Looking back 4

concluded from page 79, March 1972, Railway Modeller

Coaches in conclusion

Jim Whittaker concludes his saga of superb scratchbuilding techniques

Photographs by Brian Monaghan

PHOTOGRAPH 18 shows a finished model of a 48ft. $6\frac{3}{4}$in. long clerestory roofed Brake Compo fitted with the Dean 6ft. 4in. bogies which were designed to support the body weight via four scroll irons per bogie, attached to the solebars as shown. On the model these scroll irons had to be cut at a position just under the solebar to permit the out-of-scale bogie swing associated with 4ft. radius track, but this will be mostly hidden by the footboards when fitted. Each bogie comprises over 100 separate components, most of which are soldered together to achieve maximum strength with scale appearance. The elliptical springs are individually leafed, made from 0·006in. thick copper strip, as no alternative method could be found to produce the required delicate appearance.

Using such large numbers of components may suggest a rather formidable undertaking, but this is not necessarily so. The experience and familiarity gained from the repetition of any process, plus the application of thought and imagination towards new methods of approach can radically reduce the initial time taken. A good example of this, although admittedly proving difficult to solve initially, is the small axle-box unit, Fig. 5, which used to be one of the most laborious and difficult components to make on any vehicle. The soft metal casing approach was obviously the best way to consistently produce identical units, but experiments with moulds made from plaster, resin-bonded materials, and even metal, produced indifferent results and far short of the standard required. For a time I had to resort to filing each one from solid brass which was sufficient punishment to remind me of the Brunel perseverance formula again and, once more, it proved to be sound advice. The principle remained the same (i.e. casting) but different materials were selected—i.e. "Cerrobend" for the castings and the I.C.I. produced "Silcosse" rubber for the moulds. Cerrobend is a low melting point metal (about 70°C I believe) available from the model shops and it can be prepared for "pouring" in a few minutes. A few small pieces are dropped into a small metal cup about $1\frac{1}{2}$in. dia. by 2in. long, to which has been attached a heat-insulated handle for ease of pouring and the cup then placed in a pan of boiling water, making sure that the water level is low enough to avoid entering the inside of the cup. (These cups can be obtained from radio scrap dealers—I believe they were used to shield oscillator coils and the like.) The choice of this low melting point Cerrobend permits the use of rubber moulds whose temperature limit is 250°C beyond which the life of the mould is considerably shortened. I.C.I. recommend Silcoset 101 combined with curing agent A for our purposes and room temperature is sufficient for curing (24hr. is advised). The rubber is available in 1lb. tins and although it appears rather expensive, there is sufficient to share amongst club members to meet even the shallowest of pockets. It is not possible to give a positive supplier's address, as I was given a small sample, the shelf life of which was greatly exceeded and was thus regarded as scrap (results contradicted this) but any I.C.I. agent will assuredly oblige. Except for the curing time and the making of the original component (axle-box in this case) which are "once only" efforts, the making of the two-part mould and the subsequent castings takes only a few minutes. For the first mould, the axle-box is placed in the centre of a round metal cup and the Silcoset rubber (mixed with its curing agent) poured into the cup to a depth of about $\frac{3}{8}$in. (see Fig. 5A). The rubber has a viscosity similar to syrup and to avoid the risk of forming tiny air pockets, and thus possibly producing a faulty mould, the rubber should be poured on to the bottom of the cup and allowed to slowly build up and creep over the axle-box until completely covered. When the mould is set, remove from the cup and cut three angular notches round its perimeter at irregular distances to act as mating points for the second part of the mould. The face of the first mould, including the three notches and the axle-box face (still nesting in the mould) should now be smeared with Vaseline to ensure subsequent separation from the second half of the mould when it is poured, as follows:

Replace the first mould in the cup with the Vaselined face upwards and place a short length of approximately $\frac{1}{8}$in. dia. brass rod immediately above the axle-box and secure it temporarily in position with a narrow strip of wood pressed into the top of the cup as shown in Fig. 5B, whilst the second rubber mix is poured in to a depth of about $\frac{3}{4}$in. When set, the brass rod is removed to provide the hole for pouring the metal into the mould. The two-part mould is now ready for use except for one vital operation on the face of the first mould, i.e. the cutting of several channels approximately 0·020in. wide and 0·015in. deep, to allow trapped air to escape during the casting operation. These are shown in Fig. 5C and a minimum of eight channels is recommended, radiating from the axle-box mould as shown. These channels, of course, produce unwanted tiny legs on the casting, but they break off with a touch of the fingers.

A final word about the casting operation which might be helpful. The rubber mould is placed on any flat surface (a shallow metal saucer is ideal) and one end of a ring spanner placed with slight pressure on top of the mould and encircling the $\frac{1}{8}$in. pouring hole in the mould. The ring spanner acts as a funnel for ease of pouring and provides a useful "head" of metal towards getting a clean sharp casting which is gravity produced, of course.

The Cerrobend takes only 3 to 4sec. to set and just before it does so, the ring spanner, with its contents of Cerrobend, is quickly slid to one side, thus separating it from the casting below—otherwise it would not be possible to remove the casting from the mould. The $\frac{1}{8}$in. dia. surplus feeder behind the axle-box is then sawn off and the surplus Cerrobend in the

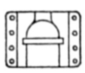


FIG. 5

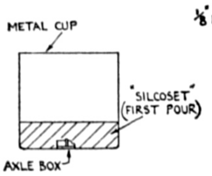


FIG. 5A

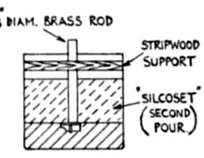


FIG. 5B

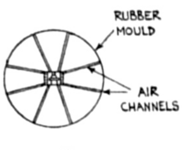


FIG. 5C

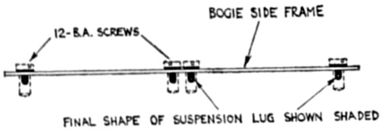
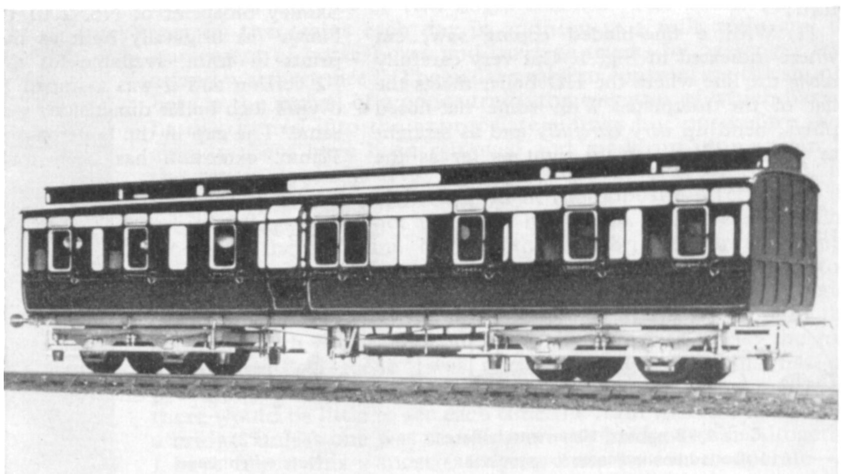
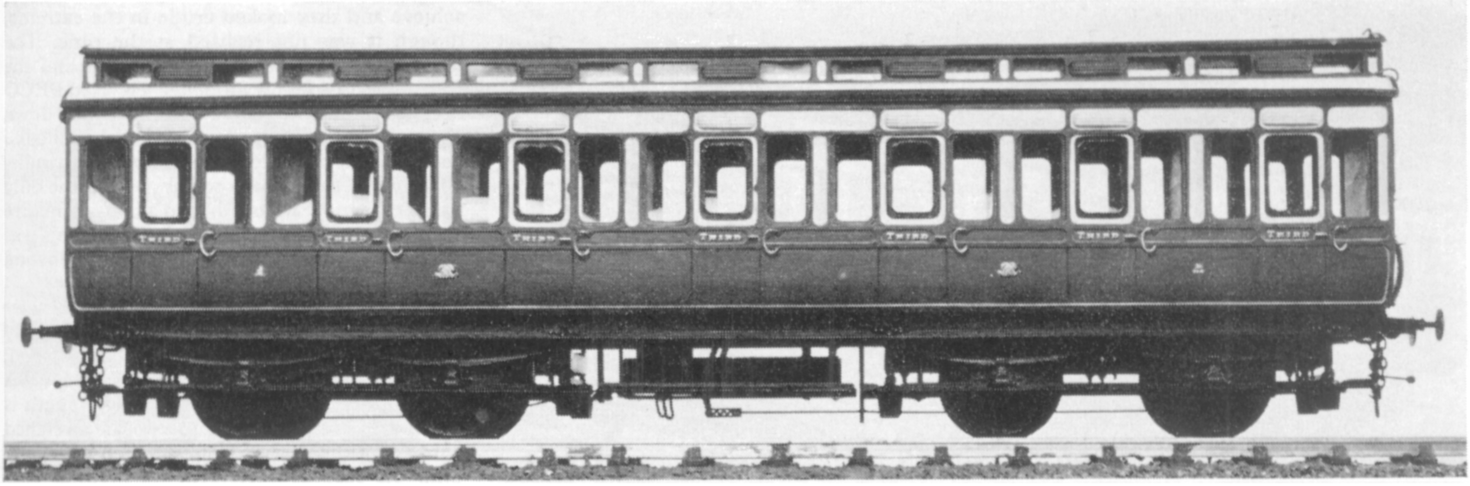


FIG. 6



16 *Partly completed 48ft. 6in. 1st/2nd compo brake.*



17 *40ft. 0¾in. 7-compartment all third.*

spanner tapped out for re-melting and the process is complete. This process is far more long-winded to describe than to perform, but the advantage and scope of this method (particularly when applied to irregular-shaped components) justifies, one hopes, going into a fair amount of detail. Frankly, if you react as I do when "pouring" you will find it difficult to suppress a chuckle of glee (at each pour!) at the thought of how you have cheated Father Time once again.

Not everyone, of course, wants to go to these limits of scratchbuilding—indeed many modellers visibly derive considerable pleasure from a combination of interests and this is all for the overall good of the hobby. The most significant change over the last 10 years is probably the enormous range of model railway equipment which has appeared on the market catering for nearly every conceivable taste and requirement, ranging from basic raw materials for the scratchbuilder to the completely finished product. In between these two extremes there is now provision for anyone to indulge in track building, scenic effects, kit building, almost unlimited in range and scale, to mention just a few, and the degree of participation is entirely up to the individual modeller's discretion and skill.

Let's face it, the trade has done us proud; in fact, one might conclude that we are on the verge of being spoilt for choice these days, though it does make a nice change to be woo-ed, doesn't it? At least let us appreciate it. I never imagined we would ever see so many first-class plastic and metal kits covering such a wide range of locos, goods and passenger stock, and the enthusiasts who prefer the finished product have not exactly been neglected either—the "Dean" Single and Stephenson's Rocket are but two examples of "off beat" offerings and little masterpieces they were too, especially at the price. And they smoked! Yes, we have come a long way and if one accepts that manufacturers do not tool up for the fun of it, the demand must surely be there, suggesting that the hobby has reached new peaks of popularity.

The 6ft. 4in. Dean Bogie referred to above can, for instance, be bought commercially for a small amount (and the 10ft. version also) but for those who feel like a bash at scratchbuilding, I will press on, as the principles apply to nearly all bogies. As there are so many pieces attached to the bogie side-frame (some in close proximity) a complete 100% soldered assembly was not practicable and it was decided that the ideal components to screw into position (and thus form a solid and undisturbed basis for subsequent soldering operations) were the four spring suspension lugs. The basis of these lugs is a 12BA screw with reduced diameter heads, four of which are screwed firmly into four tapped holes in the side-frame. Using simple filing jigs to obtain consistency of size and shape, the screws are then filed into the shape of the lug and the head of the screw filed down, as shown in Fig. 6. The axle-boxes are the only other item not soldered in position as these are of low melting point metal and difficult to solder. They can, however, be securely positioned using Evo-Stik, especially if one scores in criss-cross fashion the back face of the axle-box and also the mating face on the bogie side-frame to provide extra grip for the glue. As the axle-box is not actually used as a bearing surface, a blind hole is drilled in its rear face of sufficient diameter and depth to clear the axle and still permit slight adjustment to the position of the axle-box, when lining it up with the centre line of the suspension springs at the gluing stage.

Stainless steel rod of 0·075in. dia. is used for the axles, with each end machined down to 0·025in. dia. by 0·060in. long to provide the so-called needle bearings which run in 0·028in. dia. holes in the bogie side-frame (nickel silver). The 0·025in. dia. shaft ends are then burnished to reduce friction to a minimum by applying a piece of flat polished steel to the surface with slight pressure, while the shaft is running at high speed in the lathe. The axle length was designed to give at least 0·025in. end shake between the bogie side-frames, so that when the vehicle is placed on the track, the eight wheels of any bogie vehicle (i.e. two lines of four wheels) would line themselves up automatically, thus reducing possible side friction between the wheel flanges and the inside edge of the track rails. This avoids having to precisely position the wheels on every axle to get them lined up on both bogies, which would almost certainly be necessary if pin point axles were used, having virtually no end shake. The results have been very gratifying—any vehicle so fitted starts rolling freely on any plane which is only slightly off the horizontal.

Another chassis unit common to all G.W. vehicles of this period is the vac cylinder and brake assembly shown in Fig. 7. This is rather delicate and is therefore made as a completely separate sub-assembly and screwed to the underframe at the very last stage of assembly with two 12BA screws. Except for the cylinder (turned from brass rod) almost all the components are from 0·010in. thick nickel

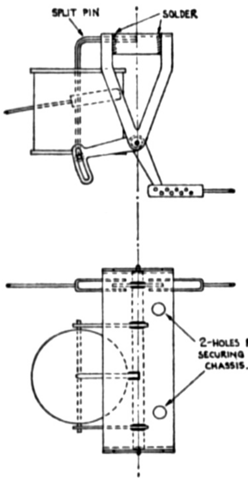


FIG. 7

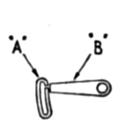
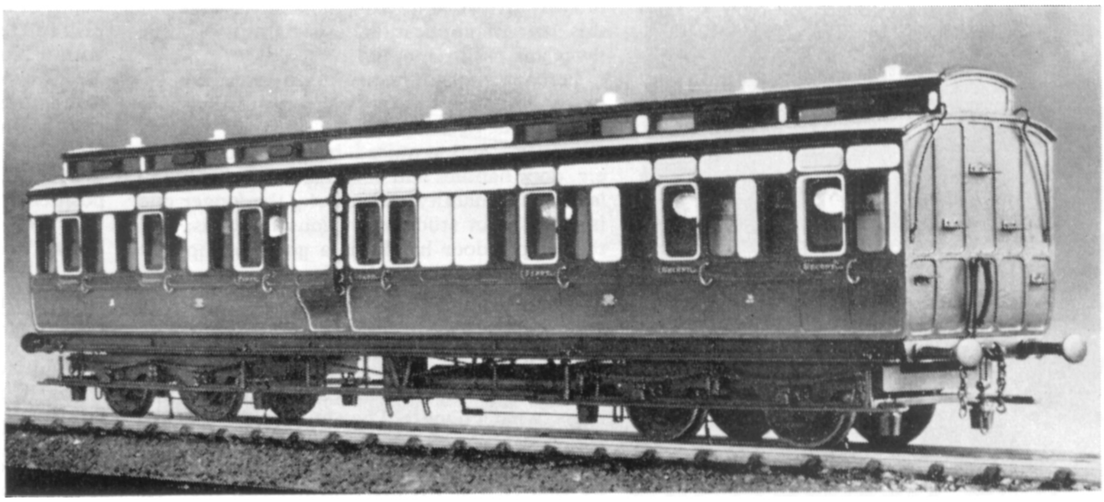
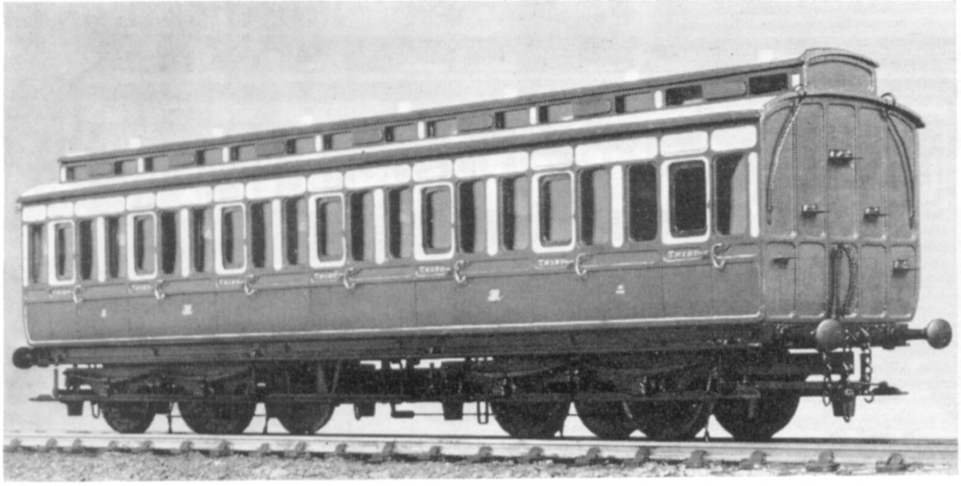


FIG. 7A

18 *48ft. 6¾in. 1st/2nd compo brake. The compartment mirrors can be clearly seen in this picture.*





19 *Three-quarter view of 40ft. 0¾in. 7-compartment all third showing end detail. Note the inverted step on the bottom left.*

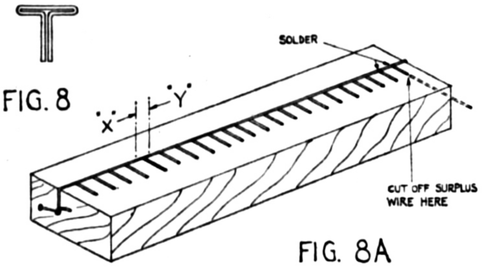


FIG. 8

FIG. 8A

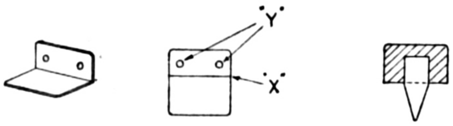


FIG. 9 FIG. 9A FIG. 9C

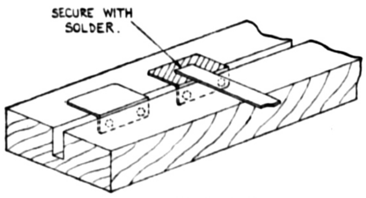
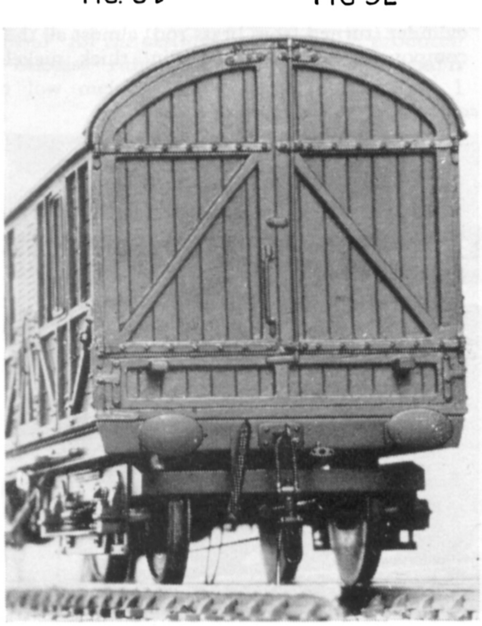


FIG. 9B

FIG. 9D FIG 9E



20 *End view of Monster, slightly over life size.*

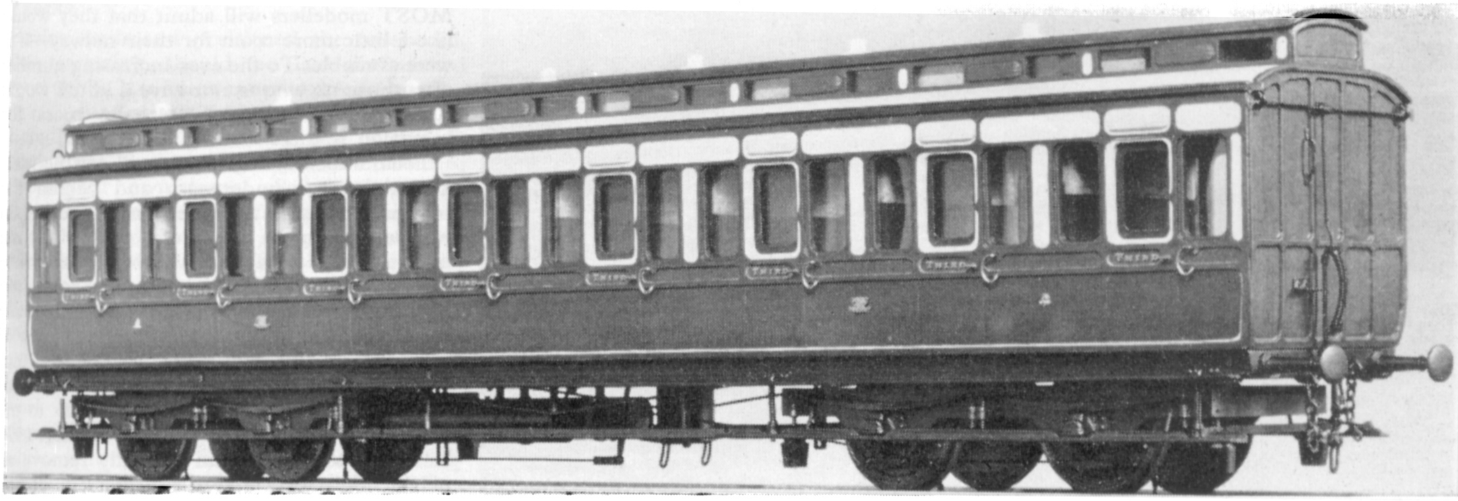
silver sheet, soldered together where shown shaded. The only difficult component is the curved slotted link, one on each side of the cylinder, which is characteristic of the G.W.R. and cannot be omitted. This is constructed as shown in Fig. 7A. The curved link "A" is made from annealed 0·018in. dia. nickel silver wire, bent as shown in the sketch with the "joint" near the top—i.e. opposite the operating arm "B" made from 0·010in. thick nickel silver sheet. The two pieces are joined together and the "joint" filled in simultaneously with one blob of solder applied to each side in turn. To complete, the excess solder and the 0·018in. dia. wire link are filed down to blend with the 0·010in. thick arm, giving the appearance of a solid one-piece job at a fraction of the time required if it really was so. The difficulties of soldering two small and lightweight components together such as these are considerably eased by the use of a block (say 4in. × 4in. × ½in.) of insulation board available from any scrap radio dealer and a reel of Sellotape. The operating arm just described is stuck down to the board using Sellotape, but with its end, of course, exposed where the solder is to be applied. The curved link is then positioned up to the arm and held with a small piece of wood whilst the blob of solder is applied to join them together. With very small components or in very confined areas where even a small piece of wood is too clumsy, a gramophone needle (held in a pin chuck) is used instead. This needle invariably gets stuck to the solder, but a slight twist of the pin chuck releases the needle point with little evidence of its departure. The application of the solder has to be done in a quick positive manner, otherwise the Sellotape shrivels up under the heat and soon loses its gripping interest. Most assuredly, it is invaluable for this sort of application, especially as a time saver and skill remover.

Perhaps it would be helpful to describe a few body components at this stage, especially those which are virtually common to all railway companies and required in large numbers—e.g. door handles and end steps. Obviously the larger the quantity per vehicle, the longer one is justified in studying various methods, and the simple door handle is a good example of what can be achieved using the principles outlined earlier. First efforts (before the advantages of these principles were fully appreciated) were based on fuse wire, bent as shown in Fig. 8 with a spot of solder added to strengthen and then painted gold to resemble brass (what a hope!). They were fiddly to make and consistency of size almost impossible to achieve and they looked crude in the extreme, though it was not realised at the time. The next method was a big improvement and the clever idea of a fellow modeller. He used PECO brass track pins with the round head filed down to the shape of a door handle, which eliminated painting and produced a genuine brass handle. These were very strong to handle and the only troublesome area was filing to a consistent size and shape, which to me is a vital one. This was eventually surmounted by the following method which is currently in use.

A 6in. length of brass wire (diameter according to your scale) is stretched tightly between two nails driven into a block of wood, with the wire lying flat on the wood. A similar piece of wire about the same length is then positioned at right angles to the stretched wire and a tiny spot of solder added to secure. Snip off surplus wire with wire cutter to a length of about ¼in. and repeat the process all the way down the stretched wire at about ⅜in. intervals, which will then appear as in Fig. 8A—i.e. sufficient for about 16 to 20 handles. A minimum gap of ⅜in. is recommended, otherwise the heat of the soldering iron affects adjacent joints. After removing the length of handles from the wood block, they are cut into individual units at points "X" and "Y", aiming at a length slightly in excess of the finished length to allow a margin for filing to a clean sharp finish. The leg of the handle is then secured in a pin chuck and the handle filed to the required length and any excess solder removed, the whole unit then being given a few strokes with fine emery cloth to complete. These operations sort out the weak soldered joints and a few handles drop off, but there is little lost in time or material and it is better to find them at this stage than after they have been inserted in the vehicle.

Using this method and one size of wire throughout, there is little difficulty in producing a batch of handles that all look the same and if they are mounted in the vehicle with the soldered joint underneath, they offer a genuine all brass appearance.

End steps are another component required in fairly large quantities (see Fig. 9) and the current method was only developed after many fruitless hours and really crude results which bring a slight shudder even to recall. Initially, the step is punched out in its flat state from 0·004/5in. thick copper strip using a punch shaped as shown in Fig. 9A. The line "X" is a scribed line on the punch, which reproduces itself on the punched copper blank to show the position of the subsequent 90° bend to form the step and thus ensures consistency without effort. To bend, a 6in. rule is placed up to the line and the protruding copper simply bent upwards at 90° using a sharp penknife. The two holes "Y" in the punch are drilled to a depth of approximately 0·020in. with a No. 80 drill and the edges of the holes lightly chamfered with a No. 76 drill. These two holes produce an embossed effect on the punched copper step, simulating the two securing bolt heads, the size of the latter being determined by the amount of chamfering applied to the holes in the punch. Thus the overall size of the step, the position of the bend and the two bolt heads are produced simultaneously for each punched blank. There remains the problem of firmly fixing the steps to the body and Fig. 9B shows the basic principle of preparation. A block of wood about 3in. long is slotted along its length to a depth of ⅛in. and a width of approximately 0·012in. (virtually a sawcut). The slot is then loaded with several steps with the embossed bolt heads always in the slot, as shown. From a piece of 0·004/5in. thick hard brass sheet (or nickel silver) cut a narrow strip about 2 to 3in. long by approximately 0·040in. wide. One end



21 *Eight-compartment all third G.W.R. clerestory coach.*

of this strip is placed centrally on the step as shown and secured with solder. Cut the strip with snips, leaving a length of about $\frac{3}{16}$in. attached to the step and repeat the process on all the other steps. If plenty of solder is applied at this stage, it will be attracted towards the support strip and level up flush with it, thus disguising its presence and actually away from the edges of the step, which of course is ideal.

The final operation is to file the support strip (or lug) to a point as shown in Fig. 9C and apply a smooth file over the soldered joint to clean up. (This face is mounted underneath and virtually out of sight.) To secure to the body, a 0·028in. dia. hole is drilled in the body at the position required and the lug (with the step) pressed in firmly, using smooth nosed pliers. As an additional security precaution, a spot of Evo-Stik is also applied to the lug and the back face of the step. When in position, they look very delicate (as they should do in 4mm. scale) but are in reality very strong and secure. Most of the G.W.R. vehicles of the period were fitted with five steps on one end of the coach, but with a rather unusual but consistent peculiarity—i.e. the bottom left-hand step was always mounted in an inverted position to the other four (see Fig. 9D). It has been suggested that this was to facilitate the removal of the lamp from the adjacent lamp bracket, but I have no positive confirmation. Can any reader offer an explanation? On the model this entails slightly more work—i.e. to cut a slot in the step and repeat the general procedure just outlined above (see Fig. 9E) which should be self-explanatory.

Internal detail on coaches is mainly confined to seating made from suitable section stripwood, though in a rash moment the Compo Brake, photograph 18, was fitted in each compartment with two mirrors and four "Hamilton Ellis" paintings of the day. Not being familiar with Mr. Ellis's predecessor (if one existed!) or his work, I thought that some licence was permissible, and the scenes, although in colour, are confined to simple subjects based on my own imagination. It may be possible to discern some of this internal detail on the photograph, though it is unlikely that you will recognise the subject matter. Still, they have at least caused some amusement amongst friends and fellow modellers, which is something not to be decried.

Perhaps one should conclude on that note. After all, the main purpose of the hobby is surely to make or assemble models and working layouts of all kinds (preferably to the best of one's individual ability) which will promote warm interest, pleasure and amusement for all to share.

The constructional methods of some other common components (e.g. screwed couplings and ventilator bonnets) have not been included in this particular series, but with our Editor's permission, perhaps this could be rectified in due course.

22 *As a change from building superb rolling stock, Jim Whittaker collects old tin-plate trains. This photograph shows him with some of his collections and the "pots" he has acquired as a by-product of his modelling skill.*