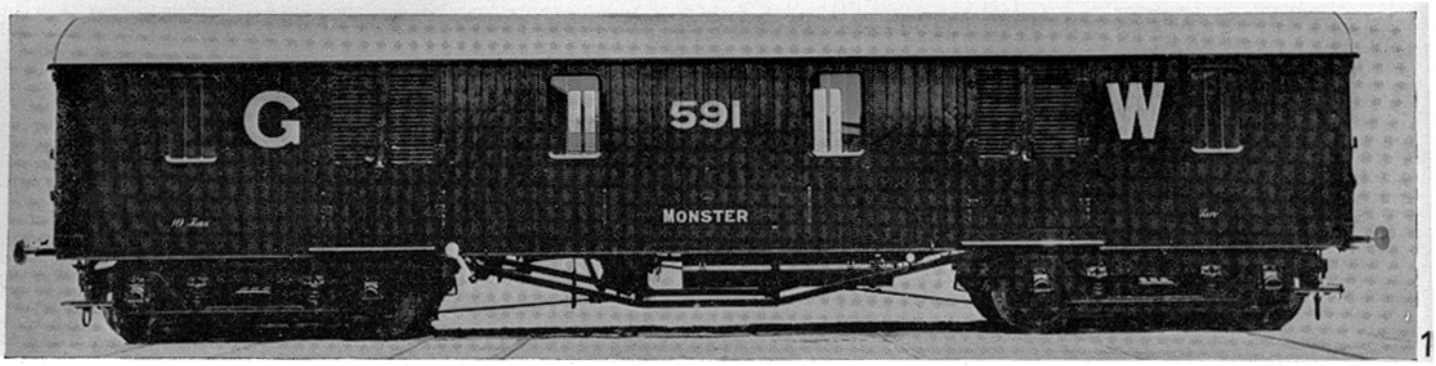


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# A tale of two Monsters

## Jim Whittaker shows you how to build outstanding vehicles

Photographs by Brian Monaghan

Concluded from page 369 December 1967 issue

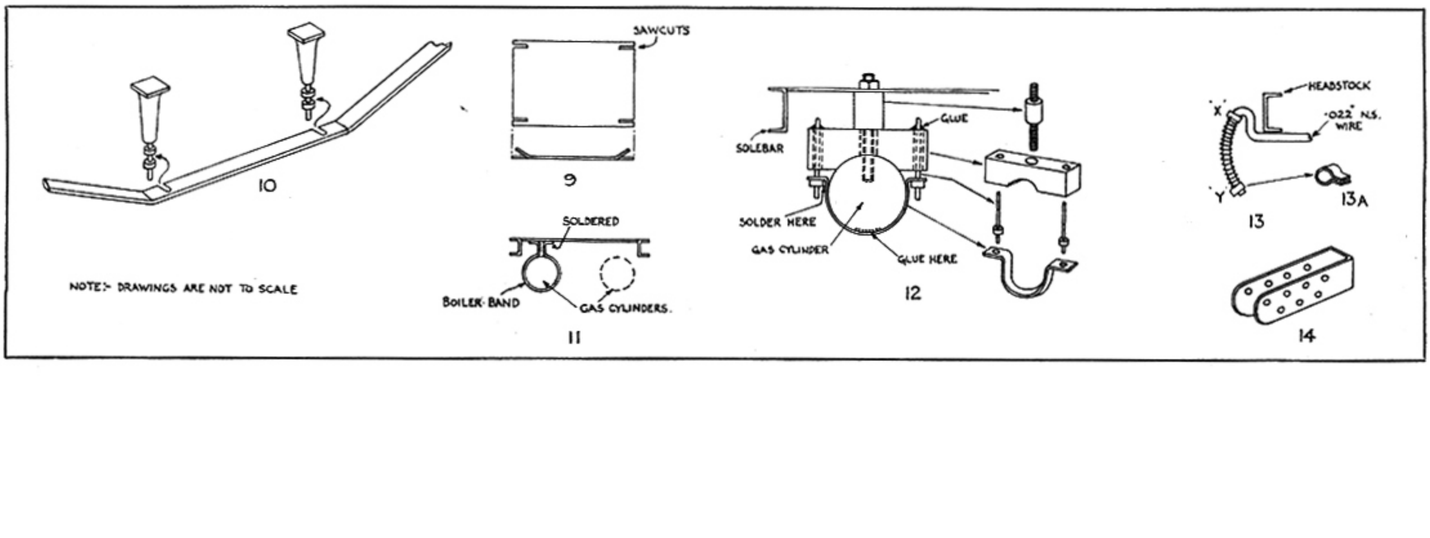
**Chassis (underframe) and associated components.** Many railway vehicles, both freight and passenger, feature an assortment of metal sections which are not easy to reproduce in model form without the aid of some type of jig, e.g. channel, angle and T-section, etc. For some years I struggled with these, usually making them from 0·010in. thick copper sheet, as this was the easiest material to bend in length, but I was never very satisfied with the result. Thanks, however, to "Hobby-time" of West Wickham, all this work has now been eliminated, including the jigs. This firm offers an incredible range of assorted brass sections in lengths of 200mm., 250mm. and 500mm., all beautifully finished and it is virtually impossible not to find one that meets scale requirements (usual disclaimer, though I cannot resist mentioning that their postal service is second to none). The two "Monsters" are my first efforts incorporating these new sections which have been a joy to use.

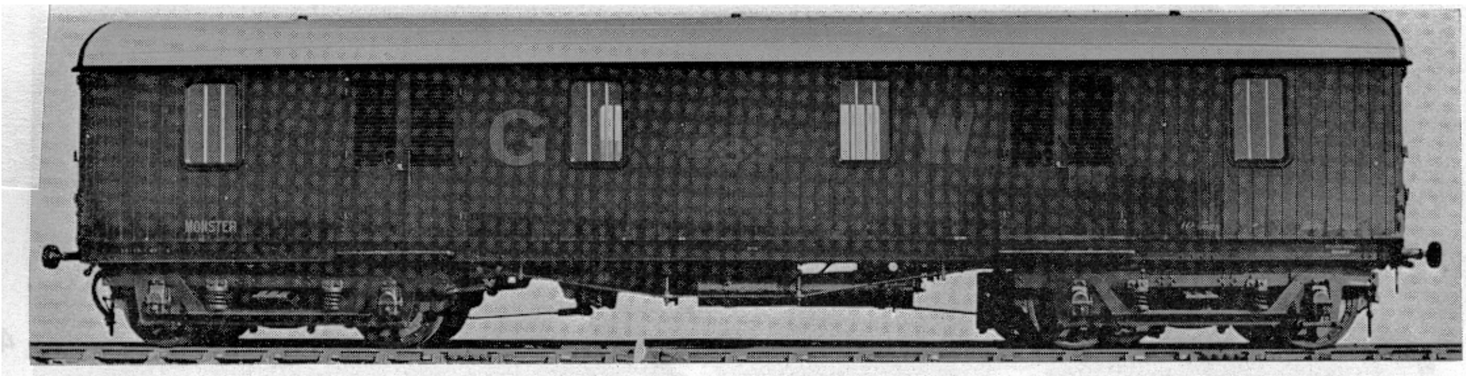
**Underframe.** The main backbone of the underframe, of course, is the solebars and headstocks for which brass channel, 3mm. × 1mm., is used. The parts are simply cut to length and soldered together to form the basic rectangle of length and width, using a simple wooden jig to ensure squareness all round. For additional strength, several cross-members or spacers cut from 0·012in. thick nickel-silver sheet are soldered between the two solebars, which also provide a means of suspending the various underframe items such as gas and vac cylinders, etc, and for finally screwing the complete chassis to the body. Usually, about six to eight of these spacers are used according to the length of the chassis required and are positioned at approximately even centres along the chassis length. This method is preferred to using a single spacer going the full length of the underframe, as it provides several very useful gaps offering access to the soldering iron during the subsequent stages of soldering the V-hangers and step supports, etc., in position. (This access, available from both below and above the underframe, is extremely useful, as the "area" underneath eventually gets congested with eight queen posts, not to mention four truss rods of long and delicate proportions.) To eliminate the danger of the spacers moving out of position and riding over the edge of the solebars during the soldering operation (they are only 0·012in. thick!) a small saw-cut is put in the corner of each spacer, producing a simple tag which is bent downwards at approximately 45°, thus increasing the locating face from 0·012in. to a more positive 0·030–0·040in. (Fig. 9). This idea simplifies the soldering operation and the tag provides a useful soldering point, giving a strong neat job.

**Truss rods.** The trusses on both prototype "Monsters" are of rectangular section metal bar—a most difficult thing to model, I think, in view of the necessity to make them straight and parallel over their entire length. This new source of supply for odd sections already referred to offers brass strip 0·040in. × 0·012in. section, which is near dead scale and completely solves this problem. When assembling the truss rods to the queen posts, two narrow slots are cut in each truss at positions equal to the queen-post centres and the truss is then pushed into appropriate slots in the queen post and secured with a spot of solder (Fig. 10). The solder also fills up the remainder of the slot in the truss rod and thus disguises the fact that the whole unit has not been assembled in the proper nut and bolt fashion of the prototype.

**V-Hangers, etc.** The various items attached to the solebars, such as V-hangers and step supports, are all soldered in position and this can be a rather fiddling and frustrating operation, in view of their delicate nature and small size. The main problem is to hold them firmly in a set position whilst the soldering iron is applied and the best appliance I have found for this purpose is a spring-loaded and hinged hair clip, available for a few coppers. They are very similar to the crocodile clip but without teeth and of more delicate proportions, and an assortment of these has been gradually built up, bent to various shapes to suit a particular requirement. Some of them are available in aluminium which is preferable, because there is then no risk of them being accidentally soldered to the solebar. They really are ideal tools, having just a nice light pressure for holding delicate components.

**Gas cylinders.** The suspension of the gas cylinders has been considerably improved on these two models after considerable experiment and thought. For some reason, not very clear, this apparently simple requirement proved most difficult to solve. Previous efforts simply used brass strip (boiler band) wrapped round the gas cylinder and soldered to the chassis spacer above (Fig. 11). This was crude but not very noticeable, as the top half of the cylinder was invariably hidden behind the solebar. On the "Monster", however, the twin cylinders are unusually low-slung and it was decided that something more like the prototype was overdue. The final design eventually involved many more components and took much longer to make, of course, but this is sometimes difficult to avoid in the search for a more accurate model (see Fig. 12 which, it is hoped, is self-explanatory). It will be seen that the design





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incorporates a combination of gluing (using Evostik), soldering and screwed threads, using brass strip and rod throughout.

**Vac pipes** (Fig. 13). Vac pipes of considerable strength, and, I think, realism, are produced quickly and easily from two basic ingredients, i.e. 0·022in. dia. nickel-silver wire and 0·0075in. dia. tinned copper wire from the usual electric light flex. The 0·022in. dia. wire is bent into the basic shape of the vac pipe required, leaving a convenient extension for soldering to the chassis. The copper wire is then wrapped tightly round the nickel-silver wire, starting at *X* and finishing at *Y* in Fig. 13. At this stage the turns of copper wire are really too near together to look exactly like the prototype vac pipe, so they are separated just a shade (i.e. create a gap between each turn of wire) by pressing the blade of a craft knife between each wire, snipping off any surplus turns which may now project beyond *Y*. To secure the wire in position and to simulate the securing clips of the prototype at *X* and *Y* the finishing operations are as follows:

(1) Cut off two pieces of the 0·0075in. dia. copper wire approximately $\frac{5}{32}$in. long and flatten into a rectangular section by tapping with a hammer.

(2) Wrap these pieces round the vac pipe at *X* and *Y* and lightly clench with pliers, forming the shape of the clip shown in Fig. 13A.

(3) Apply a spot of solder to each clip to secure and clean up with smooth file as required.

**General brake gear.** All the items such as brake levers and operating arms, etc., are made from 0·010in. nickel-silver sheet and follow normal practice, i.e. mark out, drill, cut to shape and finish with smooth file and fine emery paper. There are no repetitive items in quantity, so the preparation of a marking-out template, or even a punch, is not justified. In any case, they are easily and quickly made; it is the assembly (soldering) which requires more skill, as already discussed. One exception to the use of nickel silver is the brake rod adjuster (Fig. 14) and this is a good example of how a tedious operation can be made relatively simple and much more quickly by selecting the best material for the job—0·005in. copper strip in this instance. This was selected because the drilling of several No. 80's (0·013in.) dia. holes was involved and to put these small holes in soft copper is a matter of a few seconds only, with absolutely no risk of breaking the drill. Furthermore, if anything goes wrong with the bending of the two forked arms (e.g. the bend may be in the wrong position) the arms can be straightened out and rebent without risk of fracturing the metal.

**Bogies** (Fig. 15). Most of the prototypes were fitted with the 9ft. American-type equalising bogie, though it is known that at least one vehicle (No. 490) ran on the 9ft. volute bogie, probably utilised from a passenger vehicle on which they were reputed to be not very successful. I decided to select the equalising bogie as it is very common on G.W.R. vehicles and I would thus be modelling a number of these over the years, justifying a detailed investigation into the best methods of production, including the making of jigs as required. Although jig making is most irksome, however simple the design, there is no doubt that if a top-class model is aimed at, some jig making (even if fairly crude as mine are) is unavoidable. The equalising bogies also featured the transversely mounted bolster springs—a mass of leaf springs projecting from the bogie side which I thought would be rather a challenge to model properly and I was not disappointed, although they are non-working in the model. All the main bogie parts, such as the side-frame, axle-guards and equalising bars, were made from 0·012in. nickel-silver sheet. For the process of marking out these components, a master template was made for each one (also from 0·012in. nickel silver) which helped to ensure consistency of finished size and shape on identical parts (this is particularly essential when making angular components like equalising bars—Fig. 15A).

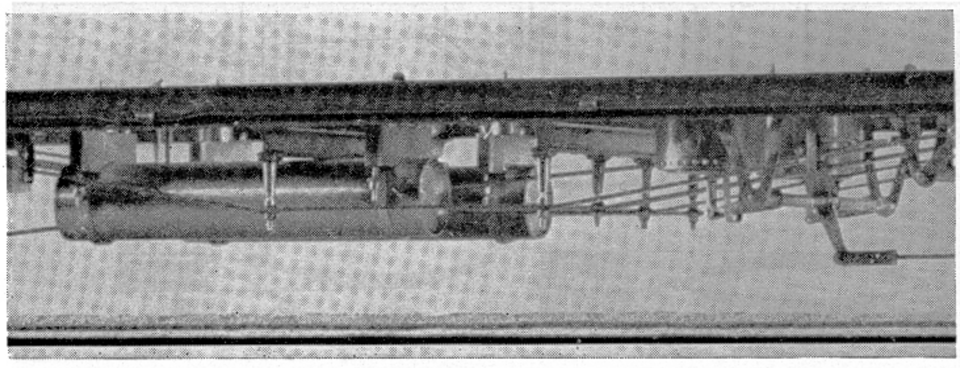
The template is placed on a flat sheet of 0·012in. nickel silver, already painted with marking-out ink, and stuck down with short lengths of Sellotape at convenient points to prevent movement during the marking-out process. The marking out of the profile is then done with a gramophone needle held in a pin chuck, always making sure that the needle is pressed up firmly against the template edge.

For the subsequent cutting out of the various parts, a piercing saw equipped with a fine 80T per inch saw blade is used throughout. Tin-snips were originally used for this operation in the belief that they produced quicker results, but one modeller is now convinced that they do not, especially if a perfectly flat component is required. Tin-snips frequently "pulled" or bent the metal which then needed straightening, not always with success by any means.

By using the saw the metal will remain dead flat and it is surprising how fast it rips through the metal, and how long these incredible blades last without wear and without breaking once one has acquired the knack. The actual saw-cut is kept as near as possible to the marking-out line to minimise the subsequent filing operation. On the latter operation, which really determines the final shape, one simple principle is followed throughout, i.e. to file away the metal until the marking-out line just disappears and to facilitate this it is essential to have a firm grip on the component. This is achieved by clamping it firmly in a standard Eclipse pin vice which has jaws only about $\frac{1}{8}$in. wide, and as each edge presents itself for filing the component is continually repositioned in the vice to offer the best position for filing accurately and easily. A final few strokes of fine emery paper along all edges and faces produces a sparkling component ready for assembly. I find that component making (using the above methods) one of the most rewarding sides of the hobby, as so many attractive and assorted pieces seem to appear in no time at all once the marking-out templates have been made. This is fortunate because there are very nearly 100 pieces in each bogie, the assembly of which is mainly an exercise in soldering, though in a few cases where strength is not required some of the smaller items are positioned with Evostik, especially when there are several components in close proximity with each other, and already held with solder, which would probably fall to pieces if just one more item was soldered on. Using a combination of soldering and Evostik frequently surmounts awkward assembly operations and experience will soon help you

**1, 2** *Inside-framed Monster. (Photos: British Rail, Western Region.)*

**3** *Underframe details.*



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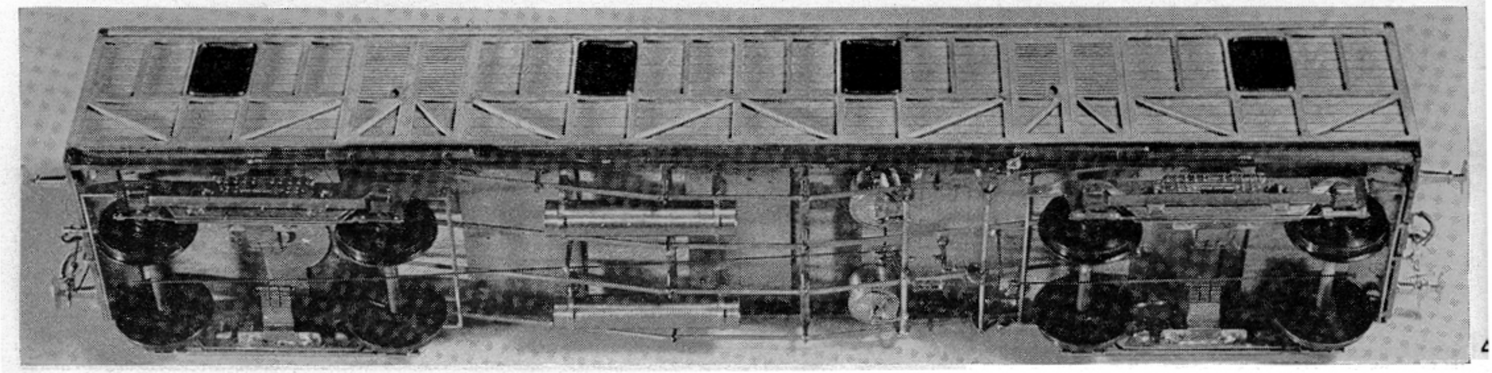

to decide which one to choose and in what order.

In the case of these equalising bogies the first operation is soldering the axle-guards to the side-frames and this presents no problem. This soldered joint, however, is immediately threatened with the next operation of soldering the axle-box to the axle-guard and this in turn threatened by the subsequent soldering of the equalising bars to the guards—all these joints are within $\frac{1}{8}$in. of each other. In these cases the threatened joint can be safeguarded by firmly clamping it between the jaws of the Eclipse pin vice, which prohibits any movement whilst the next soldering operation is prepared. It is necessary to insulate the vice jaws with cardboard to prevent heat dissipation. For further soldering operations another pin vice can be added, though two of these vices in use simultaneously is about the limit, otherwise there is no space left to apply the soldering iron. If even more assemblies are required, one can either resort to using Evostik or chance one more joint by "controlled" soldering, i.e. applying just sufficient heat to tack the component into position without disturbing the other adjacent soldered joints. This is quite a practicable proposition after a bit of practice, providing that both faces to be joined have previously been tinned with a thin coat of solder.

**Axle-boxes.** These are made from hard brass and to date no quick and easy way of making them has been found. It is just a question of careful marking out, followed by piercing saw and smooth file with frequent application of the micrometer to check progress if one wants them all to look alike. It is essential to make all immediate requirements in one batch; by so doing one can get into the swing of it and thus cut the production time.

**Bolster springs** (Fig. 16). It will be seen that these are of triple elliptical leaf-spring type mounted transversely with both the upper and lower sets of springs linked with a common fulcrum pin at each end: a total of 72 leaf springs per bogie. In the model this was reduced to 24 separate pieces without losing the appearance of the prototype by the following method (using 0·005in. copper sheet throughout):

(1) Cut the copper sheet into strips approximately 6in. long, but exactly 0·18in. wide (this width is equal to the total width across the three bolster springs, including the gap between each).

(2) Apply a very thin coat of solder along one face of each 6in. strip (virtually a tinning operation by wiping the hot solder with a rag).

(3) Using a small guillotine (available from the photographers for about 25/–), crop to length a sufficient number of springs to meet your requirements (six different and diminishing lengths are required and, of course, a batch of one particular length is produced before changing to the next size).

None of these operations demand much skill or time once the various lengths of spring are determined by trial and error on a preproduction sample. The main (longest) spring has a loop at one end and this is formed by wrapping it round 0·022in. dia. nickel-silver wire producing the effect shown in Fig. 17. This spring, along with its five other neighbouring springs, is then placed individually on the shaped jig shown in Fig. 18 and stroked a few times with any smooth tool to form the curvature required (soft copper permits this without any springing; hence its selection).

The six leaves of the spring are now all soldered together, using the same jig referred to above, by placing one leaf at a time on top of its predecessor (sighting its position longitudinally by eye) and applying the soldering iron a few seconds until each leaf is held with solder. This assembly now represents one half-section of a complete bolster spring. Two of these identical units are then simply soldered together in back-to-back fashion as shown in Fig. 19 by applying a spot of solder behind the hinge pin loop, which is out of sight from a normal viewing position.

Two saw-cuts are now put through the entire unit from both ends producing the appearance of three sets of leaf springing as per the prototype. (The saw-cuts stop short of the centre line by about $\frac{1}{16}$in.—otherwise, if taken right through, the whole spring would divide into three separate units.)

For completion, a short length of 0·022in. dia. nickel-silver wire is now pushed through the loops to form the hinge pin.

### General Comments

Fully detailed models of rolling stock are not seen very frequently in comparison with locomotives, which appear to be produced in great variety each year, many of them obviously the products of much love and care. The reasons for this are not very apparent, unless it is the basic attraction of motive power from steam, but it is hoped that these few notes might encourage more modellers to transfer a little of their affections to rolling stock.

Admittedly, bogie vehicles of this nature probably involve more component parts than many locomotives and thus take longer to construct, but, after all, locomotives were not intended to run light throughout their careers. Possibly, also, there is less information available on rolling stock and most certainly less photographs, but the search for information on prototypes can be great fun in itself. Two summers ago I spent a most enjoyable holiday tracking down "Monsters" in Wales with not a few escapades, but that is another story which should perhaps be left untold.

**4** *Underframe and bogies of the outside-framed Monster.*

**5** *End view of outside-framed Monster.*