in the workroom, you will not find the bits you drop. Imitation woodblock or parquet flooring is not good either, too much like the colour of brass. The best colour is green, the darker the better.

To Work

If you have had your flatpack for some time, you may need to clean it up before starting to solder. This particularly applies to the early Society kits which were not well cleaned before packing. Wear a glove on one hand and scrub away with a fibreglass scratch brush on a flat surface with the other. I do this in my garage and you'll know why if you don't wear the glove. Most manufacturers' sides come as part of a fret so that they have to be cut out. If you can get at the tabs easily, the method I use is a pair of shears made by Tullen of New Zealand. I don't know if they are still available, certainly not in Squires catalogue. The other way is to cut the tabs with a craft knife/scalpel blade. The combination I use is a Swann Morten No 4 Handle with a No 23 blade. Being flash I have two scalpel handles, one with a new sharp blade in, the other a dull used one which I use for this sort of job. (That is if I haven't broken it already, a frequent occurrence.) Get rid of any residual tabs by using a warding file, or similar, along the edges not across them, that way you won't dig in to the side. Finish off by holding the side flat in the hand and use a scrubbing motion away from you on the inside and outside with the same file. If you have off cuts from your fret that are straight and 2-2½ mm, keep them as they come in handy for footboards etc. Now we are working on the sides do not forget that panelled sides are thin and easily bent. If you do bend them, or any other piece, place it flat on your cutting mat and rub the reverse end of your scalpel handle over it on both sides until flat again. *Remove the scalpel blade first.*

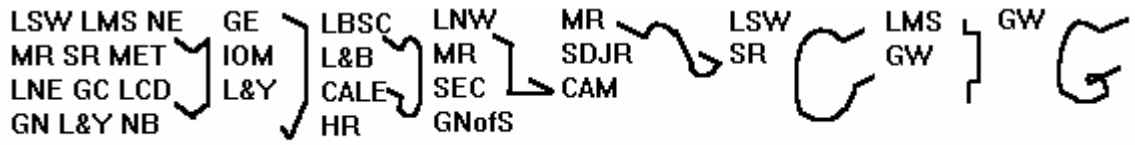
Tumblehome

Get down to the local DIY store and buy a foot length of quarter round beading, easier to manipulate than halfround, approximately ¼ " on the flat sides. Hold the side in one hand on the finger tips and with the same thumb press the beading into the side below the waistline. Rub it along and across the required area for the full length of the side. It doesn't matter if you overdo it, just reverse the side face up on your bench and press down in the appropriate place with that scalpel handle. Easier to do than write about. If you are building non-panelled coaches, Alan will form the tumblehome for you. Otherwise place a steel rule on your bench, place your side just on the edge and rub that very same scalpel handle along the length until it forms.

If you are making 9' Maunsell brakes, now is the time to fit the two parts together. Butt the two parts up to a fairly thick 1' steel rule, having first measured them to make sure you have the correct length. Liberally smother the joint, inside and out, with solder. Here you can use 16 SWG to good effect, then file down to get the correct profile.

Grabrails/Handrails

A veritable minefield:-



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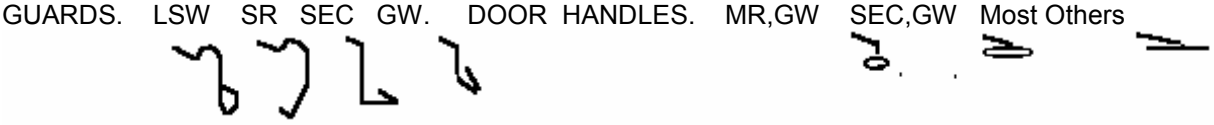
GUARDS. LSW SR SEC GW. DOOR HANDLES. MR,GW SEC,GW Most Others

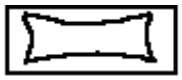


I use Alan Gibson .33 mm brass wire for these, therefore a .4 mm drill bit is required, held in an Archimedean Drill. This is a hand operated spiral pin vice with a return spring. I break one of these bits a month on average, but you can retrieve the situation if there is enough of the bit left with a flute on. Rub the bit on an oilstone, held at an angle of 45 deg, with a twisting motion until you get a reasonable shape to it. Not exactly re-sharpening, but it will wear its way through brass fairly effectively. Most modern manufacturers either drill some holes, or at least have an indent as part of the etch. I prefer the latter as some holes can be over etched and the handles I use drop right in. Again, check the holes are in the right place. Some companies had the guards door opening the same way on both sides, others the opposite, therefore the handles will be on the other side. The LSWR went in for horizontal handrails around the guards van on the top waist beading, the GWR had them on both ends of most coaches, but on the lower beading. If there are no holes for these, a problem arises in that it is rather difficult to keep a drill on the beading. The way I get round this is to drill as close to the beading as possible, at a fairly acute angle so that the hole appears in the side of the beading. Once you have the hole straighten the drill and proceed. Now you know how I break so many. The better method is to go to the nearest junction of vertical and horizontal beading, where there is a bit more meat, and drill there. Not always possible with GWR I'm afraid. A number of companies also used a locking handle for double doors. This could also be left or right handed. Now all the holes are in the right place we move on. If there are holes for door hinges, I will fit them, if not I won't. I do not think they are necessary in 3mm. I find they get lost in the paintjob. Some kit suppliers continue an indented line down from around the doors to the solebars, Alan does this on his steel sided coaches, but not the panelled ones. I agree with this policy, as the sides are quite thin on the latter. I therefore do not scribe those lines as they will bend the sides no matter how careful you are.

Droplights

The first bit of soldering for most kits. Clean up each droplight as you did the sides. Rub the face of the droplight with the warding file to ensure that it is flat. Offer it up to the hole and ensure that there is enough meat left either side to fit your glazing. All the Southern companies used the leather strap to raise and lower their windows. A consequence is that the lower rail of the light is more prominent than the upper. Don't overdo this as you will leave a gap at the bottom. Cut a piece of solder approximately 1 mm in length. Hold the droplight in place, I use an old broken flat file for this, other people use Bluetack etc. Place the bit of solder on the coach side abutting the top of the droplight. Apply the previously tinned soldering iron to the solder and allow to flow. If you have not tried this before, use two bits of scrap brass to practice on, try pulling them apart when you think they are fixed. Once the solder flows it has made the joint so remove the iron. Turn over your side and ensure that the droplight is in the correct place. If not reapply heat and move it around when the solder flows again. If correct, repeat the procedure on the bottom of the droplight. With a six inch file, get rid of any excess solder from the rear

face of the droplight, until you see bright metal over the whole face, this helps when glazing as you have a flat surface to start with. You shouldn't have got any solder on the front face of the light but if you have, use a minidrill with a burr in to get rid of any excess. Do not buy a Precision Petite or similar, they are not up to this sort of use, as the bearings will give out. The one I have gone for is the Minicraft, I have no knowledge of the Dremel but it seems about as good. Problems arise with double door lights as quite a few grab handles have the top fixing between the two doors. File the width of both lights until there is a gap sufficient for the handrail tang to get through. The LSWR droplights from Worsley Works, appear to be shaped like this (exaggerated).



To get round this I use a square needle file, on the sides first to straighten them, then top and bottom to produce the rounded corners. Yes a square file has rounded corners. Incidentally I don't have any open windows in my coaches, I don't think the British weather is up to it. Comet sides for LMS coaches have integral droplights, with some etched in the open position. Now recheck your handle holes are still see through. Some SECR coaches had droplights in the first and second class toilets, other railways may have followed suit, something to look for. You may find if your woodblock barrier is unseasoned, that the rising sap due to heat from your soldering iron, has left nasty deposits on your work. If so, run a file across the area, or a scalpel held at a fairly flat angle.

Handrails Continued

Again I will describe the LSWR fittings first and then some of the others. Using a pair of flat ended tweezers (a discarded set of eyebrow tweezers are ideal) turn over the last 2 mm of a length of Alan Gibson brass wire at 90 degrees. Insert it in one of the holes, align the long end with the remaining hole. Take hold of the wire with the tweezers, on the inside of the length, so that you can see the hole fully. Remove and make another 90 degree bend, parallel to the original. Drop the long end into one of the holes, release the wire and allow the short end to drop into the other hole. If it goes in first time without fiddling, you're a better man than I am Gunga Din. If it happens more than twice per side, you should be writing this not reading it.

That was a straight rail, everything else stems from it. As you can see the most popular grabhandle is the first one. For this turn over 2½ mm, same 90 degree. Grasp the bend in the wire, covering approx the extra ½ mm, with a pair of flat ended pliers and bend the short tang over at 90 degrees. A normal pointed set of tweezers is required next, mine have several notches filed on them, corresponding to various sizes of grabhandle. Hold the wire in the tweezers so that the short tang is parallel to them and bend your third angle in the long end, again at 90 degrees. Taking the pliers, again at ½ mm from the last bend turn over the long end at 90 degrees, to make the final bend to line up the two ends of wire in parallel. That took longer to write than do. The reason I changed from flat ended tweezers to pliers, is that being stronger, you will not get any slippage of the wire. The eyebrow tweezers are fairly thin bladed, compared to the average pliers, so can be used to turn over the rounded type of grabrail like the Brighton type etc. The C's of the LSW/SR and the G's of the GW type are best done on a jig. This is first mentioned I believe in the notes for the Toplight kits. It consists of a flat piece of brass with a .4 mm hole drilled near the top. Two small posts of 30 thou wire, and a further hole drilled to take the return of the G. This is designed to allow for accurate drilling of the holes in the coach side as well. The one I have was made by a client of mine, and he will get it back, when I have built all my Ironclads and Maunsells!? The idea is to bend that obligatory 2 mm, insert in the top hole, wind around the two posts, and bend the long end so that it drops in the bottom hole. However this means cutting off the long end to approx 2 mm again to be able to get it in the hole. I don't want to do this, with my system the longer the better. I make the last bend by hand, but the above does give a degree of uniformity to your grabrails. Roxey Mouldings supply a jig as part of their kits for the SECR type, if you don't like the handles they also supply.

Okay, refer back to the end of paragraph one of this section. You need something to keep all these bits of wire away from the surface of the side. For this I use a previously broken scalpel blade, in fact several different ones to give a range of various sizes of broken bits. Slide the biggest piece of blade that you can get under the wire, turn the side over, holding on to the long end, and place face down on the bench. Now you see my reason for not cutting the wire. Bend over the short tang of wire, the broken file is used again because with the crosshatching it won't slip and damage the side. Do not press down too hard, as

the indentation of the wire will show through. Cut off the long end with a pair of sidecutters, raised slightly from your work, this gives you enough end to turn over. Now the handrail is gripping the scalpel blade, so you have two hands free to proceed.

Either cut off 1 mm of solder as you did for the droplights, or place the soldering iron bit up against the wire and feed the solder to it. Again practice if unsure. Reverse the side again and check the handrail/grabhandle is level/in the right plane. If not a certain amount of tweaking with pliers or tweezers can be undertaken without detriment to the wire, as long as you don't squeeze too hard, it is brass after all. If a straight rail is bowed, concave or convex, placing a scalpel blade, this time in its holder, under the wire and pressing outwards, can shift it quite a lot. If its too bad for any of this treatment, scrap it and try again, its not a huge expense. When satisfied with the look, rub down the excess solder on the back, until level with the droplights. If there are bolections on the quarterlights, all well and good, if not, do not solder the top end of your grabhandles too close to the hole. On some coaches the handrails come mighty close to the end of the side and may cause problems when fitting the ends, if so, use your burr fitted minidrill to get rid of any encroaching solder.

The locking handles are next. Turn over that 2 mm, but this time feed the long end of the wire from the inside of the coach. Hold the side down on the wood, with the long end of the wire dangling over the edge of the workbench, and hold against the edge with your thumb. Solder in, keeping clear of the handle holes that remain. Turn over the side and place a scalpel blade against the long end. Turn over and snip off to the required length. This method is also used for horizontal guards door handrails on LNE coaches. Guards grabhandles complete the furniture. Start as before but the second bend is made over the flat ends of the eyebrow tweezers at 180 degrees. Drop the short end in the top hole and take hold of the long end where you want the bottom bend to be. Remove and make the bend, again over the tweezers, replace on the coach side. Take hold of the wire where the last bend should be and complete the grabrail. Solder in the usual way but remember that this one will be more proud than normal because of the locking handle, two thicknesses of scalpel blade. The top leg should fit between the two droplights, so when soldering ensure that the solder runs well into the gap. Rubbing down the back of the area should then not affect the wire thickness.

On to the door handles themselves. You will see from the diagrams that there are only two types in effect, as the first one is only a turned over second one. Some manufacturers supply grabhandles and door handles, but in our scale I find them rather flimsy and prone to breakage. Instead I use
Roxey Mouldings T door Handles, 4A 108 is the Ref No. Take hold of the crossbar of the T with flatnose pliers, now with flatnose tweezers try to pull the handle out in two planes. This gets rid of any residual brass left after cutting from the fret, and makes them pointed. They have a bulge half way up the vertical of the T, so that you can press it into the .4 mm hole, and it stays there while you turn the side over. If the hole has been etched oversize the above two sentences are wasted.

If this is so, drop the handle in the hole, keep hold of the tang with a pair of tweezers while you put your side down. Push the tang back through the side with a file end, then hold in this position, as this will be the correct distance away from the coach side, because the grabhandle is making it so. Solder up as before, but keep your soldering iron away from the grabhandle ends, otherwise it will drop to the face of the coach. If I'm making early GW/MR coaches, I use Roxey Mouldings Loop Door Handles, 4A 107 is the Ref No. and bend over the actual loop. These have a rather fat tang on them which will have to filed down to make them fit a .4 mm hole.

For SECR coaches use the ones supplied with Roxeys kits as the 4A 107's are a little large. With the Southern slam door locks the handles tended to stay horizontal, however, I have noticed that LNE Gresleys handles slant down at the grabhandle end, probably due to wear. You may realise that there are now a number of blobs of solder on the inside of the coach. As long as they are flattened, they will not interfere with any internal fittings. Even with a dentists mirror and a torch, nobody will ever see the inside face of a coach side, even from the opposite side, once the paintwork is finished.

With some panelled coach kits being so thin and therefore easily bent, you may find it useful to strengthen the top of the side, especially as we will be fitting a plastic roof. One method apes the fold around style of the older kits, by soldering a length of brass strip, culled from your kit fret edge, at right angles to the top of the side. Slightly cut back to allow for the ends to fit, this gives rigidity and a base for the roof. A better way is to use a length of 40 thou square brass, fitted along the top so that it overlaps the edge by a small amount. Similar rigidity, and an easier way of fitting and securing the roof. About the only part of

the MTK kits worth having, you were supposed to make the angle truss underframe from them. As I use Alan Doherty's floorpans, they became surplus to requirements, but I never throw anything away. Bill Bedford's kits can also benefit from this method, but take care not to interfere with his method of aligning the coach ends.

Last thing to do on the sides is fit any guards lookout, if supplied in brass. If not and you have to make them yourself from Plastikard, wait till all soldering has been carried out. If you are making Worsley's Pullmans, the only pieces you have to worry about on the sides, are the toilet window surrounds. These are best sweated on. By this I mean coat the coach side in the vicinity of the window in solder. Do the same with one side of the surround. Place in the correct position on the side, and apply heat via a tinned soldering iron, until the pieces fuse together. Any residual solder can be removed by either a file or the minidrill burr. So now we have the two prepared sides. It takes a while, but to me, is the most important part as it is the first thing you see. A little care doing the sides, will reward you with the final look of your coach. Final job is to place small blobs of solder, all along the inside of the side, at approximately 10-15 mm spacing, halfway between the windows and the bottom of the side. Do keep well away from any soldered parts already fitted. Mainly for LNER modellers, if you have any Trevor Charlton Mazak sides, solder will adhere to them, without them melting. So all the above will apply.

Floor

Cut the floor from the fret, and get rid of any residual tabs as before. Also run a file along the outer edges to clean them up. Most of the coaches I have to make do not fit any particular floorpan size, so I buy the nearest one up and cut to suit. To do this, measure your side and mark it in the middle. Do the same with the floor. Line them up and mark for cutting at both ends, this is really important with the drop down trussing types. Do not forget to allow for the thickness of the ends. If you are making bow ended stock, bear this in mind as well, you don't want large gaps at the ends. Pullman floors, as supplied, are cut correctly for you.

Using a setsquare and scriber, mark your cutting line, cut with shears. Either that or use a craft knife, to indent far enough, to be able to snap off the unwanted pieces. Whichever method you choose, the ends will need cleaning up with a file. Recheck with the side that you have taken enough off, and that the ends are square. If doing a coach with long handrails that reach the bottom of the side, or near enough, you will need to remove part of the floor uprights to avoid fouling. I use my minidrill and burr to make the obtrusion as small as possible on the side, and use a square file on the upright, to make the gap the same. If possible try not to go all the way down with your gap, far stronger. Bend up the two floorpan edges to just less than 90 deg, to allow for the tumblehome (Pullmans to 90 degrees).

With the floorpan flat on the woodblock, offer up the first side to its correct position. With the index finger and thumb, hold down the floor firmly. Curl your other fingers around the side, to hold in place, and down at the same time, most important. Some modellers tell me that they use Bluetack and pieces of wood to achieve this. I prefer my fingers as I can feel things better.
Tin your solder bit, and apply to one of the blobs on the coach side, drawing it down until it attaches to the upright. Convention tells us to start in the middle, to even out the temperature differences, and avoid bowing of either piece. Now inspect both ends to ensure that the overlap is exactly the same. Continue to tack solder in this way along the whole side.

Turn the vehicle on its side, and run the solder blobs together, while holding the upright hard down on the bench. For this I use the end of a file. I also try to remember to do the corridor side first, as then I can get the file through the larger windows to do the holding for the other side. Try to keep the file upright while pressing down, as any sideways pressure will force the floor away from the side, then you will end up with the floor showing beneath the side. This is particularly relevant with the drop truss frame type as there is little rigidity in them. If there are any gaps, after running the blobs of solder together, cut off a small piece of solder and join them up. Again during this bit stay away from previously soldered parts. Also you may find that some sap adheres to the sides. Check the sides are square to each other, by means of a set square, before running the blobs together on the second side. You do not want the ends to fit at an angle.

The particular floorpan that I am using has no drop down pieces, truss frame, V hangers etc, however a lot of kits come this way. The most useful of Worsley's floorpans, are the ones designed for the LMS coaches, they fit anything that has an angle iron truss. The only problem with this type, is that the angled irons that go up to the back of the solebars, are not attached to the floor, and they are very sharp. I have more scars from these, than from scalpels. The Bulleid ones don't have this worry, but the trusses do bow when soldered up, so have to be cut away from the floor, at the ends, prior to soldering. Swings and roundabouts as they say.

Ends

To provide the compartment partitions, or bulkheads, that are needed, I use one of the ends as a template and mark out on 10 thou Plastikard. Not forgetting to allow for the thickness of the floor that you intend to fit. The reason for using 10 thou, is that in suburban third's, there is not a lot of room to get partition and two seats in, without encroaching on the quarterlight. The other way is to fit the seats back to back, then to the coach and fit a dummy bulkhead on top of the seat join. For first's you can use 30 thou if you like. I have a number of these templates, made from a variety of mediums, to most of the types of coach widths and companies. Prepare the ends in the same way as the sides, and fit as much furniture as you can, far easier in the flat. However do not fit any handrails that come close to the edges, they will only get in the way, just drill the holes. Bruce Hoyle has made some cast ends for Gresley coaches, especially for those MTK horrors, as the ones supplied with the kits are well narrow. Soldering white metal with resin cored solder is fairly easy, as long as you don't stay too long at the join. Best to tin the brass and wipe your iron over the joint fairly rapidly. Bow enders give the most problems here, as the angle to bend them at to give a smooth appearance of your coach, is a matter of trial and error. Unless you use the etched junction pieces supplied with the ends, I don't, they intrude into the coach too much for my liking.

Worsley Works supply a fret of endsteps which fit as one and are easy to use, other makers have individual steps which are not. Whichever you have, bend the tabs to 90 degrees and fit into the holes provided. Hold the end and the tab in a pair of flatnose tweezers, cut off a piece of solder and proceed as with the droplights. Recommend just three places with Alan's. To save getting solder on the face of the end, when doing individual steps, bend so that the tab goes up when fitted. Some of Alan's kits come with the two bottom steps, over the buffers, as part of the ends, others do not, unfortunately. Some also come with loops for the emergency telltale wires, and some do not. If no loops are present, use a couple of loop door handles.

Corridor connections come in two forms. Pullman for the Southern and LNER, British standard for GWR and LMS and 90% of pre-grouping companies. I use the Society B.S. type where appropriate. The two pieces seem to have a concave shape to them. Get rid of this by placing the side on your bench with the top and bottom lugs vertical. Now press down between them with the end of a scalpel handle. Make sure the mating halves are square to each other top and bottom by running a file over them. Take hold of the two halves together with a long nosed set of tweezers.

Line up the two halves exactly using a flat nosed set at top and bottom. Cut off about 3 mm of solder, place on one of the joints and fuse. Reverse the tweezers and repeat for the other end. Now file what is now the front until all irregularities are got rid of. Also file top and bottom until square and not showing any joins. File away any excess solder from the inside as well. When lining up the gangway on the ends, do not forget that the floor and therefore the top of the gangway tread is approximately level with the top edge of the bottom beading. Place on the ends, cut off 2-3 mm of solder, and solder the two insides to the coach end. If I've left the fitting till after the ends are fitted to the coach, I place the end of my coach over the woodblock turned through 45 degrees, with most of the body over the edge of the workbench and between my knees. Now hold the gangway down with that broken file.

Pullman gangways come in one piece, so just carry out the soldering job. There are two types of Pullman gangway on the market, one with and one without a top step fitted. Bow ended stock ends are best done in the flat.

Take your first end, make sure it is the right one, offer up to the three piece coach body. Butt up to the floor and top of side pieces. Hold down the tops of the sides by thumb and first finger, and press the end hard up with the remainder. If the kit you are building does have bottom steps fitted by Worsley Works

you need to raise the floor by the same amount before proceeding. Usually one thickness of fret. Cut off 2 mm of solder and place against the joint between floor and end to one side of centre, tack solder. Inspect the end to ensure it is square and even and that the sides will fit well when finished. Do the same on the other side of centre, re-inspect. Turn the coach on to its side and raise it so that the extreme end is pressed down on your block. This should ensure the end and side are in coincidence, now tack solder the top of the side and repeat for the other side. Inspect again, if satisfied complete the soldering all the way round. If you have handrails near the ends, place that broken scalpel blade back in position while soldering the end.

Complete all the furniture on the ends i.e. handrails, brake telltales etc. To make the telltales themselves, use a length of .33 mm brass wire as follows. Make a 180 degree bend of 1½ mm, take hold of the long end at halfway across the bent piece, and bend to 90 degree, now you should have a T. If making non-corridor coaches, pass the wire through the loops, line up so that the T is in the correct position and solder to the loops. Put a large blob of solder in the centre of the wire and attached to the end, and file up to simulate the connection box for the vertical rod to fit. Some GWR coaches had this box off centre. Now make the final bends so that you have a T on this end as well. Corridor coaches are slightly more difficult in that the wire usually has to clear the corridor connections. Best way I've found, is not to solder the loops to the end first, but to thread them on to the wire, before making the second T, then fitting and soldering the whole assembly as one. Make sure that the end you are fitting the telltales to is the correct one. The P.C. LSWR cross-country kits have a slot for the bottom steps, and a system for the telltales, and they are very old technology. A couple of gentle nudges there.

If you are making the type of coach that has handrails ending on the roof, ignore the start of the last paragraph till later. This statement includes the Pullman tank filler pipes which are best fitted to the roof. The handrails for the LSWR turn through nearly 90 degrees twixt bottom and roof, but on a gradual curve. I make this curve around my index finger as opposed to using anything with a sharp edge. Hold them off the end face in the same way as before, with a broken scalpel blade, bend over internally and solder.

If you have an end that requires telltale and handrail, it is best to press down on the wire at both sides of the telltale at the same time, allowing the handrail to take up the correct position. My coach has windows in the brake end, so the internal tang will be bent and flattened down from the hole, as opposed to my normal method, which is always toward the other end. This gives me a bit more room for the glazing.

There appears to be a problem with the Pullman ends as supplied by Worsley Works. If you look at a photograph, the area above the door extends into the roof by quite a way. So taking 1.5 mm off the bottom of the bulkhead as directed, doesn't give enough height. However, any less off than 1 mm, will allow the floor to be seen below the ends. A catch 22 situation. More on this when we fit the roof.

Underframe

Buffer beams first. If like me you are making a flat ended coach, place the end down on your soldering block, butt the buffer beam up to the end and tack solder one side of centre. Check the beam is in the correct place, if so repeat on the other side. Leave alone until after the solebars are fitted. For bow ended stock, open out the buffer shank holes until you can get a decent hold with a pair of serrated tweezers, with the points in the holes. Place the coach body upside-down on the bench, hold the beam in the correct position with the tweezers and tack solder as before. Now you can see why I have only a 5"x 6" piece of wood, the ends of the coach overhang, and therefore your work is far steadier.

On to the solebars. You do not need large tabs sticking up inside the body, they only get in the way of seats and bulkheads etc. If there are any, cut them down to ½ mm high. Alan's are good in this respect. Place the solebar on the model with as many tabs in position as possible. Now mark the back of the solebar where you need to cut to clear the buffer beams. In this kit the solebar has an integral footboard approximately half way up. Some coaches have the footboards extending past the buffer beams to act as the bottom end step (SECR). If so, cut the solebar only, to fit between the buffer beams, and make a slot in the footboard part to clear same. For steel solebars a turnover piece is fitted in place of the footboard. Whichever is fitted, you can bend them on the bench without recourse to bending bars.

Refit the solebar to the floor and hold in place with a flat file, at 90 degrees. This should give the solebar the correct position. Cut off 2 mm of solder, place against the inside of the solebar, on the outside of the coach, abutting one of the tabs and tack. Again start in the middle, go along to one end, repeat to the

other end. You will usually find that the last tab is some way from the bufferbeam. Make a joint with solder so that beam, solebar and floor are all together. Now run the tack joints of the bufferbeam together. No need to do this on the solebar. If solder appears on the front face of the solebar, minidrill and burr again. When both solebars are fitted, slightly round off the corners of the footboards. If you place the coach face down on the woodblock you should be able to tell if it is square, if not, it is easy to twist the whole thing now.

If you have a coach where you have to fit footboards under doors, or full length, proceed as follows. This is where those previously hoarded pieces of 2-2½ mm strip come in. Cut to length required and offer it up to the solebar with the coach on its side. Hold the footboard upright with a pair of flat nosed tweezers, so that one of the tweezers faces is against the turnover on the solebar bottom. This will give the distance required. Cut off 1mm of solder and place under the footboard and down on the face of the solebar at one end. Apply heat, and do this at regular intervals to the other end of your footboard, no matter how long or short it is. Do make sure that the footboard is actually soldered to the solebar face and not just to the turnover. Hold the body face down and remove all the excess solder from under the footboard, with the minidrill and burr. This gives a semblance of blocks/brackets on which the real thing rests. To get rid of any solder that gets on the solebar above the footboard, the burr will fit between the footboard and the bottom of the body.

Now is the time to fit any remaining parts that can be soldered to your ends. Open out the holes in the bufferbeam to fit the buffer shanks. For this I use a drill bit just undersize, and finish the hole with a micro drill-reamer. Buffers are placed in position and the coach is turned on its end. Cut off a couple of mm's of solder, place in position and fuse the buffer shank to the beam. Do not press down too heavily on the end during this exercise, or your buffer length will shrink.

With corridor stock, the face of the connection and the buffer faces should be in co-incidence. For non-corridor coaches, a vacuum pipe and hose should be fitted, and the brake telltale piping connected to the top of the hose. If Supergluing, leave till later. I like to fit the old ABS vac parts, when I can get them from 3 SMR, as this includes an operating arm for the vac cylinders. Most companies kinked the piping around the coupling pocket, some though fitted a straight pipe to one side of the pocket. I now fit a drawhook on the outer ends of brake coaches only, but not to corridor ones. LSWR corridor coaches had two grabhandles fitted just under the eaves, at the lav end, presumably for hanging onto when filling the toilet tanks. If the tanks have fillers down to platform level, fit a couple of loop door handles at the edges of the ends, to receive them.

Here comes the tricky bit if you haven't got a plan. You need to know where to fit the queen posts and trussrod ends, if making them from wire, or just the angled ends if the truss is the dropdown type. You need to know where the bogie rear finishes so that it clears the trussrods. So therefore I make the bogies next. Incidentally any coach under 42' usually only had a king post fitted, as opposed to two queen posts.

Bogies

Type 1

All bits being white metal clean any flash from them. Take the centre stretcher and drill through the three holes in each end. Then bend it so that it is slightly convex. Ensure that the two sides of the stretcher are parallel, if they are twisted, so will the bogie be. Drill out the sideframes to take the bearings that you have selected. My problem here is that the LSWR axleboxes are very narrow, so any bearing is liable to breakthrough the side. I have even come out of the front of the axlebox and still managed to disguise the fact. Don't worry too much, as the paint job will hide this. You will need to countersink the hole to allow the rim of the tophat to go in far enough. I find KM bearings fit with the rim flush with the surface of the sideframe, whereas Slater's have to be a lot deeper. Force the centre stretcher on to the pips on one sideframe and hold both, on the inside, with flatnose tweezers. Cut a 1½ mm length of solder and place in one of the end holes in the centre stretcher, tack, and do the same at the other end hole. Carry out the same routine with the other sideframe. Bend back all four axlebox ends and fit the axles, having previously checked the wheel back-back and that they are equidistant on the axles. Once the sideframes are squeezed up tight, make sure that the two axles are parallel. Never mind panes of glass, and the wheels sitting square, its the axles you should worry about.

Turn the bogie upside down, and place the end on the woodblock until the wheels are touching. Take the

rear stretcher and align it on the bogie. Hold down with something heavy, tin your soldering iron, and tack solder the two ends of this stretcher. Repeat for the front stretcher. The reason, the tops of the stretchers must coincide with the top of the sideframes. Also ensure that this stretcher's turn under is parallel to the axles. This now gives a base for your couplings. File the underside of this stretcher to make it flat. Cut off the front half, as the coupling will fit on the rest, and cut both sides at 45 degrees. Now make sure the wheels revolve. Easing or squeezing of the axleboxes, with care, is all that's needed.

Once the bogies are fit to run, fit the coupling of choice. I use the Slater's plastic type, modified as follows. Cut 1½ mm from the rear of the loop piece, not too close to the hook hole, as to break through. Cut back the front of the hook but keep the angle the same. Cut off the blob on the bottom of the drophook. Use a square file on the under side of the hook, adjacent to the vertical, to ensure that the hook sits down parallel when engaged with its opposite number. You may find that you need to ease the hook hole to allow the hook easy lift and drop. A flat file does the job. Now that all these bits have been cut off, the whole thing is less obtrusive and an improvement on the Triang type. Put the hook in the bar hole, and offer up to the bogie front stretcher so that it fits hard back against the turnunder. Remember that I am building a 56' coach. If you are making say a 45' one, you need to fit the bogies as near to the coach end as possible, to allow a decent trussing system.

So the coupling has to go back even further, through the turnunder, and even between the wheels. Fix with Superglue, when satisfied it is in the middle of the bogie. Take care that the glue does not go anywhere near the hook. If it fixes everything solid, do not despair. The Southern ran 89% of its coaches in sets of 2-14 units, and added swingers, usually all thirds, to strengthen when needed. So you will only require one hook and two bars between any two set coaches. You will notice that we are not using the clamping piece of the coupling. This and any other plastic sprues and off cuts are put in a bag and delivered to Ian Osborne when next I see him. He makes railchairs for those who make their own track. Offer up the completed bogie so that the coupling bar is level with the buffer heads. Mark the coach floor where the fixing screw is required. Also mark the extremities of the bogies, for those trussrods. The size of fixing screw I use, is 3/16ths 8BA cheesehead. Drill an 8BA clearance hole in the floor on the centerline for the fixing screw. I do this in stages, starting with a very small drill, working my way up. This way I have less snatch and catch, and the hole stays central. All drills I hold in a variety of pin vices. I do not like having either a nut or a screwhead inside the coach, they can get in the way of bulkheads and seating. Drill out the bogie pivot with an 8BA tapping drill, and use an 8BA tap to cut a thread in the pivot. If you haven't got a tap, use a steel 8BA screw, it's only white metal after all. Fit a ½" screw in the pivot and into the hole in the floor. With the 8'6" floorpan, the pivot fits between the solebars, however any slimmer and you will have to cut off the two end pieces on the pivot. Now solder the pivot to the floor at each end. Remove the fitting screw, and repeat all the above the other end. Place a 30-35 thou thick washer over the boss on the pivot. If you look across the bottom of the solebars you should just be able to see the edge of this washer. Alternate method, fit a washer of two thicknesses of fret under the pivot before soldering. Fit the bogie over the remainder of the boss. Place another washer, outside diameter larger than the boss, inside diameter smaller than the head of the screw, on the bogie, and fit your screw.

I did say in the preamble that this system gave no compensation. However, if you gave the centre stretcher of one of the bogies a convex shape, this gives athwartships motion. If you then leave the other bogie stretcher flat, then file down fore and aft of the hole in the middle, you have a three point suspension system. Check your coach is a runner, and sits correctly on the track, i.e. buffers the same height both ends, with all buffers over their appropriate rail. Before removing the bogies, use a permanent pen marker, on the floor and the bogies with 123/ABC, so they go back in the same position.

Put the fixing screw back in the pivot by a few threads. Reason, useful for pick up and repositioning the coach during spraying/painting. If you have footboards on the bogies, now is the time to fit them. The LNER fret sold by Andy Green is very useful. If a planer type is required, use those fret off cuts. Superglue again, fast grab for preference. Holding the bogie steady while attaching the footboards, is the main problem. The method I've developed, is to have a large lump of Bluetack attached to the bench, press your bogie into it by the axleboxes. Now the footboard can be held vertically while the Superglue is dropped on and sets. A slight problem I have found with the MJT LNER footboard fret, is that all of them have been etched one way, therefore they can only be fitted one side of the bogie. To get round this fold against the crease line on half of them.

In the 3mm Society Handbook under loading gauge dimensions, it gives the height above rail of the buffer centres as 10.5 mm. I find this restricts the bogies and they can derail frequently, due to coming in contact with the solebars. I use a height of between 11 & 12 mm depending on sideframe clearance. I have an S bend with super elevation, on both sides of the S, on my bench test track, and every coach I make must pass this test. This still gives a rail to top of coachside of approximately 31.5 mm, which is also quoted.

Type 2 - 3 SMR

Depending on the age of these, you may have to cut them out of a fret, and or take out pieces of brass where the axles fit. Don't throw these away, they will come in handy. Snip off the piece that makes up into a box to fit onto the middle of the bogie, and discard.

Open out the axle holes to take your preferred bearings. Again, do this in stages if using drills. Get rid of any burrs, and place the flat bogie on top of all four bearings. The side you see should be the one with no bend lines. Tack solder them in. Do not go mad with the amount of solder, once it runs it will find its way onto the inside face, which is all you need. File round the bearing to remove all the solder from the outside of the fret, and rub over both sides of the bearing. Bend up all the framing, then fit your axles. The front stretcher has three bends to make, to produce the coupling fixing point. Solder all four corners and two of the middle ones so that the sides cannot spread. Also a spot of solder on the back of the coupling rail will stop it undoing. Check that the axles are parallel, and that all wheels revolve. If not, twisting the sides in/out will cure the problem. Remember you are fitting sideframes, so any distortion will not be seen. Sideframes being white metal, are prone to having the bearing holes slightly out of position due to the shrinkage in the casting system. Offer up the frame and drill your bearing holes accordingly. I drill at an angle, and straighten up when the centre of the hole is in the correct place. Fit the sideframes over the bearings and tack solder to the brass fret. With SR/GWR types you can do this in the centre stretcher, one tack will do. The LMS/LNER ones have springing arrangements to fit in the middle, so solder the frames in two places, outside the centre stretcher.

Again fit the couplings of your choice. Slater's type will fit in exactly the same way. Offer up the completed bogie to the coach, keeping the coupling bar level with the buffer heads. Mark on the floor for bogie extremities and fixing screw hole. As before, drill an 8BA clearance hole in the floor, and get rid of any burrs. For this I use a countersink drillbit in my hand. Cut a piece of printed circuit board/paxolin material (59-60 thou thick) approximately 15 X 10 mm, and drill an 8BA tapping hole in the centre. Cut an 8BA thread in the paxolin. *We are not going to do this next bit now, as we have not finished soldering, but later fitting is as follows.* Run a ½" 8BA screw into the paxolin pieces and place in the hole in the floor, at one end of the coach athwartships, the other fore and aft, and superglue. Remove the fitting screw. Cut two pieces of 60-61 thou piano wire about 4mm long, and fix them either side of the screw hole. One end of the coach athwartships and the other fore and aft to match the paxolin/PCB. This gives the aforementioned three point suspension system. When looking across the bottom of the solebars, you should be able to see the top edge of piano wire. Now offer up the bogies and ensure good running as before. If there are any clearance problems, a washer of the required thickness, stuck to the top of the bogie will suffice. Mark the bogies and the floor as before and remove the bogies. Replace the fixing screws in the holes by a couple of threads. Fit footboards as required.

Type 3 - MJT's CCU's.

These come with pretty comprehensive instructions, so just a few observations to add:

Assembly Item 1	The torsion bar is 28 thou thick so the drill size you require is .72 mm. Do not open the bearing holes any more than they are, as the KM bearings are a nice tight fit as it is.
Before Item 2	Solder in the bearings in exactly the same way as for 3SMR type, and treat them the same way.

Item 7 Some of our members do not solder this central bolster, but leave it free to float. They say it gives even more freedom to the bogie, but I have yet to be convinced. Fitting the units. Before rejoining the presstuds, take a flat file to the male at an angle to produce the profile as shown:

Do not go overboard with the file, as you can go right through, then a trip to the sewing box will be required. The reason for this measure, is to ease the revolvability of the bogies. This also saves oiling. The packing mentioned I have found to be two thicknesses of fret material, sweated together and then to the coach floor, with the pivot bolster soldered to that. I use the middle pieces from the 3 SMR frets. An alternative to this method is, leave the pivot bolster in the flat, and glue it to a 15 X 10 mm piece of 60 thou paxolin, thence to the floor.

Whichever is used, if you look across the bottom of the solebars you should just be able to see the edge of the flat part of the presstud. Fit sideframes as before, also the extra springing of LMS/LNER with a slot in the bottom to clear the torsion bar. As mentioned previously, if you fit hook and bar couplings in the normal place, you will negate half the suspension properties of the bogies, so a method will have to be worked out to get round this.

Whilst on the subject of bogies. There is a problem with the six wheel type supplied by 3 SMR. The brass etch has 6'6" wheel spacing and the white metal sideframes are at 6'. This is compounded when you realise that the LMS type, which they are supposed to represent are 6'3". For further information, the GWR sleeper is 6'3" and the diner 5'9". Gibber gibber. I don't fit brakeshoes to bogie coaches, they tend to get hidden behind the solebars. However they do appear on non bogie vehicles.

Underframes Continued

Measure the distance between the two buffer beams, halve it and mark the centre on the floor. Draw a line across the floor with a scriber and engineer's square. Incidentally the later is a precision instrument, please, do not use it as a hammer! The distance between queenposts, varies with length of coach, at least on the LSWR. Not all railways are the same, and to quote all the widths would be somewhat tedious. Suffice to say, for a 56' LSWR one the distance is 18 mm. So mark your floor 9 mm either side of centre. The queenposts available from the Society were designed for the SECR, however with a bit of work they will convert to a variety of prototypes. They are designed to be soldered behind the solebars, with an entry for the wire truss of 20 thou/.5 mm. File off the casting pip, which otherwise may stop the post fitting right up to the bottom of the solebar. Take hold of the post by the flat/half round part, and snip or file away, either side of centre, those pieces of the wire trough that you don't require. The LSWR ones were fairly square ended and virtually parallel all the way down. So when squared up all I have left at the bottom is a small nodule. Place the coach on the bench on its side, hold it down from the inside with something fairly heavy, I use a large pair of pliers spread with a lead weight on top. Take hold of the queenpost, with flatnose tweezers, hard up against the half round bit. Place on what is at present the bottom solebar, 2 mm of solder, and tack into place. Repeat for the other three. The main thing to look out for, is that they are vertical, and butt to the solebar in both planes. Turn the coach on its back. Take a length of 20 thou wire, hold one end across the mark you made as the end of the bogie. Make a slight bend at the first post, go on to the next post and bend again, at an angle to come down to your second witness mark. Snip the wire allowing enough to cross the solebar. Sounds complex, but as long as you hold the wire firmly at the start mark, everything fits fine. Fit the horizontal part of the truss into the back of the queenposts. Turn the coach on its side again and tack solder both angled ends to the back of the solebar. Repeat for the other side and inspect to ensure that both trussrod angled parts are parallel to each other. No need to solder the wire slot, just squeeze the ends slightly, from top to bottom and they will close sufficiently to grip the wire. There was a turnbuckle fitted to all wire truss types, usually in the centre of the horizontal portion. So the underframe could be reset to the horizontal, once the body was fitted. If not in the kit, make a blob of solder on the wire and file to the required shape.

Now for the dropdown angle iron truss type. Fold down the truss, then solder the uprights to the back of the solebars. Bend the angled pieces, so that they cross the solebar at the witness marks, cut off any excess, then solder these as well. At last we have got rid of those wretched tines. The LMS had a cross truss system, which is amply catered for by the Worsley floor. The LNER also had this crosstruss, but

the 45 degree bar was inverted. To produce this, cut the bottom rail on the LMS type to make it the same thickness as the rest, then fit it upside down. To be completely accurate the middle uprights should be got rid of, but they cannot be seen, once everything else is in place. Word of warning, make sure that this is soldered to the outside of the upright on the main truss, as the LNER battery boxes, supplied by Alan, are an extremely tight fit between them.

All this heating and cooling, of the floor, will have made the narrow membrane between front and back, buckle. To get round this, and also to provide a stable floor for fitting the rest of the bits, I sweat on a piece of brass fret, wide enough to encompass all seven elements. This also ensures that the floor is kept at the required width throughout its entire length. The last for GWR/SR modellers, i.e. with no crossbracing. With crossbraces, just solder the membrane to them. Get rid of any solder finding its way inside the coach, it gets in the way of a false floor.

The position and type, of all the other components on the underframe, varied with company and era, so I will describe the LSWR placings and refer to others as we go along. When my prototype was built, gas lighting had gone out of fashion for new build, battery boxes and dynamo are therefore required. Most coaches of this length had three boxes, and as this one worked independently, it needed them. They are fitted one either side in the middle, with the extra one to the right of centre on the compartment side. Most lines used this system, apart from the GWR, who fitted them as near the bogies as possible. On the prototype they were butted up against the first longitudinal not the back of the solebar. Belay my last, GWR/LMS. The ones I am using came from John Bateman and are raised on stilts. Very useful when soldering. The LNER battery boxes had a strap fitted between the box bases and the back of the solebar, these are very obvious in photographs, and are well worth fitting. All that is required is a 1 mm wide strip of brass.

The dynamo is usually fitted on the corridor side nearest the brake end. However this is not a hard and fast rule by any means. As long as it is fairly close to one of the bogies, for operating reasons. The Society dynamo, with brackets, is adequate, and is easily soldered, but can be rather prone to getting knocked off while other work is being carried out. The LMS one, or Society ones with no bracket, are more stable if fitted as follows:

Drill a hole in the dynamo to take a piece of .8 mm copper wire, household wiring again. Touch solder in place, cut to length and solder to the floor. Even if this now gets knocked, it will bend but not snap. A ½ mm strip can be wrapped around the inside end of the dynamo, to simulate the belt drive, but do not interfere with the bogie swing by making it too long. Now that we are attaching white metal bits to the floor, with every successive piece, it is becoming more cluttered, so take care which way you attack with the iron. White metal melts very easily.

V hangers for the vacuum brake system, is another area that varied a great deal. Questions such as, were they fitted outside the trussrods or inside. Were they to the right or left of the vacuum cylinders. Were they to right or left of the queenposts. Or even both fitted the same side of the coach (some SECR and some Pullmans). In the LSWR case, prior to electrification, they were to the right of the queenposts, and reversed after and the vacuum cylinders were nearer the battery boxes. Now you know why I like a plan to hand. The GWR V hangers seem to be quite long as against the other three, possibly a hangover from the Dean type large vacuum cylinders. These and the LMS/LNER ones as supplied by Alan have a reasonable amount of brass, on the ends, so that you can drill a .72 mm hole, to take .7 mm operating rod. The Southern ones are rather slim, so this is not possible, .4 mm hole only I'm afraid. Having drilled the operating rod hole, offer up to the coach floor and tack solder in position. Mark the floor, so that the V hanger the other end of your rod, can be fitted to keep it parallel to the buffer beams. Alternate method, run the operating rod into the fitted V hanger then thread on the other one and solder to the floor. Usually this hanger is set just over the halfway point of the floor. So that if the two vacuum cylinders are interacting, (not all were), the rod doing the connection is kept parallel to the solebars. Repeat at other end of the coach. Do not forget to thread on to your rod, an operating arm for each vacuum cylinder, before soldering at both ends. If you use the ABS type, a hole will have to be drilled in the top of whatever vacuum cylinder you are fitting. If the kit doesn't come with an arm, I make one from Plastikard, then leave it loose on the rod. The riveted LMS vacuum cylinders come with a large stump of white metal underneath them. This can be used to solder the cylinder to the floor at the correct height, as you melt it.

The LMS men will also now fit the regulator to the parallel portion of the trussing opposite the battery box. Comet, in their leaflet suggest placing a support arm between the crosstruss's before fitting. I do solder the regulators, but be careful not to leave the iron in proximity for long, they have disintegrated on me. Probably because I was holding them too tightly. As to the rest of us, we have just finished soldering. And there, you were just getting into the swing of it.

The Society vacuum cylinders are not tall enough as they come. I use a small off cut of 60 thou paxolin, about 7 mm square, to use as a spacer. The Supergluing starts here. Mount your cylinders and connect up the operating rods/bars as far as your super detailing whims take you. Remember, a lot of the coach under gubbins get lost to the eye, when seen at normal operating range and viewpoint most of it is in shadow anyway.

Interior

My coach has no holes in the floor, so I won't be fitting a liner. However the drop truss floor type have a lot of holes. We receive a large number of Christmas/ birthday cards of various sizes each year. I cut them into strips of 20-22 mm, depending on coach width, and attach them to the floors full length. Much cheaper than Plastikard, it's not load bearing and you will paint it anyway! The glue I use for this is Revell's Contacta Liquid Special. A Christmas present, any contact glue will do.

Something that the Worsley Works apprentice might think about supplying is a corridor partition strip. This must be one of the most tedious jobs to do. As he doesn't, here's how to proceed. Measure the outside of your coach over the complete length that has to be covered by a continuous partition. Cut a piece of 10 thou Plastikard, 20 mm wide to this dimension. This 20 mm will allow any roof to fit on top, without hindrance, and is higher than the coach side. Offer the piece up to the inside of the coach on the non-corridor side. Now mark through the quarterlights and droplights, the width and height of the windows. Just two marks on the vertical, and two more on the horizontal will do. I use a scalpel for this, so that the cuts are already started. Word of warning, the Plastikard can creep as you work along the length, refer back to the first compartment you marked to stop this. The other way of doing this, using the side in the flat before even fitting the droplights, is worth thinking about. I always forget and you will have to make allowance for the width of floor you are intending to use. Use a new blade to cut the Plastikard away, and you know where the bits go by now. LMS modellers ignore the above, they mostly had a set of two sliding doors in their partitions. Incidentally so did a couple of the Southern electric types. If like me you haven't managed to get every window exactly right, squaring them up with needle files is easy enough, as long as you grip the partition as close to the hole you are filing as possible. The droplight aperture you marked out is a lot smaller than that required, so adjust your cutting to take this into account. Remember what I said about square files having rounded corners, now you will find out what I meant. An extra that may be worth fitting, are the sliding doors on the outside of the partition, 20 thou will show up better.

If you followed my advice, and used one end as a template, for the internal bulkheads, reap your reward. Make as many as required, taking into account the contour of the side with the soldered floor uprights, and any strengthening you did to the top of the sides. If making a non-corridor coach, Superglue them in. In my case, I only require one full width, at the end of the brake compartment. I don't glue this in but leave until all the rest is fitted as follows. Being 8'6" wide, the bulkheads between compartments are 19 mm leaving a corridor 6½ mm wide. Slightly over scale, but you do want room to manoeuvre the glazing into position. Other widths of coach are easy enough to work out. Make the same considerations with regard to contour, and make these the same 20 mm high. The alternative method is to use your template and cut off the part in the corridor. Whichever way, ensure the bulkheads are all the same width.

A wavy line is not a pretty site. MEK the bulkheads to the corridor partition, between the quarterlights, bearing in mind compartment width, if making a composite. I hold the partition upright, and slide the bulkheads into position, so that I can hold both with one hand, while feeding MEK with an old paintbrush. The awkward one is always the end that abuts a lavatory, only an edge to stick to.

Seats

Having bulkheads at 19 mm wide, you require a ½ mm gap twixt seat and coach side, for the glazing. Now it just so happens that the Society seat units are 76 mm long, and any dart player will tell you that is 4 x 19, not much for the plastic bag there. If you make the bulkheads 19½ mm wide in 9' coaches, it's even better. Again I use templates to save having to use a rule for every one. Make three cuts with a scalpel. One across the backrest, another across the bottom and the third straight down through the seat squab itself. Using this system the seats will snap off easily. True up and get rid of any burrs produced by the cutting.

I have been told by Dave Finney that the seats supplied at present by Colin Ashby on short sprues, will be available from next year in far longer strips. These have a much more plump profile, or more stuffing if you prefer, and will be much used for first class seating I imagine. Post Pentonville, he also tells me that the new seats will be slimmer. My main priority is that however narrow the compartment, the seat edge should not show against the glazing. Now the Society units are made from grey plastic, they seem to have slimmed down, and are therefore much better in this respect. However even these vary in thickness, so choose according to class. Very non P.C. To make sure that the edge doesn't show, chamfer that edge with a file. If fitting to non-corridor stock, chamfer the back edges of the seat that fits at the end of the coach, to allow for the solder in the corners. Once you have put the seat sprues in the plastic bag, work out where you want the seat height to be. In most coaches the headrest is situated just over halfway up the window . Some spartan thirds, as perpetrated by the Midland and others, didn't have a headrest at all, so cut down accordingly. Most Southern seating I produce by cutting off a little over ½ of the bottom rail under the seat. This 76 mm X 2 mm piece, if cut into 6 mm lengths, is ideal for first class compartments. Place at the bottom of the bulkhead centrally, and MEK to it. Now glue your seat to it and the headrest to the bulkhead. This gives a slightly better profile to the first class seats. Don't forget to file off sufficient material to allow for the tumblehome before glueing all the seats in. Don't flood with too much MEK, you are dealing with 10 thou partitions, they can distort easily. One seat I can't fit goes against the full bulkhead of course.

Place the completed compartments into the coach. Superglue the middle bulkhead to the outside wall, making sure that it is at 90 degrees, continue either way until all are fixed. Add a dab of Superglue at the junction of door and floor, when satisfied all bulkheads are square. Now fit any full bulkheads, by glueing them to the outside walls, and MEK to the end of the corridor partition. Fit the remaining seat . In corridor coaches, the toilet doors/partitions came in a variety of angles. I normally don't worry about this, as they are usually not seen, just a straight piece of Plastikard twixt last bulkhead and one side of the corridor connection. A lot of pre-grouping coaches had the window opposite the toilet door obscured, Victorian values I suspect. The toilet partition should be the 20 mm height, as before, but any thickness you like. To complete the interior, I make distinction between first's and the rest, by putting armrests in. These I make from 3/64th styrene rod cut off in 4 mm lengths. MEK to the backrests of the seats, this is superior to just sticking them to the seat squabs themselves. My coach being only 8'6" had two per side in the first class, so three armrests per seat.

Open coaches, catering vehicles and Pullmans, all require tables. Simply cut a length of 40 thou square styrene strip, and MEK to a table top of 10 thou. Shape the top as needed and Superglue in position. Pullmans, by the way had rather low windows, so that the end of the table is in view. I don't lay up for dinner, just leave the table bare, painted a dark brown and varnished.

Pullman seating can be supplied by Bob Barnes, thirds, firsts and doubles, if you ask him nicely. Lamps I make from brass fittings used in PCB work. There is no point in describing these bits, as you are unlikely to find an exact match. Suffice to say, I cut them in half, turn both ends the other way round and rejoin with a short piece of .5mm brass wire. Paint the top/shade pink and insert in the table.

For LNER Tourist stock I used old Kitmaster restaurant seats, with an inverted U of insulation stripped telephone wire, bent and shaped around them, to represent the tubular steel construction. In the "5522" kit for an LMS open, there was a piece of fret for the end of the seats. I kept one, and use this as a template for all sorts of seat ends, suitably modified of course. Amazing what you can find to use, but then you wouldn't be a 3mm modeller if you couldn't be inventive.

Exterior Completion

For the last year or two Alan has been etching the door ventilators as part of the sides, if they are corrugated, this saves a lot of work. I have never liked to solder these from the rear, far preferring to Superglue them now. The main thing is to get rid of any pips remaining from the fret. Take hold of them, or any other small bit of brass that you have to work on, in a pair of flat nosed pliers, to do any filing that is required. I got fed up with hunting for small pieces, after they have sprung from the grip of tweezers.

Pips gone, lay them on your index finger, so that you can run a file over the flats, to ensure they are exactly that. Most vents came with rounded corners on the top, and square at the bottom, of course the GWR had round corners on all four. So fit them the right way up. If you are making more modern coaches like Thompsons. Cut a 15 X 60 thou strip of styrene into 5mm lengths. I apologize for the mixture of Imperial and Metric measurements, but that's the way styrene is sold. Evergreen is far superior to anybody else's, in finish, length and size variety.

If electrical connections appear on your coach, cut slivers of 3/64 thou rod as the junction box, a drop of Superglue at the required point and fit the sliver immediately. This pushes the glue out slightly to produce the double hump effect. A small off cut of 30 thou styrene, glued to the top of the buffer beam, connected by a length of .5 mm wire, completes the connection. For added realism, kink the wire a couple of times, so that it appears flexible. The SECR had a long operating lever on one end of each coach to switch on the electric lighting. I now fit one of these on the brake coaches only. The other prominent part on birdcage coaches, is the guard's handbrake operating mechanism. I fabricate this from styrene off cuts, as follows. A set of bevel gears, chamfered, sliced and stuck together of 30 thou, connected with a length of .5 mm wire to a double turnbuckle on the bufferbeam. This transmits the motion from the horizontal internal handwheel, to the brake system under the floor. The only things remaining for me to fit are those bottom steps.

Roof

To make the LSWR roof fit, cut one end off and make sure it is square. By now you will realise I don't like measuring, so offer the roof to the coach, mark for length, and cut. Most coach roofs should only overhang by about ¼ mm. I recommend that you cut slightly more than this and file back. The tricky bit is how much to cut off the sides. If you hold the roof so that the sides are one above the other, you will see a line appear 2-2½ mm above the sharp bend at the bottom of the roof. If making an 8' wide coach, my cut is made just below this line. For the 8'6" type the cut will be halfway between that line and the sharp bend. Those Tullen shears are used for these cuts. Offer up to your coach, and then file back as required to make a tight fit. Do not worry if you are left with a slight gap in places, fitting a cantrail later will hide this. Occasionally you will find that a bit of re-profiling is required to make the ends a snug fit.

Rubbing with the non-business end of a paintbrush, throughout the entire length is recommended. This is how I made all my roofs at one time.

Cut a length of 15 thou styrene sheet, slightly over width, hold almost vertical to your cutting mat, and start as near to the bottom as possible. Now rub your way along in straight lines, over the whole of the strip. I have produced a near perfect tube with this method, and what's more it stays there. So SR elephant vans and LBSCR balloon coaches can be done this way. So rubbing only where you need the curves, will produce any roof profile you may require. Once your roof fits, mark one end, so that it always goes on the same way round. I usually use BK at the brake telltale end, with a permanent marker inside.

If you are using the extruded aluminium roofs, there are a number of differences. The inside extensions will have to be filed back to the cantrail line in all four corners. Often the inside strakes have to filed flat at the ends, to ensure a decent fit. If you are fitting these to Thompson's, Gresley's or Maunsell's later

coaches, a lot of the inside extension will have to filed off. Only do this above the toplights/windows, with a small margin either side for the glazing to be fitted. Any more and you negate the thinking behind the extension, which is to keep the coach sides the correct distance apart. If using the Society Maunsell roof, you have the correct length and end angles cut correctly, so no worries.

Gresley, Pullman and Hawksworth roofs, being bowed, present special problems. The method I use is to cut to a length exactly where the bowing starts, and file the ends exactly square. Cut six pieces of 80 thou styrene, slightly wider than the roof, including cantrail, and slightly longer than the overhang required. Do the same with a couple of 30 thou pieces, although these can be made smaller, as you will see. Make one long edge of all pieces an exact right angle to the flat parts, by filing. Hold your aluminium roof firmly down, right way up, onto a flat work surface. Push up the first piece of styrene to the roof at the square end. Add the next piece and MEK together, add the third and then the final 30 thou bit to the sandwich. Mark each sandwich, and the roof end that it fits. Leave for an hour to harden off. Now butt the roof and the sandwich together again and liberally Superglue both top and bottom of the joint, repeat for the other end. I usually do these jobs on a Friday, so that they have the whole weekend to harden the Superglue completely, for two days. No, I don't make coaches seven days a week. Once set, you can carve the ends roughly into shape. I cut as much off as possible with an Xacto saw, and a scalpel. Don't go mad, otherwise there will come a parting of the ways. I finish off with a file, to get the roof exactly back to the same profile as it was before I cut off any aluminium. This includes the cantrail and the extension. Sounds daft, but is the way to go. Now cut the ends to take account of the bow end coach angles. Using a large halfround file, take out the underside of the sandwich, at both ends, until the roof is a snug fit on your coach. Again, don't try to do too much at once, it's only a Superglue joint. Now gradually take down the domes to the top of the ends, with a file. If it's a Pullman you are making, the sides of the new roof, above the doors, need to filed back until flush with the side above the door. This is one of the most awkward parts of the job, trial and error I'm afraid. If you do make a bloomer, at least all you have to do, is glue another layer of styrene on and start filing again.

Another method I have used, is to leave the aluminium roof slightly over length, and make a number of cuts back to where the domeing starts. Bend the pieces down to the end. Fill all the holes left, with Araldite or similar, harden off and file to shape. This is stronger, but takes longer and is messier. Alan tells me his method is to cut off at the start of the domeing, and then glue the piece back on, under the roof end, presumably with Araldite, and file to shape. Whichever method you use, frequent checking of coach to roof, while doing the filing is essential, care now will pay dividends. Having just completed the last couple of paragraphs, I had a word with Andy Green at Pentonville, and he showed me a preformed plastic roof for Gresley coaches, typical. As I still have seven to build, my order is in.

SECR Birdcage brakes also need a little bit more work than the norm. I cut to the full length of the coach, then cut back to the start of the birdcage, where needed, to clear the glazed portion.
Now a separate roof is needed for the birdcage itself, made in exactly the same way as before, but the edges have to be a lot sharper. It might be worth doing the vertical portions separately and glueing them on afterwards. Luckily, I have a few spare Mallard ones.

There can't be many GWR clerestories still to be built, I've had to make 20 of them. However here are a couple of wrinkles if you need them. I mentioned a couple of paragraphs ago, how to profile a roof from sheet, this is one roof that needs this treatment. Once happy with the fit of the lower deck, cut two slots, sufficient to go over the end panels, and loose fit. Fold your top deck fret to the U shape required and trial fit it to the coach. Make the top deck roof the same way as the bottom one, and trial fit this too. Once happy with the ensemble, fix the top roof to the U. Paint the U in the appropriate colour scheme, and varnish. When dry fit the glazing and now fix the whole top deck to the lower roof, while it is loose fitted to the coach. Now the whole roof comes as one unit, far easier to handle. You will usually find that drilling the top roof for furniture, will come up against the bracing of the U, so cut the tangs as short as need be. A couple of other points:

Post 1930 the clerestory windows were quite often painted over brown. Also in the 30's some of the coach ends were sheeted over and the steps removed. Part of these modifications involved cutting away the end of the roof that we have just wrapped around the end of the clerestory. Food for thought. If you want to see through the clerestory windows into the coach, the slots for the ends can be extended all the way along the roof, however you will be weakening the roof exactly where it needs most strength, where the U fret is glued to it.

Now mark out the roof for all the furniture. This is exceedingly important, as it's the first thing that other people will see. Do this on the inside of the roof, if you are using aluminium, the strakes help you when drilling the holes. These strakes are at 3 mm & 6 mm from the centre line, equating to 1' and 2' respectively. With my roofs, I hold them on to the coach, and mark the positions that way. Then mark the centre line and draw across the roof, using that engineer's square. If, as with a lot of corridor coaches, the ventilators are offset from centre, to appear over the compartment centre, or in the LMS case, over the corridor partition, measurement of an end plan becomes essential. The LSWR was an all in line, torpedo vent company. Others oscillated between shell/torpedo and inline/two across versions. Also, remember that positions and number of ventilators, varied as the coaches life continued. That photograph gets even more useful, as plans tend to show the vehicle as built only. The plans to get, are the ones that show vent positions in a plan view, few and far between I'm afraid. The coach I'm building had two per compartment, in line astern, and in the middle of the quarterlights, offset by 1'6". Typical, halfway between strakes, if I was using the aluminium roof. Drill the holes of sufficient size to take the tang of your chosen furniture. Which brings us to the choice. When they started fitting them, the LSWR chose Laycock's torpedo vent, and a very good representation of the large type, as fitted to non-corridor stock, was to be had by using Kenline 4 mm ones. Unfortunately Kenline appear to have gone out of business.

The Society now sells two lots of torpedo vents. There are good and bad points about both. The older type, on a thin square sprue, have a good profile but sit on a large dish base, and at an angle. The others are on a flatter oblong sprue, have a better base, are larger but the cones are too big for the barrel. Those swings and roundabouts again and, yes I do know what the remedy is. 3 SMR and Bruce Hoyle both sell LMS and BR types, which are both very good. Bruce also supplies a lot of other roof furniture, several types of oil and gas lamp tops for example, and Mk 2 mushrooms. The Society gas lamp tops (GWR I think) make excellent toilet water tank filler caps, for SR coaches. For some strange reason the toilet vent on LSWR coaches is smaller than the compartment ones. Don't forget to drill holes in the roof for those handrails that finished there. The LSWR and a number of others, had short handrails on the roof to coincide with where the end rails finished. LNE had them either side of the tank fillers.

Again now's the time to drill for them, but remember to do so far enough away from the roof edge, so that they will not interfere with the fitting of the roof to the ends.

Now all the holes are drilled in the right places on the roof, get down to your local supermarket, and purchase the cheapest two-ply tissues you can find. No you don't want quilted. Part the two sheets and place one on the roof. I can usually get six roofs out of each sheet, yes I bought my tissues some time ago.

Liberally flood the roof with MEK, I use a No 6, or above, paintbrush for this. Once the tissue has adhered to the roof, cut off all four corners, so that when turned under and stuck down the sides and ends don't overlap. Naturally the aluminium roofs will require some other glue, if you want a traditional canvas roof. I have tried superglue, but it gets expensive, and the smell is appalling, so now I rough up the aluminium surface and leave it at that. Push all the roof furniture through the tissue and Superglue on the inside.

Rainstrips I make from 15 X 20 thou styrene strip. Check the photograph here, as some were fitted not to reach the end of the roof, others all the way and over the end. Most semi-ellipse roofs kept the rainstrips above the first sharp curve in the roof, whereas the GWR/MR flatter types had the rainstrips as near the edge as possible. Don't forget the clerestory roof had its own rainstrips as well. Maunsell's even had two, and the Society roof reflects this. The curve of the strip also varied between prototypes, which is why I always fit the furniture first. The length of coach had a lot to do with the curvature, the longer the coach, the shallower the arc. Naturally I try to ensure that the middle of the arc is in the middle of the coach, and that both ends are in the same place. MEK on the plastic roofs, Superglue on aluminium. If you are making LNER, Gresley's & Thompson's corridors, don't forget the destination board rack, it is fairly obvious.

A lot of coaching stock in the 30's, had the toilet tank fillers extended by tubes, down to platform level, at least. Operational and safety reasons I presume. The LMS coaches with a toilet in the middle, are particularly noticeable. Telephone wire is used here, stripped of its insulation. It is easily bent to shape, and if the bend is in the wrong place, easily straightened. Place the wire on a flat surface and rub across with a scalpel handle as the wire goes away from you. Wrap the middle of a length of wire around the

toilet filler and then flatten in parallel to the end of the roof. Bend over the edge of the roof and cut to length, taking in any other bends required. Make sure they are long enough to go through the loop handles you have fitted to the ends. The Pullman ones have to negotiate the end windows of course. Superglue to the roof. I even manage to fit them on Pullmans so that they will fit inside the brake telltale, when the roof is finally fitted. It's a fiddle but well worth the effort.

If you go back to the gas lighting era, a few words are required. From 1880 till circa the 1890's a system was in use that required only one gas pipe on the roof. After this a pilot light was fitted so that staff didn't have to light each lamp individually, but a whole coach from a lever/switch at one end. This required a second pipe to be fitted to all the lamp tops. For the pipes I use 10 thou styrene rod and MEK. All the tanks required are amply catered for from the usual sources.

Apart from some handrails, and the cantrail on plastic roofs, to be fitted later, you have effectively made a coach. Doesn't that feel good. If the answers yes, make another one. Yes I know people say they are tedious to make, because they are all the same. Not true of course, as I hope I've just proved, but when I see a rake of finished coaches, all the same livery, all the same height, I am rather pleased. Yes I know, easily satisfied. But remember they came before locos, which were only invented to take the place of the horse, not the be all and end all, they appear to have become.

You will now have a few empty self-seal plastic bags, save them for Andy Green. I know it's only a few pence but it still helps the Society.

PAINTING

Before you start, make sure that all the handrails etc, are well proud of the sides. If not a build up of paint, whether sprayed or hand brushed, will occur. The devil's own job to get rid of without damaging the other paintwork. Also brush over the whole coach just prior to painting, to ensure freedom from dust. I do as much spraying as possible, using Halfords/ Holts car sprays, as I can find in matching colours.

Warning If it's raining, looks like rain or is below 6 degrees C , **DON'T**. Find something else to do like make another coach. Car sprays will either blob and run, or not adhere properly under these conditions. Blooming can also occur. Wear a mask, if at all possible, and do the spraying in an open garage, or similar. Mine has ventilation all round the eaves, and the main door is always open. Shake that can for at least a minute before use, longer if it's cold. I spray in the following order:

Inside
Underside
Both sides
Ends

Colours

Now comes the controversy, all I can do is tell you what I use and let you make up your own mind.

Halfords Grey Primer	This I use, with no masking, over the whole coach, inside and out. The only parts I don't spray are the bogies, since it sometimes gets in the bearings.
BR Maroon	Halfords Vauxhall Carmine Red.
BR Blood	Halfords Rover Cinnabar. Holts Orange Red/Rally Red.
BR/GWR Cream	Halfords Rover Alum White.
LSWR/SR Maunsell/BR late Green	Holts Austin/Rover Brooklands Green.
LMS Maroon	Halfords Damask Red.
LMS Black	Halfords Gloss Black
BR Early Green / Postwar Malachite	Holts Volkswagon Sumartra Green.

All I can say in defence of these colours, is as Max Boyce once said, "I was there". No, I have a number of colour photographs taken from the postwar period onwards, to which I try to match colours. Yes I know all about colour film variations and filters etc, you should see some of the Fuji stuff I shot during the sixties. It is also worth remembering that perception of colour can and does vary depending on the

brightness, or otherwise of any lining, especially golden yellow. The Brooklands green looks a totally different shade, when used for BR late, as opposed to Maunsell with full lining, in fact I don't use the spray if I am doing full lining.

Quite a number of passes are required with reds and greens, to build up the colour. Normally I will do three passes, and then wait for them to dry, before re-spraying. It only takes a minute or two before the side is touch dry.

A pass by the way, takes less than ½ sec from 6-8" away. The second pass, the reverse of the first, right to left/left to right. Turn the coach upside down for the second set of passes, and reverse again for the third. Reason, even spread of paint, especially on the top/bottom of door vents etc. Reasons for spraying, speed of painting, finish and quick drying. If you subsequently get any enamel paint in the wrong place, load an old paintbrush that has worn down nearly to the handle, with thinner/brush wash and scrub away. The enamel will disappear without damaging the acrylic finish. I have not used spray guns etc. but I would think that the cleaning and unclogging would take up too much time.

Word of caution, you can enamel over acrylic, but don't spray acrylic onto enamel, it won't adhere. If doing Blood and Custard coaches, I spray with one colour, doesn't seem to matter which, wait till it hardens, that weekend again, then mask using ordinary brown sticky back plastic parcel tape. You need to push the tape down into all the cracks and crevasses, especially around the door handles, to avoid the second colour creeping under the tape and spoiling the line. Don't forget the cantrail was the same colour as the body of the coach, so if using Alan's roofs, they will need spraying. You can mask off quite easily on a roof, although I don't normally bother, just paint over the overspray.

Paint Manufacturers

Revell's are the only makers whose tins I have used completely, without any waste. They also sell the best cheapish paintbrushes 0,1 and 2, are the ones I use most. Always shake the tin/jar for at least 30 seconds before opening. Load the brush well and brush out all the paint, it doesn't matter if you don't cover all in one go, another coat will. I quite often find old tins of Humbrol Railway enamels, in secondhand shops and at exhibitions. They seem to be fine, it's only when you take the lid off that they start deteriorating. Consequently, I can usually turn up the right colour, for most coaches and wagons, according to Humbrol.

Now that the main colours are on, proceed to the hand painting in the following sequence.

Internal floor	Any grey, except in the first class section, which should be the same as the seats.
Seats	Dark red for thirds, dark blue or dark green, for the firsts(GWR went in for various shades of brown). On the LNER anything went it seems, depending on the works doing the building. In pre-grouping carriages, the upholstery was carried on the doors and quarterlight facings, especially in first class.
Corridor Coach First Compartments	I now paint on antimacassars, simply white with a pen nib.
Bulkheads/Partitions	These varied with the wood used and how much staining it had. From a yellowish brown, deal, to a dark brown, mahogany. LNER tourist type stock used various pastel shades, on it's walls. There is an extra on the outside of the corridor partition in LSWR/SR coaches. Between every compartment and above the quarterlights, there was a Lincrusta panel, inlaid in the wood. I fit the necessary width of panel, on top of the partition, and paint them cream. The SR inherited a number of 44' first/second composites from the SECR. Some they kept as compo's, albeit first/third, some changed to all first, later some were made all third, as needs changed. My point is that the upholstery was changed, but was the woodwork, somehow I doubt it. If your railway went in for these shenanigans, it is worth thinking about the different colour woods.

Guard's Vans	Seem to be quite light in colour, light green SR, buff GWR , terra-cotta LMS and stone on the LNER.
Toilets	All over white, floors included.

Don't worry too much about the inside faces of the sides, remember, they won't be seen. Especially the corridor side wall.

Underframe/Ends	All over black as a base, then Railmatch Weathered Black to finish. I use Railmatch Oily Steel on the bufferheads, once matt varnished they look quite reasonable.
Footboards/Steps/ BogiesBase	As above, then Railmatch Executive Dark Grey. Dry brush a lighter grey where footboards get the most use. If you look along a typical full stepboard, you will see a difference of colour below every door. Matt varnish the bogies.
Roofs	If you want a straight from shops look, white lead was used. To slightly distress this, I keep a jar of brushwash that I have never cleaned out. Dip a large brush in the mire at the bottom and smear it all over your roof. Degree of distress is up to you. Then various greys as age takes it's toll. Some LMS roofs were painted black to start with, others just below the rainstrips. Early GWR roofs had this in brown. With that Pullman problem I mentioned, take the umber as high up on the roof as you can. This will disguise the height difference above the door.
Brake telltales	Ends only, Signal Red.
Coach sides/ Some ends	Pre and early post-grouping, full lining was used by most companies (teak later), even after all steel coaches appeared. I have not seen the flooding technique I use described anywhere, but then I gave up model magazines some years ago. This only works on panelled types, steel sided I do the simplified versions.

Liveries

Midland/LMS Early Livery

Spray or paint with the most useful base colour, LMS Black, the whole sides and ends. Feed with an ordinary pen nib, Humbrol Yellow 154, hard up to all the beading, but if you load the pen right, you won't actually touch the beading.

I use the back of the nib and draw the pen towards me. Unfortunately I now have to use an instrument/watchmakers eyeglass for this job, getting old. To give a more solid feel to the pen I fit the nib into the largest, therefore heaviest, pin vice I own. What you are aiming for, is to colour the curve up to the surface of the beading, without going over. However if you do, and you sprayed the base colour, it's easy to get rid of. You don't have to cover all the panel, just the edges. This does take a while and you need a steady hand. Once dried, do the same again with thinned down, Railmatch Crimson Lake. This time further away from the beading, so that it flows toward the yellow but doesn't obscure it. Even steadier hand and a lot of patience. Fill in the rest of each panel. The thinner the line, of yellow, you leave, the easier it is to letter. The ends only had black beading and crimson panels, no lining.

LNWR

Paint with Carmine lake. Golden yellow up to the beading. White for the waist and above. Deep lake below. Ends Chocolate. All bolections/frames/droplights teak.

GWR Early Livery

Spray or paint black again. Golden yellow up to the beading. Cream above the waist, brown in waist and below. Don't forget the droplight bolections were also cream. All other bolections and the droplights themselves, Phoenix Venetian Red/mahogany. Ends Brown/black.

GWR Intermediate Livery

Spray or paint brown/lake/khaki according to year. Golden yellow for the lining, not khaki. Finish with brown/lake including droplights and bolections. Ends black.

LSWR Early Livery

Paint waist and above Humbrol Pink 61. Chocolate brown up to the beading and below the waist. Finish with the pink. All bolections and droplights mahogany. Ends brown.

LSWR Late/SR Early Livery

Spray or paint green. Yellow up to the beading, very fine. Black up to the yellow, again very fine. Finish with the green. All droplights, and sometimes all bolections, venation red/teak. Ends black.

GNR /LNER

Paint all over yellow, roughly, so that about a quarter of the grey shows through. Do the same with an orange, but slightly less paint. same again with Humbrol brown 133. Place your forefinger in the centre of the bottom panels, and skid it a couple of compartment widths both ways. The idea is to spread and mix the paint at the same time. Needless to say you don't wait for any drying time between coats. If you have an old well worn paintbrush, it can take the place of the finger. Any vertical panels had the grain going exactly that, vertical. If you followed the instructions about fitting beading made from 10 thou rod,(I should live so long) touch in with pink. Ends teak for corridor stock, black non-corridor. Other pre-grouping stock in LNER days, teak brown, for this I use Humbrol 133.

The reason I don't use gold, or any other metallic paint, is that when varnish is applied, they run. Plus using a golden yellow, finely, is just as good.
Now onto the later company, simplified lining era and BR.

LMS Later Livery/BR Late

All over crimson with two yellow lines above the windows, BR one above, and yellow/black/yellow below. Ends crimson/black. Roof silver/grey. For the lining I use HMRS sheet 3A. Yes I know it's 4mm but the best we have. Fox transfers also have a yellow lining sheet FG 1891

GWR Later Livery/ BR Western Region

Chocolate and cream with a black/yellow line dividing them. Ends black. Roof white/grey. Cut the yellow/black/yellow lining in half. Some coaches in BR days had a thin chocolate line, again lined, above the windows. Some of the better stock, mostly all firsts, had double lining at the waist, in pre and post war liveries.

SR Later Livery

All over green, droplights as before. Double lines of black/yellow where the waist panels were, i.e. suppression of any lining above this.
However the lines weren't continuous, they were joined by verticals at every break i.e. doorlines etc. The joins had rounded corners. Same lining cut in half. Ends black, roofs white/grey.

SR Still Later/BR

Bulleid green all over, droplights included. At least three different shades of Malachite.

Other BR

Plum and spilt milk/Blood and custard whatever. Most corridor coaches, from no matter what source. Some with the darker body colour repeated above the window. Some Maunsell's had this on the non-corridor side only. Again by no means universal. Black/yellow lines separating the two colours. Some ex LNER coaches finished their lives in the pseudo teak/brown.

REMEMBER your colour perception is probably as good as the next man's. If you don't agree with anything I've said, ignore it and do your own thing. This is a hobby after all. Above all it's YOUR HOBBY.

One job I haven't mentioned, is getting rid of all that paint from the brasswork on the sides. I use the dull scalpel blade, in it's holder, to scrape off the accumulated layers. Taking care that I don't nick the paintwork of the sides. You don't have to get behind the rails, just both sides, top and bottom. With wire handrails etc, paint comes off easily, being a shiny surface to start with. If you used the manufacturers supplied parts, be extra careful, as they are more fragile. You don't want to start replacing them as they fall apart. The same applies to handles. Do not despair if you nick an acrylic sprayed side. You can spray a little into the can cap, from as close as possible, now use a pen nib to fill in the nick.

Insignia/Lettering

The only HMRS sheets not reproduced for the Society, that would be of great use, are Sheet 10, Bulleid Loco and Coach and Sheet 31 & 32, Pullman. Yes I know Fox produce Pullman, but I consider them over priced and the names over scale. Trying to get that large expanse of the whole bottom side, to stay straight, while taking the released part from underneath, is a nightmare. So in both cases I use the 4 mm sheets.

I also prefer Methfix/Pressfix to waterslide any day. By the way, you don't have to use meths with them either. Wet them with tap water, once in roughly the right position, then immediately start teasing them. No, don't tell them ghost stories, worry them, with a tool that is not very sharp, I use the tweezers that I put them down with. Keep this up until the backing paper releases, a matter of seconds, then move into the final position. If you subsequently keep the area wet, you can move the letter/number again and again. Especially helpful when making up coach numbers. Getting them all the same height and spacing is not easy. The Bulleid lettering has a habit of curling at the edges, use Microscale's Microset, do exactly what it says on the bottle. In fact use it instead of water. Use a sponge to press down the lettering once in the correct place. This also gets rid of any surplus water. Don't worry if there are any stains left by this treatment, the varnish process will cover these.

If ever HMRS revamp their original Methfix sheets, I have a number of suggestions:

SR sheet	Not enough words Luggage and far too many First and Second. No Smoking signs.
GWR sheet	Not enough small G W R and too many Second. No Smoking signs.
BR sheet	Loco numbers should be straw not white. (I use as set numbers.) Far, far, far too many words Kitchen and nowhere near enough Guard. Hindsight is a wonderful thing.

After all the painting/ lining and lettering, a number of passes are made with Railmatch Satin Varnish spray, which darkens the BR Cream considerably.

I also use their Matt Varnish sprayed on the inside, ends, roofs and underneath the coach. You'd be surprised how much better a coach will look after this treatment. I'm not saying you can rescue a poorly put together or painted model. Just enhance it somewhat. The varnish smooths out a lot of blemishes. Having run out of Railmatch, I have tried Humbrol Satin, it works just as well, however the finish is a lot shinier. Revell's is the best for brushing, with Humbrol a reasonable second. I have some Railmatch, but unused as yet, so cannot comment.

After the varnish dries I fit mirrors in every compartment. Fablon used to produce a mirror tile sheet, but I haven't seen any lately, so as a substitute I am using a metallic silver go faster strip from Halfords. Not as good, so if anyone has a spare piece of Fablon? Most mirrors were rectangular, however the LNER used an oval shape a lot. To produce these I made an oval stamp. I no longer bother with picture frames, as I found you can't see them most of the time. The pictures in them were usually sepia coloured and blend well into the painted brown background.

Glazing

I find that Plastiglaze marks very easily, does not leave a clean line when cut and blooms badly if Superglue goes anywhere near it. Consequently I now use celluloid of approximately 10 thou thickness. I buy a pack of five A4 sheets from my local art shop, sold for picture framing purposes instead of glass. The makers are Dutch, Kars Kreatief Ochten, marketed under the MAKE ME label as Transparent Sheets. You will usually find that quarterlights/droplights will accept a piece 5 x 10 mm. Any wider and the droplight frame or the partition will interfere with fitting. The reason for 10 mm high is to give a good area for the glue, again any higher and interference from handrail tangs/top strengtheners will occur. It is worth cutting the bottom of the quarterlight, that has the handrail protruding under it, at an angle to clear any solder blob, so that the glazing sits down onto the inside surface of the side. The glue I use now is Humbrol Clearfix, it doesn't string or go hard in the bottle, even when you are down to the last drop. A cocktail stick, with a small amount of glue, is wiped onto the top and bottom of the side where the window is to be fitted. Where you filed down the solder blobs, top and bottom of the droplights, is an easy option when doing these.

For the corridor sidelights a larger piece is required, the windows varying in size with class. Again, if door grabhandles intrude, cut off the corner. This is where celluloid wins over Plastiglaze, as the edge of the cut won't show. The corridor handrails came in wood, brass or chromed, know your prototype. I attach these to the glazing with the Clearfix, on both ends so that it doesn't show, before fitting the windows to the coach. The rule appears to be exactly halfway up the window, except those windows that reached nearly to the cantrail. These are fitted as if the window is normal height. Luggage/guard's compartments usually had grilles/bars across all droplights, except the guard's door itself. These I scribe onto the glazing, with the dull scalpel blade.

For toilet windows, I can do no more than repeat my letter in the Q & A for January 2001 Mixed Traffic. Rub a file over the back of a piece of normal glazing material, or if you can get them, building society passbook/driving licence holders give a hammered glass effect. Fix to the coach in the same way as other glazing. You will get some of the glue appearing on the front face of your glazing. Do not panic, wait until you have completed a whole side. Supporting the window from the inside, start to tease, (yes again) the Clearfix into a lump and remove with tweezers. That's the beauty of this glue, no residue with this method. Don't leave it any longer than this, as the glue will set, and it's the devils own job to shift it. Leave for a day, then tap all the windows to ensure that they are adhering top and bottom. If so, KEEP YOUR FINGERS AWAY FROM THE WINDOWS. Not because you will leave deposits, just push the glazing in. To avoid this, take hold of a coach with both hands, either by the corridor connections or the buffers. If you must lift by one hand, take hold around the solebar/stepboard area. For small windows i.e. guard's ogee/lookouts, use the Clearfix as directed on the bottle. Don't forget to fit any decals you can to the glazing, before fitting the roof. Bulleid decals go on the outside, so no worries.

Roof

Completion Place your fully fitted and painted roof, apart from cantrails, in position. Run Superglue under the eaves on one end and hold firmly for a few minutes. When satisfied, repeat for the other end. Now check along the sides, to see if a few spot glueings will help the fit. Superglue, used sparingly, won't damage the paint job. This spot glueing is most applicable to plastic roofs, however the aluminium type can sometimes benefit where a side tends to bow out.

Cantrails are made from 10 X 30 thou strip styrene. If you have left a largish gap twixt roof and body, 35 thou is acceptable. Manufacturers vary in the amount of body they leave above the door openings. Andy Mullin's has quite a wide strip, so the cantrail will have to be fitted mostly on the body. Alan Doherty's bodies have almost none, so the cantrail is fitted to the roof only. As long as the coach ends are the correct height, this should make no difference to the finished product.

Offer up the length of strip and run your old paintbrush full of MEK, along the join of roof and cantrail. This doesn't seem to affect the roof paint job once it is varnished. Frequently check that the rail appears straight as you proceed. Continue to the roof end, then turn the coach over, so that the cantrail is at the bottom and rest it on your cutting mat. Use the scalpel to cut to the correct length. Remember that some companies formed a gutter from this strip, allowing water to run off each end. GWR Toplights spring to mind. Here you will have to allow extra length when cutting.

If you have the type of coach that had the handrails finishing on the roof, now is the time to fit them, also any tank fillers. The GWR handrails finished in a three-quarter circle on the roof, rather difficult to bend convincingly. So I tend to start this end and wrap the wire around a screwdriver bit of the correct size. Then do all the other bending necessary. My usual method for most other types of coach, is to bend the obligatory 2 mm at right angles for the bottom hole, before the long bend to the roof. The toilet tank fillers should have the last 2 mm bent away and out from the coach end.

Last few jobs, paint those handrails dirty black and the cantrails the correct colour for your period and company. The last, I have found easier to do with a pen nib, top and bottom to avoid getting paint on the roof or the sides. Any toilet tank fillers should finish in a white end. When all is dry a last coat with brushed matt varnish, also any areas of Superglue that are still shiny, like under the eaves. Alternative method, mask off the majority of the coach, I use a piece of cardboard with cutouts to suit, and spray with varnish. Now thoroughly check your coach for chipped paint, all handrails, grabhandles and door handles for correct alignment. Re-coat/adjust as necessary.

I have a sudden vision of all my clients, having read this article, examining the coaches I have built for them and muttering, "he didn't do that with mine". Makes you go all hot and cold. But then at the top of this article I did say that your modelling expertise should improve with practice.

Final Job

Refit all bogies, place on the track, couple up the whole rake, sit back and admire your handiwork. I am now going to build a coach using this article to make sure

(a) It is possible.

(b). I haven't left anything out.

GOOD LUCK