Chassis Kit GWR 'Collett Goods'

This kit provides a replacement finescale chassis for the versatile GWR 2251 class 0-6-0 (a separate chassis kit is available for the tender). It has been primarily designed to suit the venerable Mainline/Bachmann RTR model but, with a measure of adaptation, can also be used with the various whitemetal and etched kits that have been produced over the years.

The kit follows the dimensions of the prototype as faithfully as possible. Like all RTR manufacturers in the bad old days, Mainline were not always totally faithful to these matters when creating their tooling, but the plastic bodyshell is basically accurate and these instructions identify those areas where remedial action and correction may be called for. The kit includes additional cosmetic components, such as a whitemetal casting to replace the missing bottom half of the boiler which is part of the chassis on earlier models. Although not catered for in the kit, other significant variations between members of this class are summarised below:

Introduced in 1930 the class totalled 120 locomotives. They were intended as replacements for the Dean and Armstrong Standard Goods classes, built in the latter part of the 19th century, which were becoming due for withdrawal. The frames and motion were almost the same as the successful 57xx Pannier Tanks of 1929 but a new design of taper boiler with Belpaire firebox was provided. The boiler increased the weight of the new engines above that of the Dean Goods which meant that they were placed in the "Yellow" route classification thus prohibiting them from the lightest routes. The taper boiler and large side window cab gave the engines a more modern appearance.

The 2251 class was built at Swindon Works in eight batches from 1930 to 1948 thus:
Nos. 2251-2270 1930
Nos. 2271-2280 1934
Nos. 2281-2290 1936
Nos. 2291-2299 2200, 1938
Nos. 2201-2210 1939
Nos. 2211-2230 1940
Nos. 2231-2250 1944-45
Nos. 3200-3219 1946-48

Unusually for a GWR standard class there were very few alterations to the design during the course of construction. The only modification which modellers should be concerned with was on the final batch, Nos. 3200-3219, which had additional sandboxes supplying the rear wheels. A prominent filler emerged between the rear wheel and the front of the cab footstep. Fortunately the Bachmann model includes this on the moulded body and it is easily removed if an earlier locomotive is wanted. Other differences between the batches concern the cab side handrails and lack of cab side windows on Nos. 2211-2240 built during the Second World War. The side windows were added to these engines once hostilities had ceased.

It is a different matter where the tenders which ran with these locomotives are concerned. At first the class ran with second-hand Dean 3000 gallon tenders which had previously run with the Dean Goods and other 19th century engines that were being withdrawn. Around 1936 some of the class were equipped with 4000 gallon ex ROD tenders to give the engines greater flexibility. The ROD tenders had previously run with Aberdare class 2-6-0s which were also being withdrawn. Nos. 2281-86 had ex ROD tenders from new.

In 1940 Nos. 2211-2230 were introduced with new Collett 3000 gallon tenders having a flush bottom tank and the final members built also had this type of tender. Needless to say over the years the tenders were interchanged amongst the 2251 and other classes. In the post war era Churchward 3500 gallon tenders were also to be found running with the class and this is the type used in the current issue by Bachmann. The tender chassis kit will fit all the GWR designs to be found in the class as the wheelbase and other dimensions are uniform throughout the different types, but will not be suitable for the ex ROD tenders. *Gerry Beale*

Bibliography:
1) Collett and Hawkesworth Locomotives, Brian Haresnape, Ian Allan, 1978.
2) A Pictorial Record of Great Western Engines, J.H.Russell, OPC, 1975.
3) Great Western Railway Journal, No.24, Autumn 1997, Wild Swan Publications. Article by John Copsey.

The driving wheels (G4862E) and (optional) plunger pick-ups (4M62) are required to complete the chassis and these are available from Alan Gibson.

GENERAL NOTES ON CONSTRUCTION

Read the instructions carefully - preferably more than once - before starting work. Study the diagrams until you become familiar with all the parts and the assembly sequence. We have tried to make these instructions as comprehensive as possible, which may make some assembly sequences appear more complex than they actually are.

Leave the parts in the fret until they are required for use. This will protect them and makes identification simpler. Small holes can be drilled more easily while the parts are still attached. Where an accurate hole size is specified, holes are etched undersized so they can be drilled or reamed out to the correct diameter.

We want you to enjoy building your kit, but remember that even railway modelling has its risks. Frets contain sharp edges, soldering irons get very hot, adhesives may give off toxic fumes, knives and files are designed for cutting. Please be careful . . .

ASSEMBLING THE CHASSIS

The chassis can be built rigid, or with full compensation so the wheels follow the undulations of the track. The latter involves more work, but gives better electrical pick-up.

Before you start clipping out any parts, identify the brake jig (shaded in the fret diagram) cut it from the main fret and set it aside to be used later. Any parts contained within the jig should be carefully removed and stored, but make sure you don’t accidentally clip off lugs 'N' (see Fig. 10).

Remove the frames (1 & 2) from the fret. Later, upgraded versions of the Bachmann model include a metal cab detail casting and, to use this, you'll need file away the half-etched areas 'A' from the back corners of the frames, shown in Figure 1.

Using flat-nosed pliers, fold over the spring backing pieces (3 x2) to make them double thickness (Fig.1) noting that, unlike most bending operations, the fold lines should be on the outside of the bend. To get these parts absolutely flat, gently tap them between two flat pieces of hardwood. Do the same for the handed double spring/ashpan assemblies (4 & 5) - watch how you go here, as it is easy to distort these parts - and then straighten them as necessary. Solder the backing pieces behind the front springs. Drill out the location holes 'B' in the spring/ashpan assemblies, and also in the chassis sides, then use short lengths of 0.4mm wire to locate the assemblies in place on the frames. Solder them in place, as above, noting that there should be a should be a gap between the ashpan and the frames. File the wires flush and clean off any excess solder.

For a rigid chassis, ream out all the axle bush locations in the chassis frames (1 & 2) and solder the 1/8in axle bush bearings in place.

If you're going to fit plunger pick-ups (Alan Gibson, ref. 4M62) open out the holes 'C' so the plastic outer sleeve of the pick-up is a tight push-fit.

For a compensated chassis, read all of the following carefully. To make the hornblock cutaways, carefully make a slot up the centre lines of the axle locations, taking care not to damage the springs. Use a cutter in your minidrill, a fine fret saw, or a needle file. Now bend the sides of these cuts back and forth, until the metal snaps off to form the rough cutaway shape. Dress up the sides with a file using the remainder of the half-etched marks as a guide. Don't file anything from the top horizontal edge of the slot - this is used to set the hornblocks at the correct height. Finally, use a 0.4mm bit to open out the datum holes (D).

For all types of chassis, select the spacers (parts 6 - 9) for the gauge in which you model. Open out the holes in the cylinder front face (6) and motion bracket (7) to suit the wires shown in Figure 4, and ream out the hole in the Firebox front (8) so a length of 1mm wire is a tight fit. Bend up and fit the front and rear spacers (6 & 9) noting that as you bend up the rear spacer, a small tab is formed at the rear (see also Fig. 3) which is used to fix the chassis under the body. Go on to fit spacer 7 (detail facing backwards) and then 8.

When all the spacers are in place, solder a length of 1mm wire into the Firebox Front - this will be the pivot for the floating gearbox - so 6mm of the wire protrudes from the rear face. Note that for a compensated 'OO' model (where the gearbox has to be narrowed and offset to the right of the loco) you'll need to make a 0.7mm dogleg in the wire, as shown in Figure 7. Bend down the end of the gearbox pivot bracket '10' (or 11 for 'OO' compensated) then open up the hole and slot this over the end of the wire, locating it in the spacer, as shown. Solder it in place in the spacer and then, for extra rigidity, solder the wire to the bracket along its length.

After bending it to shape, add the chassis locator (12) to the rear chassis spacer, slotting it in from the inside and securing it with solder. Ream out the hole in the drawbar anchor (13) so a piece of 1.6mm bar is a good fit. Do the same for the hole in the bottom of the rear spacer (9). If you model in OO or EM, you'll need to trim the anchor etch to width, to suit your chassis: for EM, trim the ends of the locator until the outermost half-etched marks just disappear; for OO trim the etches until the innermost marks are no longer visible. For P4, the part should be left as it is.

Manoeuvre the drawbar anchor into position, working from the inside of the chassis and slotting in into the frame at one side, then locate opposite end of the etch as you centralise it in the chassis. Make a final positional check by slotting a length of bar through the holes, and then solder the etch it in place and remove the bar.

Siderods
Refer to the fret diagram, and to Figure 6. Open out the holes in the rods (14 - 19) to suit the components shown in the diagram, and layer them up. Make the holes a tightish fit - you can always open them out a touch more later. Take the middle sections of the rods (14 x2 & 17 x2) and then add the inner and outer layers. Use the fret diagram to identify the parts, remove them from the fret in pairs and solder them to the middle layers, building one rod at a time to avoid confusion.

The rods have an articulated knuckle joint which uses a 0.8mm valve gear rivet as the pivot. For a smooth running chassis, it is essential that these rivets are a good fit in their holes. When the front and rear rod sections are assembled, lightly countersink the holes at the rear of the 'forks'. Put a small amount of oil on the 'tongue' of one of the front rods and slide this into place in the 'fork' on the rear rod. Slot a rivet through the assembly and, very carefully, secure in place by soldering it to the rear rod sections only. Finally, trim the rivet almost flush at the back. Check the joints pivot freely. Do the same for both sides.

Hornblocks
For a compensated chassis, bend up six hornblock etches, using the separate instructions supplied with them. When the units are fitted, the horizontal tab which protrudes from their front face (see Fig. 2) butts up against the top edge of the frame cutaways.

Before fitting the bearings into the etches, file off the circular boss from the back of the hornblock bearings for the front and rear axles - this will allow clearance for the slidebars and the gearbox. The middle bearings can be left as they are, or filed to match the others if you prefer.

Position a hornblock assembly at the middle driver location, making sure you include a 1/8in brass hornblock bearing, which should be lightly oiled to prevent it from being soldered to the etch. Use a short length of 0.4mm wire slotted through the axlebox datum holes ('D' in Figures 1 and 2) to locate it, check it sits vertically and then solder the etch in place. Position an etch and bearing at the opposite side, slot an axle through the bearings, adjust the etch so the axle it is at right angles to the frames and then solder the etch in place.

You'll need to trim a small amount from the leading edge of the front hornblock etches (see Fig. 2) so they clear the front spacer. Although the hornblock units can be assembled without any solder, it will make the job easier if you run a small amount between the layers of the hornblock etches. When you've trimmed the hornblock etches, use the coupling rods in conjunction with axle jigs, to position remaining pairs of hornblock assemblies (complete with lightly oiled bearings, as above) in the chassis and, after having made a final check that everything is as it should be, solder the etches in place.

Inside motion
The inside motion (shown in Figs. 3 - 5) is highly detailed and greatly enhances the model. If you wish, you can simplify things by using only the radius arms and slidebars (parts 20, 21, 26 & 27) and ignoring the other parts. This may be the most sensible option for OO models, as it's difficult to see between the narrower frames.

Bend up the slidebars (20 & 21 - these are handed parts) slot them through their locations in the spacers and solder them in place, making sure the cutaways are at the bottom and nearest the frames. If the bars are a bit tight in the slots, use a blade to remove the cusp from the edges of the bars.

Whilst still in the fret, drill out all the holes in the droplinks (22 -25), the radius arms (26 & 27) and connecting rods (28 & 29) to suit the wires shown in Figures 4 and 5. Make the 0.7mm holes a fairly loose fit, so a wire can pass easily through them.

Make sure both the small holes in the connecting rods are opened out to the correct diameter, manoeuvre one of them into position and then carefully locate the front end of the rod into the slots in the slidebars ('E' in Fig. 5) springing the bars gently apart to do this. Slot a length of 0.7mm wire through the holes 'F' in the frames, and use this to locate the rear end of the connecting rod and, after checking it runs parallel to the frames, solder the

rod into the slidebars. Now gently slide out the 0.7mm wire from the rear of the rod and then repeat the procedure for the second connecting rod, then remove the support wire.

Noting that the two sides are different, use short L-shaped lengths of 0.5mm wire to locate the droplink and radius arm parts together. Solder them up to make a pair of valve gear assemblies and then trim the wires just proud of the etches to represent the pivots.

Refer to Figures 1and 4. Locate the ends of the valve gear assemblies in the outer (smallest) holes near the centre of the motion bracket. As you hold them in place, slot a length of 1mm wire through the reverser shaft holes 'G' in the frames and use this to hold the valve gear assemblies in place. Solder only the shaft in place in the frames - the valve gear assemblies must be free at this stage - and trim the ends of the shaft very slightly proud of the frames. Now slot a length of 0.7mm wire through holes 'F', and through the assemblies and the rear of the conn rods. Make any necessary adjustments to the parts, so the they lie vertically and run parallel to the chassis, and then solder them onto the support wire and the reverser shaft.

Bend the end of the slidebar top layers (30 x2) to shape, and solder them in place (Fig 5). Use a length of 0.5mm wire to locate the crosshead details (31 x2) on the slidebars and connecting rod ends, noting that the pin is slightly offset towards the front. You can solder or glue this part in place, and then trim the wire almost flush at the front of the crosshead.

For the valve spindles, slot lengths of 0.8mm wire through the front spacer, into the holes in the motion bracket, and solder in place. Because of the width (or lack of) these have been omitted for OO gauge engines. Finish off the valve gear by adding the piston rods, which can be represented using 2 lengths of the same wire, pushed through the front spacer with the ends located in the notches in the crossheads,. The easiest way to do this is to use longish lengths of wire, which will enable you to manoeuvre into position before soldering them in place. When they're secured, use a burr to cut off the excess length, so the ends are more or less flush with the front face of the spacer.

Refer back to Figure 1. Slot the tabs on the front and rear footplate supports (32 x2 & 33 x2) through their locations in the chassis and then bend the tabs protruding from the inside thought 90 degrees, so they nip the supports in place. Tweak the supports, so that are vertical and square and then solder them to the frames at the front and back. Now fit the middle supports brackets (34 x2) which is a trickier job as the brackets need to be held in place as you solder them in position. Slide the handed front bufferbeam braces (35 & 36) into the chassis slots, and then add the front brace details (37 x2) to the chassis. Using the fold-up tabs on the backs of the braces, nip the parts together and tight against the frames, adjust them as necessary, and when everything is straight and square, solder the bits to the frames.

Bend the ends of the vacuum pump body (38) through 90 degrees and then cut a length of 1.6mm OD tube, so it's a snug fit between the ends. Use a length of 0.8mm wire to locate the tube, slotting the wire through the ends and through tube, as shown, then solder the parts together leaving about 5mm of the wire proud at the right of the assembly. Now slot the tab on the pump top (39) into the location in the body, solder it in place, then trim off the excess tab flush at the rear of the plate. Bend the small lugs on the rear of the pump assembly up through 90 degrees and then use these to locate the finished pump on the inside face at the left hand frame, slotting the protruding 0.8mm wire through the motion bracket as you do so.

Compensation

If you’re building a compensated chassis, bend the small cantilever tab 'H' in the front spacer (6) down through 90 degrees. Slot a 9mm length of 1mm diameter silver steel rod through the holes in the tabs and spacer, so the end of the rod stops about 1mm beyond the centreline of the front hornblock - this will be the pivot for the front wheels. When in place, the rod should be more or less horizontal.

To fit the compensation beams, cut 2 lengths of 1.6mm O.D. tube, so they fit snugly between the frames, but without being tight. Ream out the central hole in the compensation beams (40 x2) so the tube is a good fit, and then open out the beam pivot wire hole 'H' in the frames to 0.8mm diameter.

Position the beams 1mm from the edge of the tubes, and solder them in place to make a handed pair. Manoeuvre the assemblies into position, so the 'feet sit on top of the brass hornblocks - this is illustrated in the cutaway view in Figure 3 - and then slot a length of 0.8mm wire through the holes (‘J’ in Fig. 1) in the chassis, and through the tubes. Check the beams pivot freely - if they don't, look for obstructions: tabs or wires which may be protruding inside the frames; if the beams are catching on the hornblock etches or the sides of the slot in the firebox front spacer. Ensure that the beams sit parallel to the frame sides. It's essential that the beams and hornblocks work correctly together, in a smooth see-saw motion with no tight spots.

Detailing the structure
If you have a rivet press, carefully punch out the rivet detail in the railguards (41 & 42). Solder the guards in place at the front end of the frames, as shown in the diagram, make the 45 degree bends and then strengthen these with a small amount of solder. Use a 0.5mm bit to pre-drill the holes at the bottom of the front sandboxes (43 & 44) and secure them to the frames.

Open out the holes in the brakeshaft mount (45), to suit the wire and bar shown in Figure 1. Assemble the steambrake lever halves (46 & 47) using a short length of wire 0.5mm to locate the parts together. Trim this wire almost flush at both sides, to represent the pin, and then open out the larger hole, as above. Using flat-nosed pliers, fold up the sides of the mount and locate the small stab on the steambrake lever assembly into the base of the mount. Hold the lever assembly in place and slide a piece of 1.6mm diameter bar, cut to 7.2mm in length, through the larger holes in both the lever and the sides of the mount, as shown. Line everything up, so the lever is central and runs parallel to the sides of the mount, and solder the bar to the etches. Trim the ends of the bar so they are just proud of the etches. Try the unit in place, locating the tabs in the underside of the rear chassis spacer and, after checking it's sitting fully home, solder the assembly in place.

Offer up the chassis to the body, clipping the small protruding tab at the rear of the chassis into the slot in the bufferbeam, then swinging up the front end, as shown in Figure 3. Make sure the body sits fully down on the chassis and, if necessary, make adjustments then remove the body.

Fitting the boiler
The later, re-worked versions of the Bachmann model have a separate metal boiler section. As well as being painted and lined to match the existing boiler, it also adds much-needed weight. If you wish to use this, then you'll need to trim about 3.5mm from the height of the front rectangular section of the boiler (the bit that fits inside the smokebox) so, when the chassis is fitted and pushed fully home, the bottom edge of the casting just touches the top face of the front chassis spacer '6'.

These newer models also include a cast metal cab detail insert which you will need to modify slightly. First of all, remove the mounting bolt column from the underside of the casting, then go on to file away the two ribs - these run along the bottom of the casting - until they are flush with the existing central, flat area (see Fig. 15). Continue to open up this area at the same depth, until the width of the opening is slightly more than the overall width of the chassis - don't worry if you make it too wide as it will not be seen. Ensure the backhead casting is free from flash, so if fits snugly up into the top of the cab opening.

For older models (where the boiler is part of the RTR chassis), or as an alternative to the Bachmann cast boiler, you can use the High Level boiler casting (48). This has the advantage being able to be integrated closely with the chassis, so there are no visible gaps. Of course, you will have to paint it and it is also advisable to add extra weight to the boiler cavity. Try the casting in place - the vertical faces at the front and rear of the casting should fit snugly between the inside faces of the saddle and firebox, as shown in Figure 12. Push the casting into position, until the flat side edges of the boiler barrel 'K' just disappear, and the curve runs smoothly into that of the existing plastic boiler. Make sure the boiler casting is pushed fully forward, so that the side cheeks 'L' butt hard up against the rear face of the smokebox, where it meets the saddle (see Fig 13). When correctly fitted, the bottom surface of the boiler should be horizontal.

Refit the chassis and check the relationship between the front and rear faces of the boiler casting, and the chassis spacers 6 and 8. The tops of the spacers should sit in the small recesses in the casting, as illustrated in Figure 13. When all is well, refit the boiler, this time gluing it in place with epoxy. Before the glue sets fully, try the chassis in place again and make any necessary adjustments to the position of the boiler casting, then allow the adhesive to cure.

For both older and more recent models you can go on to fit chassis mounting plate (49 in Fig. 11). Fold up the sides of this part and solder an M2 nut into the recess, making sure no solder gets into the thread. Use Epoxy to glue the plate in place inside the smokebox - it should sit level, with its front edge butted up against the front, inside face of the smokebox. Refit the chassis and check that the hole in the front chassis mount lines up with the corresponding hole in the front spacer, then carefully remove the chassis and allow the glue to set.

Setting up the chassis
The plastic body has thick moulded splashers and to get proprietary wheels (with their oversell bacon-slicer flanges) to fit inside them, both the new and old RTR models have noticeably underscale wheels. To compensate for the smaller wheel diameter the buffers mounted further up the beams.

Our model is designed around correct-diameter wheels but, of course, we still have to consider the reduced clearances inside the splashers. In P4, with scale-size flanges, the manufacturer's compromise still leaves adequate clearance for the wheelsets to tilt and move vertically in their hornblocks. In EM, flanges are more

generous, so if you're building a compensated chassis you **may** need to add approximately 0.25mm of packing between body and chassis (as flange sizes varies between makes, some experimentation may be necessary). Even so, the increase in overall height is less then a scale inch; if this offends, try thinning down the splasher tops with a router. A rigid EM chassis shouldn't need any packing.

Try the body in place, this time fixing it in place at the front using an M2 bolt, trimmed so its total length is 8mm (Fig 1). To raise the body height, you can use a small amount of plastic sheet, of suitable thickness, glued to the underside of the footplate where it touches the chassis top. You'll also need to file a corresponding amount from the top edge of the chassis locator slot in the rear bufferbeam, then pack the lower edge of the slot with the same material as above.

Temporarily fit the driving wheels, including any washers that may be necessary to eliminate sideplay. Try pushing the chassis around your curves, to see how much sideplay you actually need - this applies to both rigid and compensated chassis. In OO and EM gauges, we've allowed for up to 0.5mm sideplay (total 1mm) on the middle axle. For P4, the sideplay should be no more than 0.3mm either side. If the chassis still won't go around your curves, allow a small amount of sideplay at the outer axles.

For a rigid chassis, the ride height and levels shouldn't really need adjusting. If you're building a compensated chassis, then you may need to make some very fine adjustments. You can alter the height at the back of the loco, either by filing the ends of the compensation beam, or by attaching a small amount of packing onto the tops of the hornblock bearings.

The front end of the loco can be raised or lowered, simply by tweaking the end of the silver steel pivot rod. It may be wise to refit the body at this stage, so you can check the overall levels.. When the chassis sits level, trim the compensation beam pivot wire to length (to the same overall width as the chassis) and then fix it into the frame with a small amount of glue at one end only. Make sure the glue doesn’t penetrate into the tube.

With the correct-sized wheels fitted (as opposed to the undersized originals - see above) you may notice that the buffer height is too high. This can be easily rectified by fitting a set of sprung buffers, correctly positioned, so the flanges are level with bottom of the bufferbeam

Brakegear assembly
This method of assembly creates a set of brakegear that is fully removable, as well as totally prototypical in appearance. Do not solder anything until the instructions specifically say so. Figure 3 shows the how the completed brakegear assembly integrates with the chassis.

Before removing any parts from the fret, note that the handed pairs, parts 56, 57 & 59, 60 are almost identical, but are not interchangeable, so in order to avoid confusion, parts 56 and 57 have small marker dot on their back face. Proceed to remove the brake rods, stretchers and brake rod end details (50 - 60) from the fret, identifying each one as you do so. Cut three 40mm lengths of 0.5mm diameter wire, bend the first 5mm of one end through 90 degrees and file a point at the opposite end of the wire.

Slot a handed pair of leading rod, front end details (50x 2 & 51 x2) onto the front brake stretcher (52) noting that the forward edge of the stretcher is marked with a small dot. Follow up with the front ends of the leading brake rods (53 x2) then add the second handed pair of details to the outsides. Make sure all parts are facing the right way. Move the parts along the stretcher until the ends of the brake rods snap into small notches 'M' then push the pointed end of an L-shaped length of wire along the groove in the stretcher, and through the semi-circular locations at the bottom of the various parts. Twist the wire as you go to ease fitting and, if it's too tight, run a drill through the locations to open them slightly. Concentrate on getting the rod ends correctly positioned in the notches, but don't worry too much about the details as they can be put right later.

Slot the front ends of the trailing brakerods (54 x2) onto the midway stretcher (55) then slew the rear ends of the leading brake rods (still attached to the front stretcher) over the outsides of the midway stretcher, before adding the leading brake rod's rear details (56 & 57) to the outsides. Manoeuvre the rear ends of the trailing brake rods over the rear stretcher (58) along with the trailing brake rod's rear details (59 & 60)

A brake building jig is provided to ensure that the finished brake rod assembly is square, straight and dimensionally correct. Take the brake jig (which you've previously removed from the fret) and fold up the crosswire anchors 'N', as show in Figure 10. Carefully pull the front crosswire out from the stretcher, twisting the wire as you go, and then position the stretcher between the sides of the jig, at the front location. Push the wire through the jig at one side, through the front stretcher and rod parts, and then out through the other side of the jig.

Now pull the midway crosswires out, and swing the whole assembly down between the sides of the jig. Slide the crosswire through the jig and stretcher at the middle location, just as you did for the front stretcher, then go on to repeat this process for the rear, so that all crosswires run through the jig and stretchers, as shown in Figure 10.

Once the parts are locked in the jig, you can line them up accurately. Push the stretchers to one side - it doesn't matter which - so they butt up against one of the inside edges of the jig . Run a straight edge along the opposite side to check alignment. Check the ends of the brake rods are located in their notches 'M', adjust as necessary then, after re-checking the alignment of the stretchers, carefully tack the ends of the rods in place using small amounts of solder. Slide the various rod details hard up to the rod ends and solder these in place, then invert the jig and solder the wires into the grooves in the stretchers, taking care not to solder anything to the sides of the jig. The whole assembly should now be pretty solid so you can cut the jig at the front and rear, which will allow you to slide it away from the ends of the stretcher wires.

To complete the brake rod assembly, you'll need to fit the adjuster rods (61 x2). First, solder the cant (62 x2) and the adjuster rod end (63 & 64) details to the sides of the rods, so you have a handed pair. Working on a flat, heat-proof surface, hook the front ends of the rods into their locations in the rear stretcher and, after making sure they are sitting fully down, solder them in place - be quick with the heat so you don't disturb of any of the other parts. The optional brake link details (65 x2) can now be added using either glue, of a tiny amount of solder. The brake rod assembly is now ready to fit.

Now turn your attention to the brake hangers in Figure 1. These have small folding tabs at the tops of the front layers (parts 66 x3 & 67 x3) which spaces them the correct distance from the frames. For P4 wheels, which are narrower than OO/EM, the small pieces 'P' will need to be filed off.

Take one of the brake hanger front layers (66 x3 & 67 x3) and carefully make the bend at the top. Use a short length of 0.5mm wire, pushed through the middle holes, to locate the brake hanger rear layer (68 x6) onto the front, then solder them together and trim the wire flush at the both sides. Repeat this process for all the hangers, so you have three handed pairs, and then check the top and bottom holes are free from solder.

If you wish, add the very small (and optional) hanger pivot details (69 x6) to the tops of the hangers.

Clean out any excess solder, from the rear, inside corners of the webs which are attached to the chassis. You can also file a small chamfer the leading edge of the spacer tabs, to allow the hangers to sit right into the corners of the webs, hard up against the frames. Once you've cleaned up all of the above brakegear assemblies, they are ready to be fitted to the chassis.

Offer the brake rod assembly up to the underside of the chassis (the wires on the stretchers should be on the underside). Line up the holes at the ends of the brake adjuster rods with those in the ends of the brake levers, then slide a wire thought to keep them in place.

Slide a length of 0.5mm wire into the hanger pivot 'Q' at the front wheel location - do not solder in place. Now swing the whole pull rod assembly up and slip the bottom ends of a handed pair of brake hangers assemblies over the wires on the brake front brake stretcher, whilst also locating the top of the hangers on the wire at the hanger pivot 'P'. Push the hangers hard up against the frames and then, as you hold them in place, carefully solder the bottoms to the stretchers. Trim the wire at the top and bottom of the hangers, so it is very slightly proud at both sides - again, do not solder the top wire in place.

Do the same at the rear brake hanger locations. For the middle hangers, solder short lengths of 0.5mm wire into the tops of the hangers, using generous amounts of solder, and trim them so they protrude by about 0.5mm from beyond the innermost edge at the top of the spacer tab. Trim the wires very slightly proud at the outsides and then remove any burrs from the inner ends. Fit the middle hangers to the chassis, as above, soldering them to the stretchers only.

Set the loco down and view the brakegear, paying particular attention to the clearances between the shoes and the wheels - the length of the brake rods should set the hangers at more or less the correct distance from the wheels. Remove the brakegear by pulling the wire out from the rear end of the brake rods, sliding out the loose wire from the tops of the front and rear hangers and then gently spring the middle hangers outwards.

With the brakegear assembly removed, slot a continuous length of 0.5mm wire through the tops of the rear brake hangers, so it bridges between the two sides, and solder it in place using generous amounts of solder. Trim this wire almost flush with the outside face of the hangers, then carefully cut away the middle section (this is to provide clearance for the gearbox. Trim the inside ends of the wires so they match the middle hangers (see above).

All that remains is to trim the wire at the brake levers (part 45). Do this in the same way as you did for the wires at the tops of the rear hangers, bridging across, then trimming the ends so they are almost flush at the outsides, with about 0.7mm protruding at the insides. If you need to reposition any of the joints (if they move or bend) then it's best to refit the brakegear into the chassis before making any adjustments.

When the brakegear is off, remove the wheels and use epoxy to attach the balance weights (70 x4 & 71 x2) making sure the half-etched grooves are nearest the wheels, and that the etches lie flat and don't foul the rods. Note the position of the middle balance weights (illustrated in Figures. 1, 13 &14) which, relative to the crankpins, is different at either side.

Invert the loco and slot lengths of 0.4mm wire into the pre-drilled holes in the front sandboxes. Shape the wire so it runs down to the wheels, as illustrated in Figure. 13. Check the brakegear can be removed without the pipes getting in the way.

When you come to refit the brakegear, carefully spring the middle and rear brake hangers outwards as you manoeuvre it up into position, so the top wires clip into their locations. As it do this, you'll also need to spring the rear ends of the adjuster rods inwards, which will allow you to slot them over the pins in the brake levers. Finally, slide a long wire through the hangers at the front to secure them.

Gearbox assembly

Study Figure 7. Before cutting the gearbox etch (72) from the fret, progressively drill out or ream each of the holes to accommodate the shafts and bushes, shown in the diagram. Components should be offered up until they are a tight push-fit in their holes. Once the gearbox is assembled, the shafts are fixed but the gears are free to revolve. Remove burrs by inserting the tip of a drill bit (of much larger diameter than the hole) and gently rotating it between your fingers.

If you're modelling in OO ***and*** you intend to compensated the loco, then the standard gearbox will need to be modified so it fits between the hornblocks. To do this, remove area 'R', by cutting through the small tabs 'S' and then bending the etch back and forth until it snaps away. Now proceed as below, using what's left of the gearbox.

Solder the 1/8in bushes into place with the larger-diameter shoulders on the same side of the etch as bend lines. Using flat-nosed pliers to prevent the thin sections from buckling, bend the gearbox shell to shape, as indicated - a three-sided box with all bend lines on the inside of the gearbox - and then strengthen the inside corners with fillets of solder. Carefully file equal amounts from the non-shouldered face of the bushes to length, so the gearbox shell fits between the bearings in the frames. For hornblocks, be sure to allow enough clearance for the hornblock to slide freely.

For OO compensated models, bend up the OO gearbox dogleg (73) add an axle bush to it and file the shoulder on the bush flush, as above. Solder this assembly securely in place (see Fig. 8) using an axle to align it.

Solder the stage one spacer (74) into its location, using a length of gearshaft to position it and file off the protruding tab flush at the rear, so the motor mounting plate is smooth. Bend over the small anchor tab 'T' and strengthen with solder, as above, and then open up the hole in the tab, so a 1mm wire is a good fit. Add the gearbox pivot re-enforcement (75) to the outer face of the hole, as shown.

Using a carborundum disc in a mini-drill, cut the 2mm gearshaft, so its length equals the overall width of the gearbox. Wear effective eye protection – cutting discs can and do disintegrate if they snag. Remove any burrs with a fine file. Offer up the shaft to its location. Because it's a tight fit, you will only be able to pass it through both sides of the gearbox if it is truly square. If it won't go through, then the gearbox hasn't been folded accurately. Light finger-tweaking should put things right.

De-flux the gearbox by scrubbing with household cleaner, then rinse and allow to dry. Check that the gears themselves are free from any dust or swarf left over from manufacture. Cut a length of insulated wire into two equal lengths and solder to the motor brush tags. Insulate the terminals with tape. For testing, connect the other ends to the output leads of your controller.

The stage 1 double gear will be one of three types - 15/10T (30:1), 20/10T (40:1) or 27/10T (54:1) - depending on the overall reduction ratio of the gearbox. Fit the stage 1 gearshaft and the double gear (according to ratio) then temporarily fit the axle, along with the brass 20T. gear and check that the gears revolve smoothly.

Some brass worms supplied to us are fractionally tighter than others and if they aren't an easy push-fit, they can be gently forced onto the shaft in a vice. Hold the motor by the rear of the shaft and don't use excessive force or the shaft may bend. Instead, use a broach to ease the fit of the worm and then, if necessary, secure the brass worm with a small drop of Loctite 601 at the outer end of the motor shaft.

Fit the worm onto the motor shaft (at the mounting screw end) so it's mid-point is about 6mm from the motor face (i.e. - so the worm lines up with the stage 1 gearshaft when the motor is fitted into the gearbox). Sight through the opening in the gearbox sides to check the mesh with the worm - there should be daylight between the gear and the worm, but avoid having too much backlash. If necessary, loosen the motor fixing screws, adjust the mesh and then lightly glue the shaft in place at both ends. Now test the gearbox under power and then, when all is well, remove the driven axle and brass gear.

The gears are effectively self-lubricating but a little plastics-compatible grease will do no harm. Do not use general-purpose modelling oil, which attracts dust and grit. Metal-on-metal contact areas (motor bearings, axle bushes) should be lubricated with a tiny amount of ultra-adhesive oil, but don't use this until the final drive gear has been secured in place (see below) .

Final assembly.
Refer to Figures 3 and 6. Slide the anchor lug 'T' on the gearbox over the wire that protrudes from the midway spacer, and position the motor/gearbox unit so it sits between the rear axle bushes or hornblocks. Slot the driven axle through the frames and gearbox, slipping on the final drive gear as you go.

The kit includes axle washers of varying thicknesses, which can be used to limit axle sideplay. Fit all the wheelsets, complete with crankpins, and quarter the wheels, - the right hand cranks lead by 90 degrees. Now add the bushes to the crankpins, followed by the coupling rods, and check for free running before fitting the securing nuts.

Push the chassis along the track - it should freewheel smoothly - then fit the body and check the rods don't catch anything. Give the motor a quick burst of power, just to check it's not binding on anything, and then secure the final drive gear using a small amount of Loctite before testing the loco under power on your track. Once you're happy with the way it runs, remove the body and refit the brakegear, as described previously, then fit the body for the final time, securing it with the single M2 bolt provided.

Fitting the Drawbar
The drawbar is designed to pivot a both ends, which will allow closer coupling of the tender. To fit the drawbar, first, layer up the drawbar halves (76 x2) then slot this drawbar assembly through the rear spacer, as shown in Figure 1. Solder the drawbar pin head (77) onto the end of a short length of 1.6mm bar, and then slot this pin assembly downwards through the drawbar, into the drawbar anchor (part 13 in Figure 1) and locate the end of the pin in the hole in the rear chassis spacer. Figure 3 shows the drawbar fitted to the chassis.

Depending on which holes in the drawbar you use, you can vary the spacing between the loco and tender to suit your curves. With our own High Level Tender Chassis (where the drawbar pin in situated approximately 2.5mm from the tender bufferbeam face) holes 'B' and '2' (see Fig. 1) give a spacing of 4mm between the loco and tender bufferbeams. Taking this distance 'B2' as a datum (or zero) the table below shows how to vary the spacing, by using different combinations of holes in the drawbar.

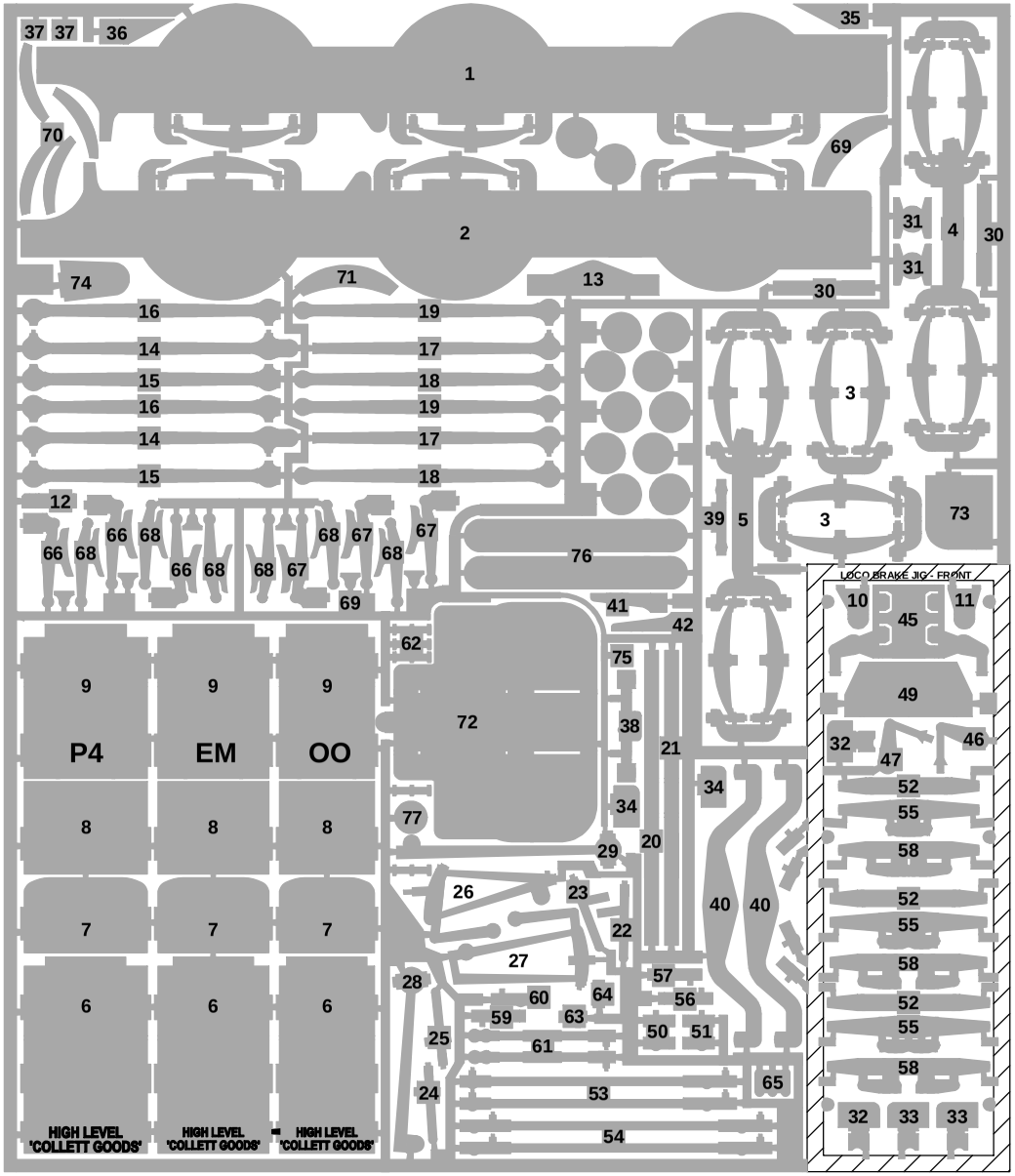
Holes	A1	A2	A3	A4	B1	B2	B3	B4
Spacing	-5	-3	-1	+1	-2	DATUM	+2	+4

Example: if you try B2 and decide you want to decrease the spacing by 1mm (from 4mm to 3mm), then use holes A and 3; to increase the distance by 1mm, use A4.

After deciding on the drawbar pivot centres, trim the drawbar to length so your chosen holes are outermost. For tighter curves, you may find that reversing with a heavy train can cause the tender to derail. If this happens, it may help if you fix the drawbar, so it is solid with the loco and pivots only at the tender end.

Once the body is fitted, the cab floor should prevent the drawbar pin from coming loose, but you can always secure it into the spacer using a tiny amount of glue. The rear end of the drawbar is designed to slot over a 1mm diameter pin on the tender, and for this we recommend using a length of 1mm silver steel, which can be glued into a hole drilled into the underside of the tender footplate area.

CHASSIS KIT FOR COLLETT GOODS



PARTS LIST

1. Chassis Frame LHS
2. Chassis Frame - RHS
3. Spring Backing Pieces x2
4. Spring/Ashpan Assembly - LHS
5. Spring/Ashpan Assembly - RHS
6. Front Spacer
7. Motion Bracket
8. Firebox Front
9. Rear Spacer
10. Gearbox Pivot Bracket - Straight
11. Gearbox Pivot Bracket - Offset
12. Chassis Locator
13. Drawbar Anchor
14. Front Coupling Rod, Middle Layer (x2)
15. Front Coupling Rod, Inner Right, Outer Left (x2)
16. Front Coupling Rod, Inner Left, Outer Right (x2)
17. Rear Coupling Rod, Middle Layer (x2)
18. Rear Coupling Rod, Outer Left, Inner Right (x2)
19. Rear Coupling Rod, Inner Left, Outer Right (x2)
20. Slidebars - LHS
21. Slidebars - RHS
22. Droplink - LHS Outer
23. Droplink - LHS Inner
24. Droplink - RHS Outer
25. Droplink - RHS Inner
26. Radius Arm - LHS
27. Radius Arm - RHS
28. Conn Rod - LHS
29. Conn Rod - RHS
30. Slidebar Top Layers (x2)
31. Crosshead Details (x2)
32. Front/Rear Footplate Support - LHS
33. Front/Rear Footplate Support - RHS
34. Midway Footplate Supports x2
35. Bufferbeam Brace LHS
36. Bufferbeam Brace - RHS
37. Bufferbem Brace Detail x2
38. Vacuum Pump Body
39. Vacuum Pump Top
40. Compensation Beams
41. Railguard - LHS
42. Railguard - RHS
43. Front Sandbox - LHS
44. Front Sandbox - RHS
45. Brakeshaft Mount
46. Steambrake Lever Halve - LHS
47. Steambrake Lever Halve - RHS
48. Boiler Casting
49. Chassis Mounting Plate
50. Leading Brake Rod Detail, Front, left outer & right inner x 2
51. Leading Brake Rod Detail, Front, right inner & left outer x 2
52. Front Brake Stretcher
53. Leading Brake Rods x 2
54. Trailing Brake Rods x 2
55. Midway Brake Stretcher
56. Leading Rod Detail, Rear - LHS
57. Leading Rod Detail, Rear - RHS
58. Rear Brake Stretcher
59. Trailing Rod Detail, Rear- LHS
60. Trailing Rod Detail, Rear -RHS
61. Adjuster Rod x 2
62. Adjuster Rod Cant x 2
63. Adjuster Rod Detail - LHS
64. Adjuster Rod Detail - RHS
65. Brake Link Detail x2
66. Brake Hanger Front Layer - LHS x 3
67. Brake Hanger Front Layers - RHS x 3
68. Brake Hanger Rear Layer x 6
69. Hanger Pivot Detail x6
70. Balance Weight - Front and Rear x 4
71. Balance Weight - Middle x 2
72. Gearbox
73. Gearbox Dogleg
74. Stage One Spacer
75. Gearbox Pivot Re-enforcement
76. Drawbar Halve x 2
77. Drawbar Pin Head

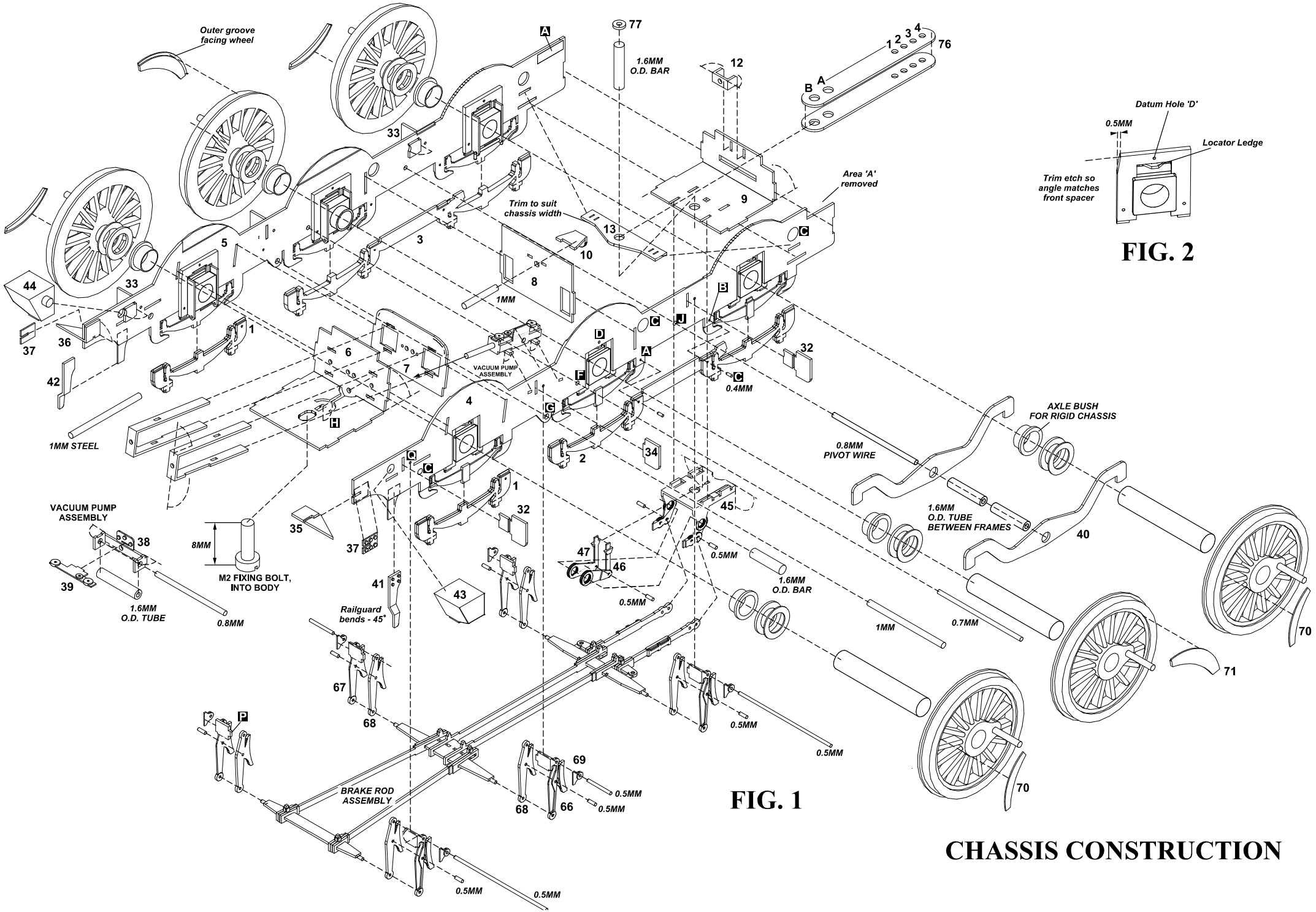


FIG. 2

FIG. 1

CHASSIS CONSTRUCTION

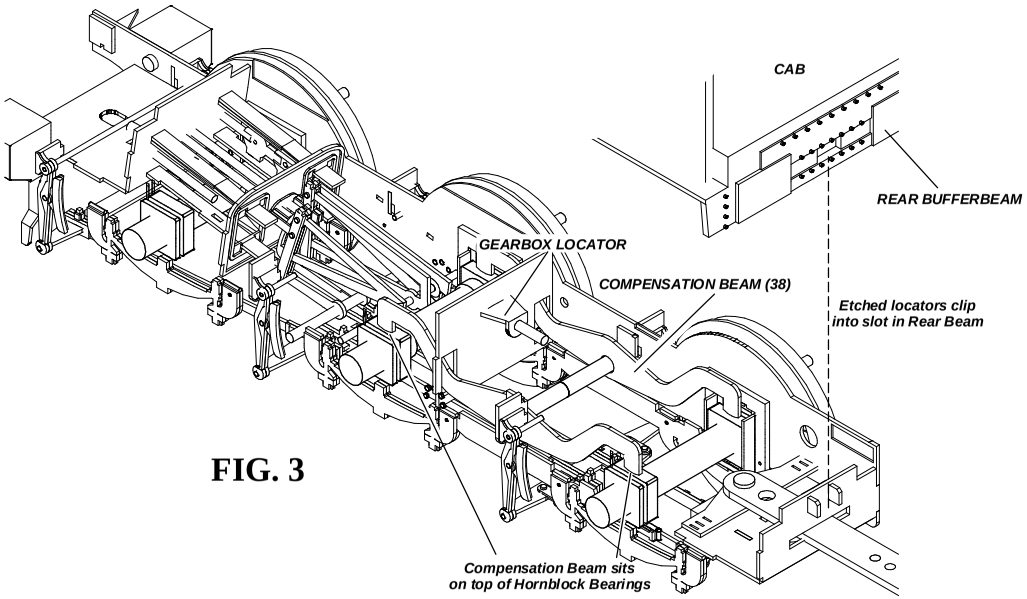


FIG. 3

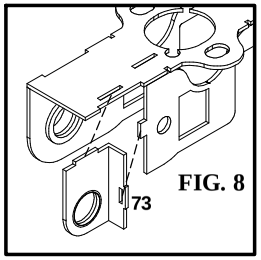


FIG. 8

FIG. 7

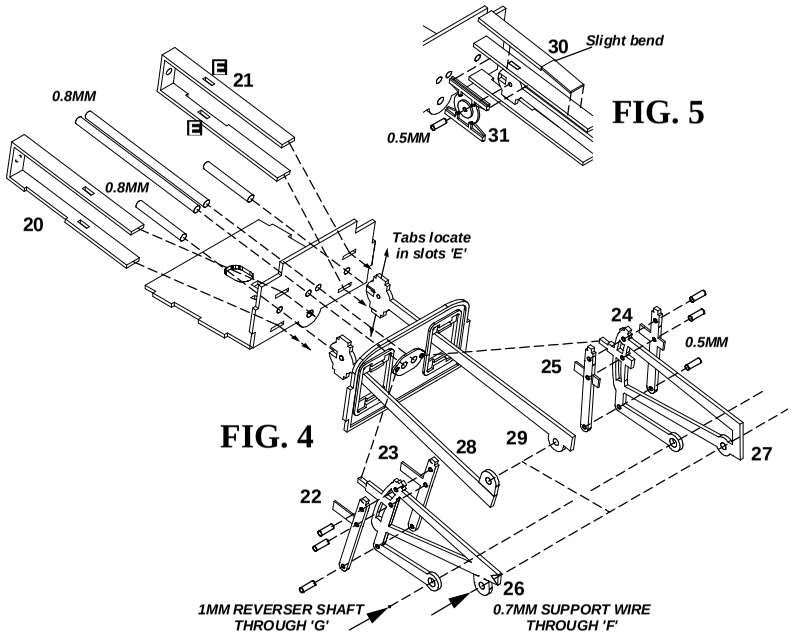


FIG. 4

FIG. 5

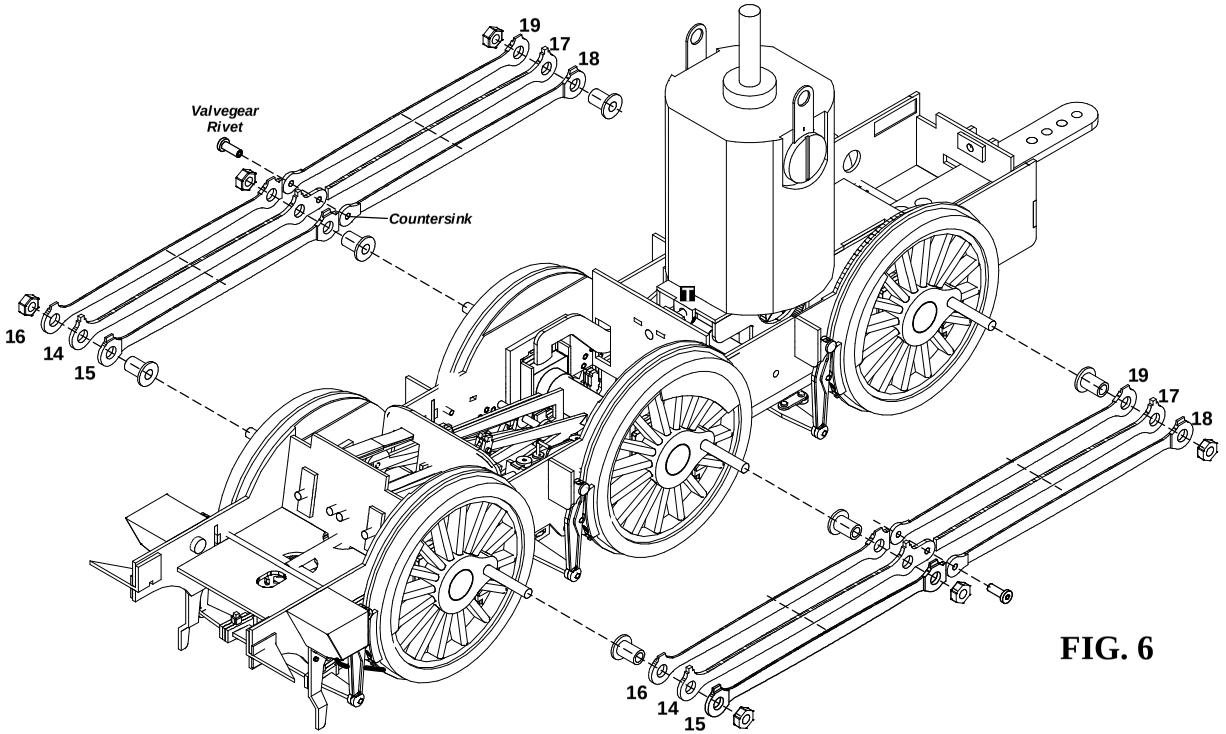


FIG. 6

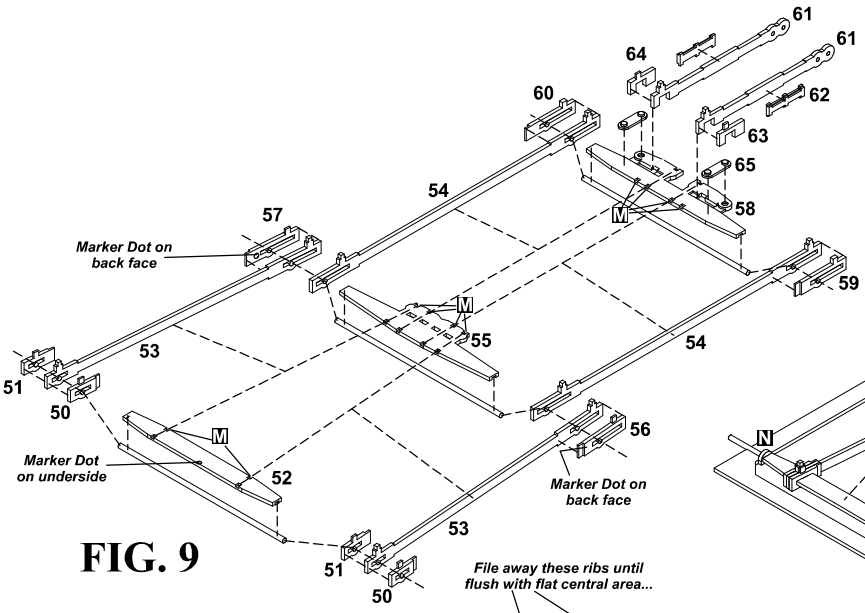


FIG. 9

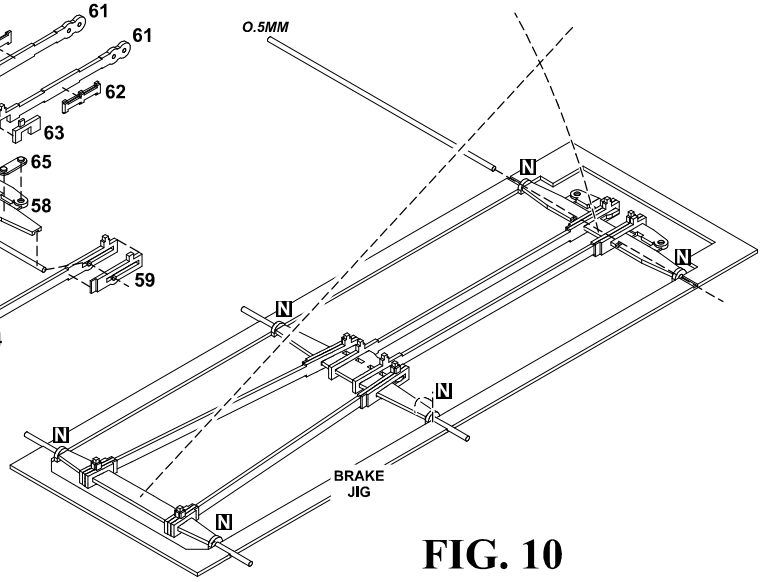


FIG. 10

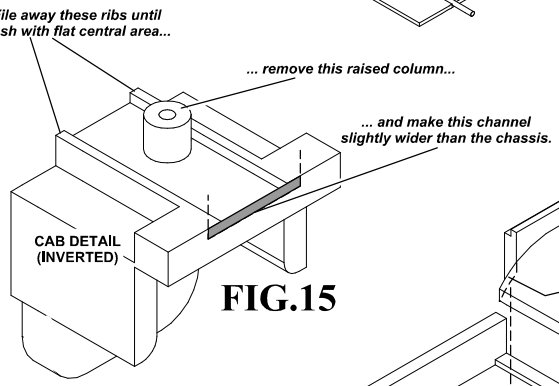


FIG.15

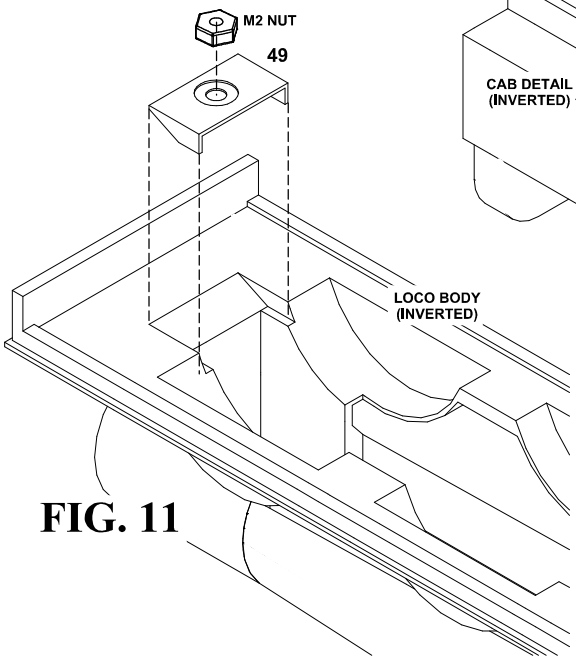


FIG. 11

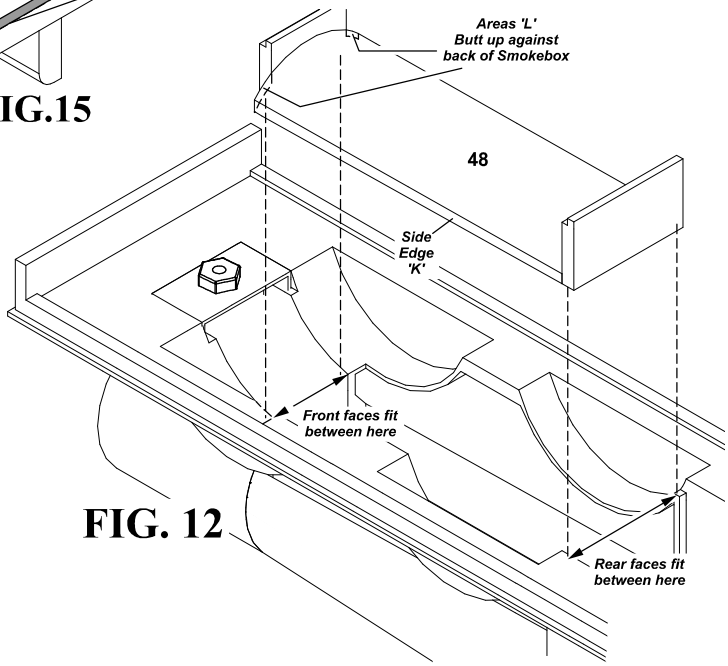


FIG. 12

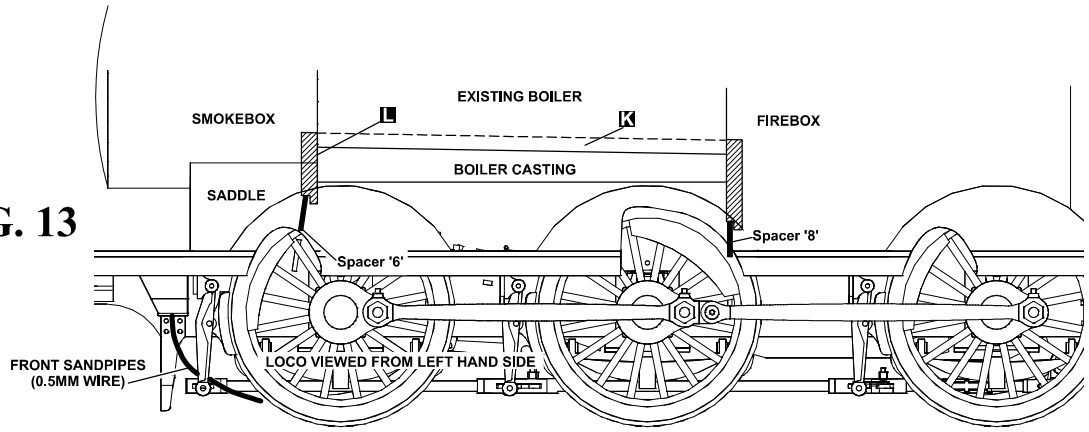


FIG. 13

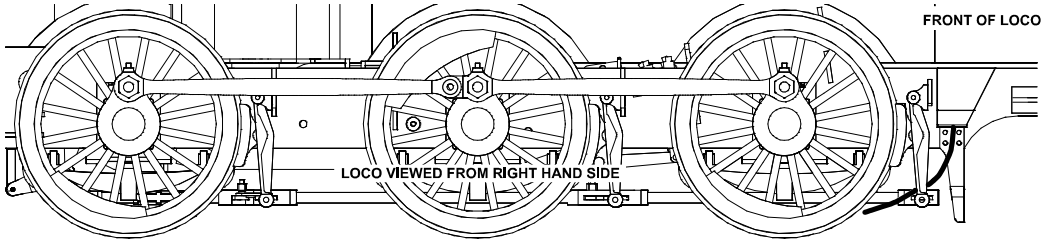


FIG. 14

HIGH LEVEL

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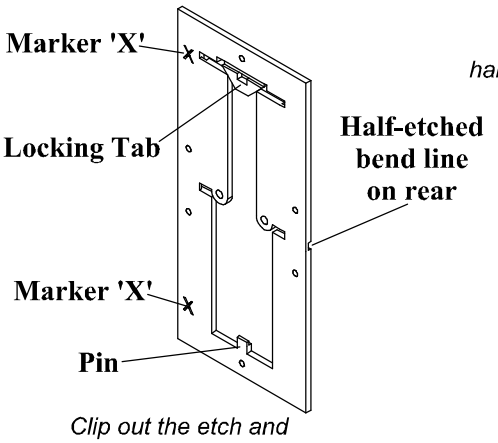
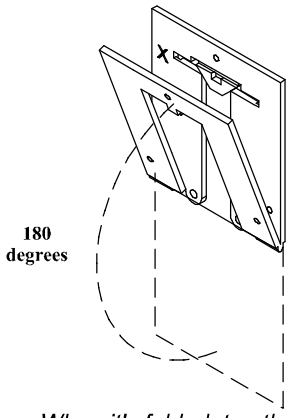


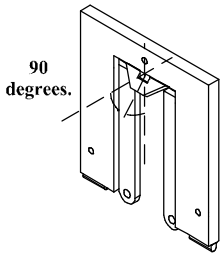
Clip out the etch and clean off any mounting tabs.

Fold the etch through 180 degrees, so the markers 'X' face each other. The half-etched line is on the outside of the fold.

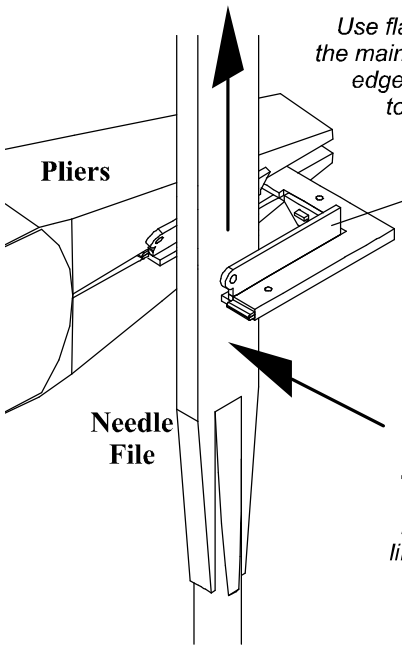


When it's folded, tap the layers between two pieces of hardwood, so they sit absolutely flat.

Hold the layers tightly together and fold the locking tab through 90 degrees, so it locates on the small pin.

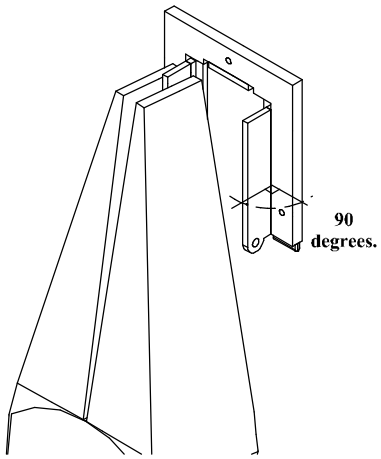


The end of a flat, pointed needle file is a good tool for this job. The tab locks the layers together, eliminating the need for solder.



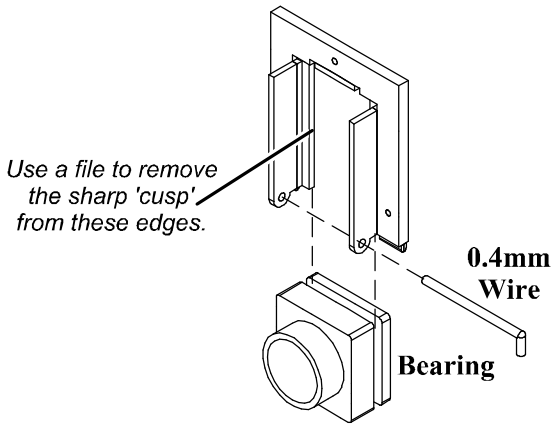
Use flat nose pliers to grip the main etch,with the straight edge of the pliers close to the bend line.

Bend the horncheeks up through about 80 degrees, using a flat needle file to apply upward and sideways pressure simultaneously. In this case, the half-etched line is on the inside of the fold



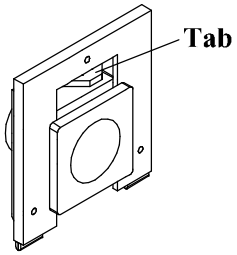
Finish off the horncheek bends so they are at 90 degrees. Check this through a magnifying glass and adjust as necessary.

Use fine emery to clean up the bearing, remove any burrs and then try it in place - the groove on the block locates on the front layer of the etches.



When the bearing is fitted, slot a length of 0.4mm wire through the bottom holes to keep it in place.

The completed assembly can now be soldered to the inside face of the chassis, using axle jigs. If you fit it with the bearing in place,make sure the sliding surfaces are lightly oiled, to prevent the bearing being soldered to the etch.



The tab is designed to sit exactly 4mm above the axle centre line, with the loco on level track. The top edge of the cut-outs on most chassis is also 4mm above the axle centre, so the tab can be butted against the top of the cut-out to set the unit at the correct height.

HIGH LEVEL, 14 TUDOR ROAD, CHESTER-LE-STREET, CO. DURHAM, DH3 3RY.
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