Chassis Kit GWR 5700/8750 'Pannier'

This kit is designed to fit the Mainline/Replica/Bachmann pannier tank bodies, both in their original flat-roof and later round-cab versions. Only very simple modifications to the RTR body are required although you can, of course, add as much extra detail to it as you wish to bring it up to the standard of the new chassis. Iain Rice has written articles on detailing and upgrading the RTR model (see 'The Ubiquitous Pannier' in *Model Railway Journal* Nos. 61 and 62).

A number of manufacturers produce suitable 4ft $7^{1}/_{2}$in diameter 14 spoke wheels for this locomotive:.

Alan Gibson, The Bungalow, Church Road, Lingwood, Norfolk. NR13 4TR. Tel. 01603 715862. These wheels are from ex-ProtoFour tools and the crankpin holes need to be drilled out by the builder. The crankpins will also need to be bought separately.

Markits Ltd. PO Box 40, Watford, Hertfordshire. WD2 5TN. Tel. 01923 249711 (www.markits.com). These are self-quartering wheels available in OO and EM gauge only.

Sharman Wheels, 13 Orwell Court, Wickford Business Park, Wickford, Essex. SS11 8YJ. Tel 01268 764985. (www.sharmanwheels.com). They come with the crankpins moulded in the wheel.

Ultrascale. Tel. 01462 685327 (www.ultrascale.co.uk) There's usually a long waiting list for their products, which are manufactured to order.

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.

First, using flat-nosed pliers, fold over the spring backing pieces (1 x4) to make them double thickness (Fig.1) noting that, unlike most bending operations, the fold lines should be on the outside of the bend. When these parts are absolutely flat (this can be done by gently tapping them between two flat pieces of hardwood) they can be soldered in place on the chassis, behind the springs, before cleaning off any excess solder.

For a rigid chassis, ream out all the axle bush locations in the chassis frames (2 & 3) 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 'A' 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 (B).

For all types of chassis, select the spacers (parts 4 - 7) for the gauge in which you model. Open out the holes in the motion bracket and cylinder front face to suit the wires shown in figure 3. Bend up and fit the front and rear L-shaped spacers (4 & 7), followed by part 5 (detail facing backwards) and then 6.

Refer to the fret diagram, and to Figure 7. Open out the holes in the rods (8 - 13) 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 (8 x2 & 11 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.

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 ('B' 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 about 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.

If you're going to use compensation in a OO chassis, then you'll need to reduce the width of the gearbox using etched overlays, which are available from High Level at the address below.

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 14,15, 20 & 21) 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 (14 & 15 - 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 (16 - 19), the radius arms (20 & 21) and connecting rods (22 & 23) to suit the wires shown in Figures 3 and 4. 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 diameters, manoeuvre one of them into position and then carefully locate the front end of the rod into the slots in the slidebars ('C' in Figs. 3) springing the bars gently apart to do this. Slot a length of 0.7mm wire through the holes 'D' 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 1, 3, and 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 'E' 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 'D', 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 of the slidebar top layers (24 x2) to shape, and solder them in place. Use a length of 0.5mm wire to locate the crosshead details (25 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. The location of the firebox sides (26 & 27) is crucial as this will effect the position of the brakegear. Remove them from the fret and ensure that they are perfectly flat, straightening them with your fingers as necessary. Use continuous lengths of 0.5mm wire to locate the firebox sides inside the frames - this will ensure the wires are absolutely perpendicular as they pass through the frames. Solder the sides in place at the top edges, then cut the wires and trim them flush at both sides. Make sure the parts sit flat against the frames - if they don't check they are straight, or look for excess solder around the spring hangers. When the firebox is soldered in place, fit a short length of 0.4mmm wire into small holes 'F' to represent the washout plug bolts.

Slot the tabs on the footplate supports (28 x2) through the footplate support details (29 x2) and then locate both parts on the frames and solder in place. Now fit the middle/rear brake brackets (30 x4) the larger angular-shaped front brake brackets (31 x2) and then go on to attach the front and rear bufferbeam braces (32 x2 & 33 x2) before finally adding the chassis end rivet details (34 - 37) to the ends of the chassis.

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. Once it's soldered in place, you can add the optional pipe detail to the top, using a length of 0.3mm wire soldered into the small hole at the top off the pump, running it up to the notch 'G' at the top of the frame.

Compensation

If you’re building a compensated chassis, bend the small cantilever tab 'H' in the front spacer (4) 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 'J' 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 5 - 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.

Finishing the structure
If you have a rivet press, carefully punch out the rivet detail in the railguards (41 x2, 42 x2). Solder the guards in place at the ends of the frames, as shown in the diagram, make the 45 degree bends and then strengthen these with a small amount of solder.

Pre-drill the holes at the bottom of the front sandboxes (43 & 44) and secure them to the frames. Bend up the etched rear sandboxes (45 & 46 - see Fig. 7) then use adhesive to secure them to the rear face of the steps on the loco body. They should be fitted hard up against the back of the rear steps, so their top edge butts up to the underside of the footplate, with the rear face of the boxes in line with the back of the steps.

Bend the boiler (47) to shape and try it in place, between spacers 4 and 6 as illustrated in Figure 5. Take time to get the boiler exactly to shape, so it stays in place by itself, without forcing. This can be tricky, but we found the following method worked well: First, bend the boiler around a rod or bar, which has a much smaller diameter than the one you require (say about 12mm) working the radius right to the end of the metal with your fingers; Now press the part over a larger rod (or similar object) which has the diameter you are aiming for (in this case 18mm) making sure there are no kinks.

If you wish, you can solder the boiler in place. A better alternative would be to fit it after painting which will make it easier to paint the inside motion and to apply the boilerbands. You can use epoxy to keep it in place although, as the boiler is a slight interference fit, it shouldn't really need anything to hold it.

On the RTR model, the bunker is fastened to the footplate using a pair of dome-headed bolts. For P4 and EM models these will need to be replaced with countersunk versions, so the bolt heads are flush with the underside of the footplate or, alternatively, you can remove the existing bolts and glue the bunker in place.

Try the chassis in place and fasten it to the body using the original fixing screws through the spacers at the front and rear. Note that the rear face of the spacer '4' extends upwards and sits between the footplate inner edges to represent the rear of the smokebox. After having made any necessary adjustments, remove the chassis.

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 5 shows the how the completed brakegear assembly integrates with the chassis.

Drill out the small holes in the steambrake and handbrake lever components (48 - 52) to the sizes shown in Figure 1. Use a short length of 0.5mm wire, slotted through the small holes in the steambrake lever halves (45 & 46) to locate the parts together, then trim the outsides of the wire almost flush with the etch faces. With the assembly complete, go on to ream out the larger holes to suit a length of 1.6mm O.D. bar. Do the same for the handbrake parts (50 & 51) this time including the small detail (52).

To represent the brake cylinder, cut a length of 2mm O.D. tube to about 6mm long, then slot this into the location hole in the rear spacer. Adjust the tube until about 4mm protrudes down below the spacer and solder it in place. Now cut a length of 1.6mm bar to about 30mm long, to represent the crosshaft. Push this through the frames and through both brake lever assemblies, holding the end of the steambrake lever assembly inside the brake cylinder (tube) as you do this. Centralise the brakeshaft in the frames - it should protrude by at least 6mm each side - and solder it in place. Now solder the steambrake to the shaft, directly under the cylinder, making sure the linkage is vertical. Finish off by sliding the handbrake lever assembly along to the left of the shaft, so the small tab at the top can be located in the spacer, then solder the tab into the spacer and the lever to the shaft.

Setting up the chassis
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 fit the body at this stage, so you can check the overall levels. When the chassis sits level, and at the correct height, 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.

Parts are included to build either the cast style, or the double layer type of brake hangers. Decide which you're going to model and then drill or ream out the rest of the brakegear components so the wires, shown in Figure 1. will pass through their holes without being forced.

Both cast and double types of hanger have small folding tabs at the tops of the front layers (parts 54 & 55 or 59 & 60) which spaces them the correct distance from the frames. For P4 wheels, which are narrower than OO/EM, the small pieces ('K' in Fig. 1) will need to be filed off.

If you're fitting the cast hangers, take one of the cast brake hanger front layers (54 x3 & 55 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 cast brake hanger rear layer (56 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 (57 x6) to the tops of the cast-type hangers. If you do decide to fit these details you may need to add crankpin spacer washers (58 x 6) so the siderods don't catch the brake details (this will also depend on the amount of sideplay on the wheels). We recommend that you try the hangers and siderods in place so you can check the clearances, before deciding whether to fit the details not.

For the double hangers, make the bend at the top of the double hanger front layers (59 x3 & 60 x3) as above. To model the hangers is solid units, which is the sturdiest option, - push a length of 0.5mm wire through the central hole and locate the middle (61 x6) and back (62 x3 & 63 x3) hanger layers onto the front. Solder all the layers together and then trim the wire flush at 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.

Alternatively, you can model the double hangers with prototypical space between the front and back layers. To do this, remove the bottom part of the double hanger middle layers (61) and, when you come to fit the assembly onto the brake stretcher wire, include the double hanger spacer washers (64 x6 - see Fig.1)

For all types of hanger assembly. clean out any excess solder, from the rear 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 hard up against the webs.

Take one of the hanger assemblies (including washer '64' if applicable) and slot it onto the brake stretcher wire, using a 30mm length of 0.7mm diameter wire through the bottom hole. Solder the wire in place so about 5mm protrudes from the outside face of the hanger. Take an opposite handed hanger assembly, slot this onto the long end of the 0.7mm wire, then offer this assembly up to the chassis at the front brake location. Slide the loose hanger along the wire, so both hangers move up to the chassis sides and then slot a length of 0.5mm wire through the holes at the tops of the hangers, and through the chassis at holes 'K'. Push the hangers hard up against the wheels, and up to the chassis sides and then, after checking that they are parallel and lying at the same angle, carefully solder the loose hanger assembly to the stretcher wire - do not solder anything to the chassis. Now slide the wire out from the top and, using the same hanger location, repeat this process for the other two pairs of hangers. Leave the last pair of hangers in place and trim top wire so it is very slightly proud of the hangers.

For the two remaining detached hanger assemblies, slot a continuous length of 0.5mm wire through the tops, 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 and trim the inside ends so they protrude by about 0.5mm from beyond the innermost edge at the top of the spacer tab - this wire will locate in the hanger holes in the chassis. Make sure you remove any burrs from the ends of the wires.

Now manoeuvre the middle and rear hanger assemblies up to their stations, springing them lightly apart until the top pins clip into the location holes in the frames.

Brake clearances

With the hanger assemblies in place, you can set the clearances for the brakes. Take a short inner pull rod (65 x2) and manoeuvre it up behind one of the rear wheels, so it sits up against the firebox. Hook the front end of the rod over the top of the rear brake stretcher wire. Now slot a 30mm length of 0.5mm wires through the small lever which protrudes from the rear of the frames (''M' in Fig.1) and then swing the rear end of the pull rod up, so the rearmost hole locates on the wire and the rod is sitting hard up against the inside of lever ''M'. Continue to feed the wire across to the other side of the loco, where you can locate the rod at the opposite side in exactly the same way. Double-check the notches at the front of the pull rods are located fully down on the brake stretchers, and then solder both rods to the firebox sides, but do not solder any of the wires in place.

Slot the long pull rods (66 x2) over the ends of the stretcher wires, at the bottom the all of the brake hangers, then invert the chassis and set the rods so they run parallel to the chassis, as illustrated in Figure 6. Look at the distance between the backs of the rods and the wheel faces and take into account the sideplay on the axles - with the wheels pushed fully over to one side, we suggest an additional 0.3mm clearance, which can be set using a piece of brass wire. When satisfied all is well, solder the long pull rods to the stretcher wires.

At the rear of the chassis, thread the actuators (67 x2) over the ends of the crosshaft and the continuous wire. Temporarily fit the short outer pull rods (68 x2) pushing the, front of these rods hard up against the long pull rods. Set them so they run parallel to the frames then position the actuators on the crosshaft, so they sit up against the back face of the outer rods. Now solder the actuators to the crosshaft, and the outer rear pull rods to the brake hanger stretcher wire at the front, but leave them free at the rear.

The brakegear can now be removed by pulling the supporting wire from the front of the chassis, springing the hangers from their locations and carefully springing the rear of the rods from the continuous wire at the crosshaft. With the brakegear off, you can trim the brake crosshaft, so the ends are very slightly proud of the actuator's outer faces.

Refer to Figures 1 and 5. Cut two lengths of 1mm tube, so they fit between the actuators and the holes "M' in the frames, and then thread the long 0.5mm wire back through both sides to locate them and hold them in place. Solder the tube and wire in place, so everything is solid. Trim the ends of the wires at the actuators, so they are 0.7mm proud at the outside (holes at the back of the short outer rods will locate on this) and very slightly proud of the inner rod faces.

When you come to refit the brakegear, slot a long wire through the hangers at the front, then swing the rear of the brakegear up into position, locating the hanger pins in their locations and springing the ends of the outer short rods over the pins on the actuators.

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. 6. Check the brakegear can be removed without the pipes getting in the way.

When the brakegear is off, remove the wheels and fit the balance weights (69 x 4 & 70 x2) directly opposite the crankpins - epoxy is best for this. Make sure they lie flat and don't foul the rods. Now clean up all the parts ready for painting.

Gearbox assembly

Study Figure 8. Before cutting the gearbox etch (71) from the fret, progressively drill out or ream each of the holes to accommodate the shafts, bushes and wire 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. Solder the 1/8in bushes into place with the larger-diameter shoulders on the same side of the etch as bend lines. File the non-shouldered face of the bushes flush with the etch, then cut the etch from the fret with a heavy blade and trim off the tabs.

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.

Slot the final drive gear between the axle bushes and include a slip of thin paper to set the running clearance for the gear. With the gear and paper still in place, brace the assembly by soldering a length of 1mm wire between holes 'N', then remove the gear.

Solder the stage one spacer (72) 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.

Using a carborundum disc in a mini-drill, cut the 2mm gearshaft, so their lengths equal 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 shafts to their respective holes. Because they are a tight fit, you will only be able to pass them through both sides of the gearbox if it is truly square. If they 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.

Slot the top idler gearshaft through the gearbox, slipping on the thin 20T. gear, a 2mm spacer washer (73 X2) and the 2mm collar as you do so. (Note that the boss on this gear runs nearest the gearbox side). Secure the shaft to the gearbox sides and then fix the collar in place so the gear sits right up against the left hand side of the box, as shown. Repeat this for the lower idler shaft and check both gears rotate smoothly.

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 turn the gear train using your finger - the gears should run without resistance. Temporarily fit the axle, along with the brass 20T. gear and check that all 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 5.8mm 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.

Final assembly.
If the boiler isn't already fitted then clip it into its locations. Position the motor/gearbox unit so the motor sits in the boiler space and, as you slot the driven axle through the frames and gearbox, slip on the final drive gear, but do not tighten the grubscrew yet.

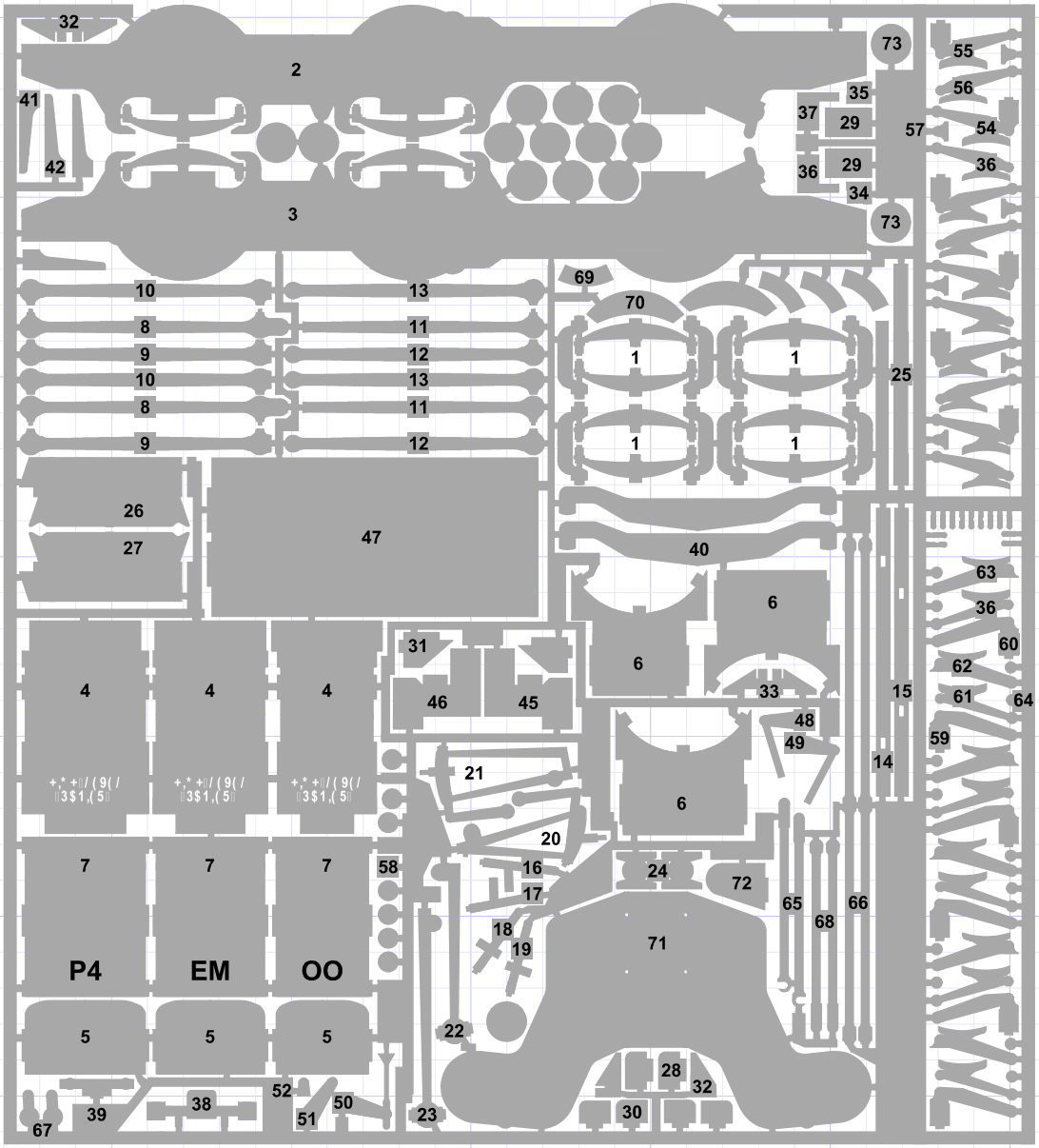
The kit includes axle washers of varying thicknesses, which can be used to limit axle sideplay. Fit all the wheelsets, complete with crankpins, and quarter the wheels, - the right hand cranks lead by 90 degrees. Now add the bushes to the crankpins, followed by the coupling rods, and check for free running before fitting the securing nuts. Optional crankpin spacer washers (58 x6) are provided, but these only need to be fitted if the siderods catch the brake hangers.

Centralise the rear axle and the gearbox in the chassis, tighten up the grubscrew in the brass gear and then test the chassis under power. When the chassis is running smoothly, fit the body and test run the completed loco.

For EM and P4 models, it'll be necessary to make a few adjustments to the body, in order to provide clearance for the coupling rods. Start by removing the moulded injector pipework from the underside of the footplate - you can make a slimmer and more realistic replacement using copper wire - and then try the body in place. As the wheels rotate, you may notice that the bosses on the coupling rods catch the underside of the valances. Use a scalpel to cut small clearance cavities (make these slightly deeper if your chassis is compensated) making sure you don't cut through to the visible outside face of the valance. Finally, to allow clearance for the rear wheels, remove the bottom inside corners of the cab front, where they meet the rear splashers, and then try the body in place.

When you're happy all is well remove the body and refit the brakegear, as described previously, then fit the body for the final time and secure with the original fixing bolts. Once the body is fitted, there's very little room for the motor to move about. You may wish to fit a very small amount of packing (perhaps a blob of bath sealant or Blue-tack) above the foremost end of the motor, which will prevent the unit from lifting when power is applied. You'll need to get the thickness of this material just right - if it's too tight the movement of the rear axle will be restricted and, on a compensated chassis, will prevent the unit from floating freely with the axle.

CHASSIS KIT FOR BACHMANN 'PANNIER'



PARTS LIST

1. Spring Backing Pieces (x4)
2. Frame - LHS
3. Frame - RHS
4. Front Spacer
5. Motion Bracket Spacer
6. Firebox Spacer
7. Rear Spacer
8. Front Coupling Rod, Middle Layer (x2)
9. Front Coupling Rod, Inner Right, Outer Left (x2)
10. Front Coupling Rod, Inner Left, Outer Right (x2)
11. Rear Coupling Rod, Middle Layer (x2)
12. Rear Coupling Rod, Inner Right, Outer Left (x2)
13. Rear Coupling Rod, Inner Left, Outer Right (x2)
14. Slidebars - LHS
15. Slidebars - RHS
16. Droplink - LHS outer
17. Droplink - LHS inner
18. Droplink - RHS outer
19. Droplink - RHS inner
20. Radius Arm - LHS
21. Radius Arm - RHS
22. Conn rod - LHS
23. Conn Rod - RHS
24. Crosshead Details (x2)
25. Slidebar top layers (x2)
26. Firebox Side - LHS
27. Firebox Side - RHS
28. Footplate Supports (x2)
29. Footplate Support Detail (x2)
30. Middle/Rear Brake brackets (x4)
31. Front Brake Bracket (x2)
32. Front Bufferbeam Brace (x2)
33. Rear Bufferbeam Brace (x2)
34. Rivet Detail, Front - LHS
35. Rivet Details, Front - RHS
36. Rivet Detail - LHS
37. Rivet Details - RHS
38. Vacuum Pump Body
39. Vacuum Pump Top
40. Compensation Beams (x2)
41. Railguard - Front LHS, Rear RHS (x2)
42. Railguard - Front LHS, Rear RHS (x2)
43. Front Sandbox - LHS
44. Front Sandbox - RHS
45. Rear Sandbox - LHS
46. Rear Sandbox - RHS
47. Boiler
48. Steambrake Lever Half - LHS
49. Steambrake Lever Half - RHS
50. Handbrake Lever Half - LHS
51. Handbrake Lever Half - RHS
52. Handbrake Detail - LHS (x3)
53. Handbrake Detail - RHS (x3)
54. Cast Hanger, Front Layer - LHS (x3)
55. Cast Hanger, Front Layer - RHS (x3)
56. Cast Hanger, Rear Layer (x6)
57. Hanger Pivot Details (x6)
58. Crankpin Spacer Washers (x6)
59. Double Hanger, Front Layer - LHS (x3)
60. Double Hanger, Front Layer - RHS (x3)
61. Double Hanger, Middle Layer (x6)
62. Double Hanger, Rear Layer - LHS (x3)
63. Double Hanger, Rear Layer - RHS (x3)
64. Double Hanger Spacer Washer (x6)
65. Short Inner Pull Rod (x2)
66. Long Pull Rod (x2)
67. Actuators (x2)
68. Short Outer Pull Rod (x2)
69. Balance Weigths, Front, Rear (x4)
70. Balance Weights, Middle (x2)
71. Gearbox
72. Gearbox Spacer
73. Ilder shaft Washer (x2)

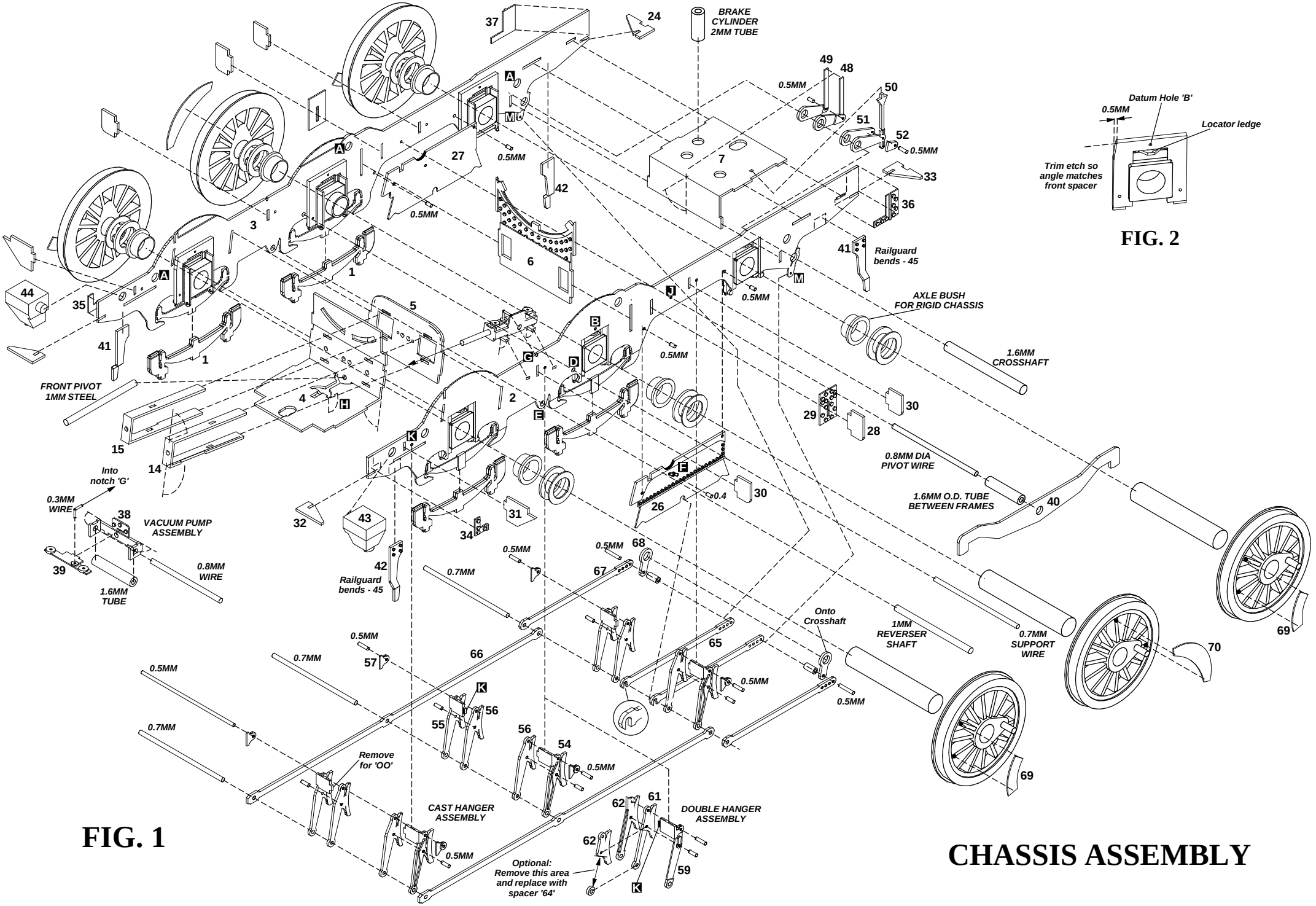


FIG. 2

FIG. 1

CHASSIS ASSEMBLY

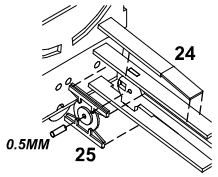


FIG. 4

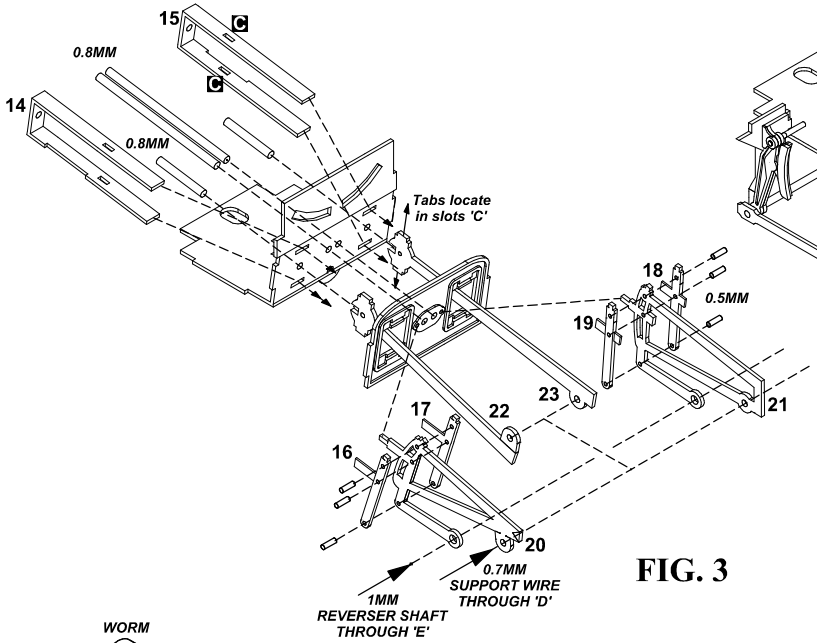


FIG. 3

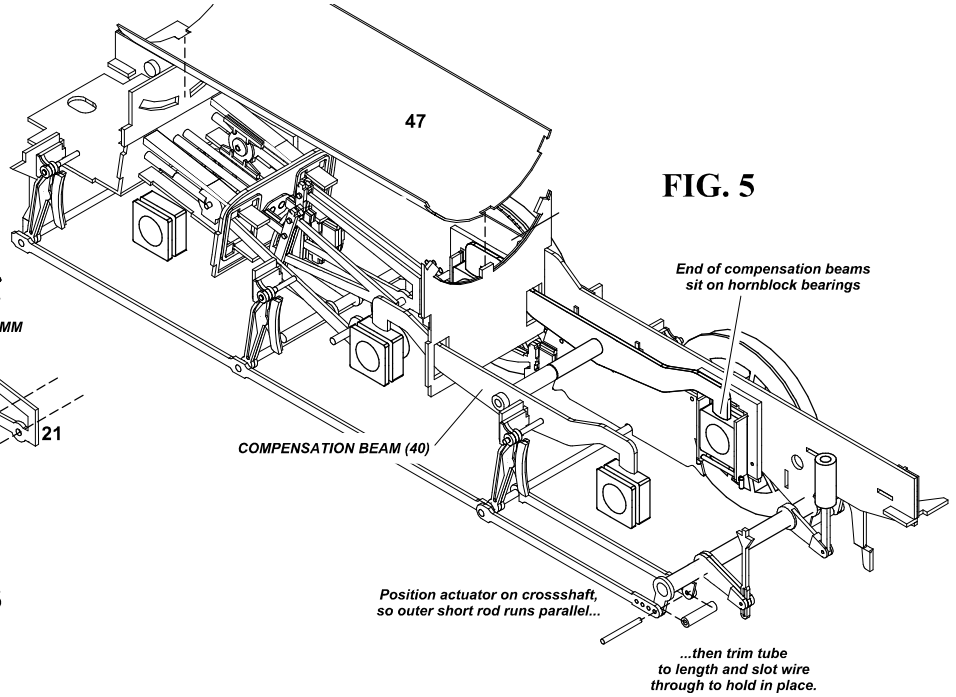


FIG. 5

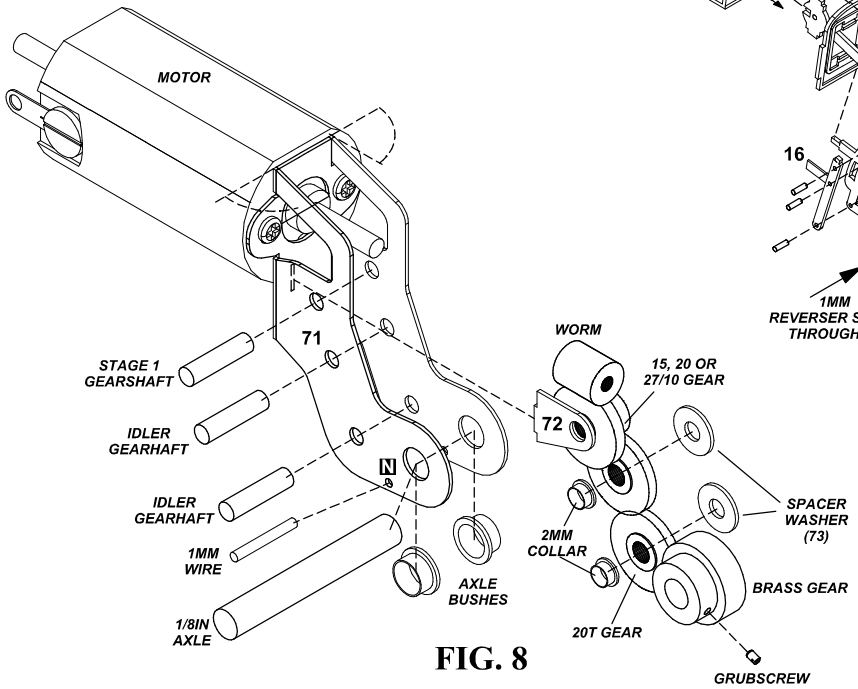


FIG. 8

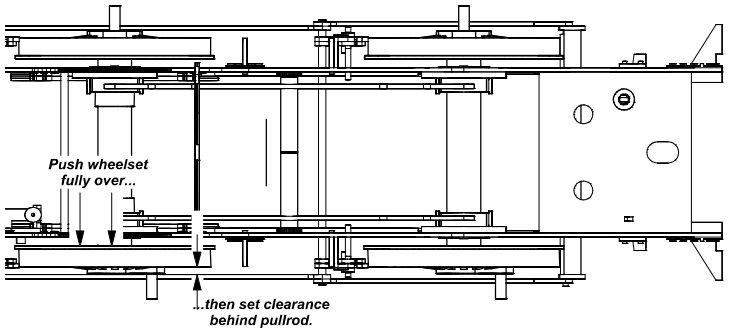


FIG. 6

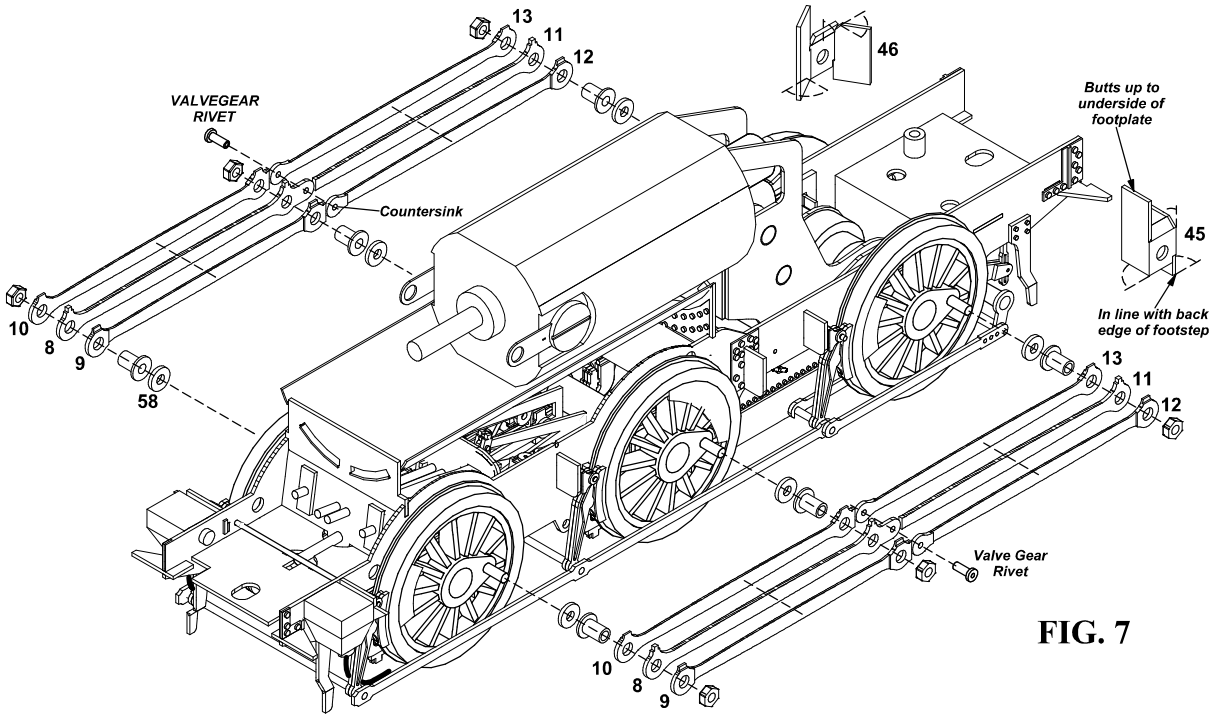
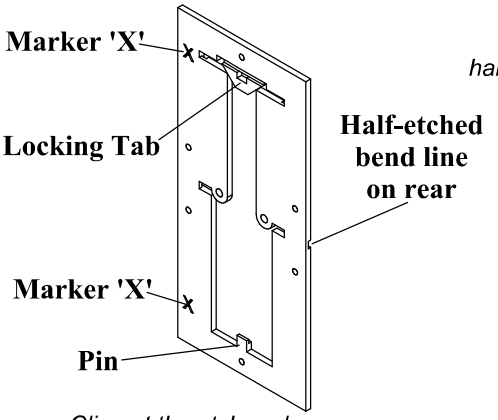


FIG. 7

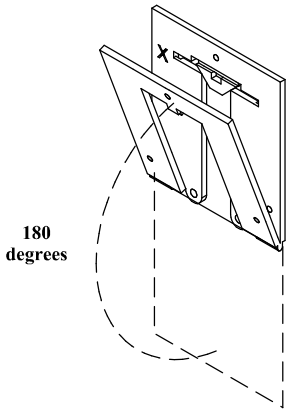
HIGH LEVEL

www.highlevelkits.co.uk



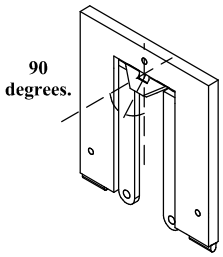
Clip out the etch and clean off any mounting tabs.

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

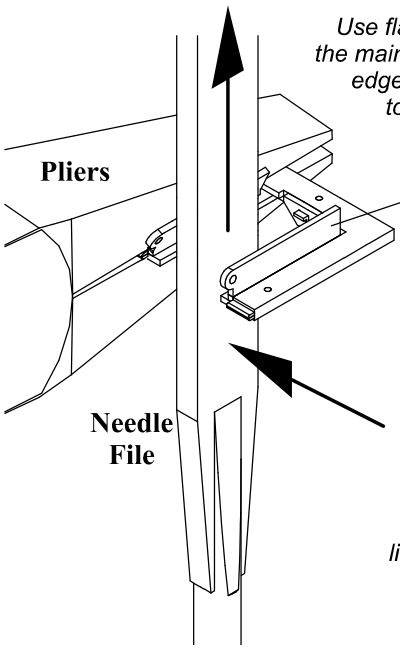


When it's folded, tap the layers between two pieces of hardwood, so they sit absolutely flat.

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

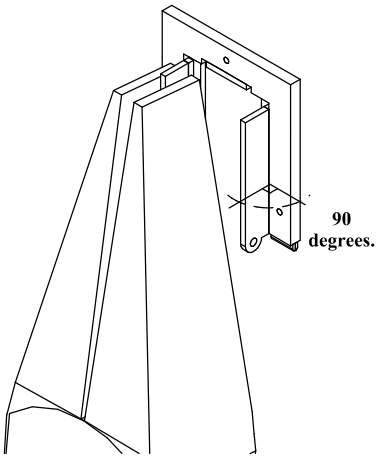


The end of a flat, pointed needle file is a good tool for this job. The tab locks the layers together, eliminating the need for solder.



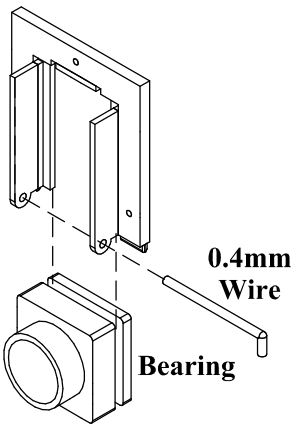
Use flat nose pliers to grip the main etch,with the straight edge of the pliers close to the bend line.

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



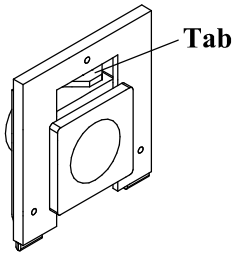
Finish off the horncheek bends so they are at 90 degrees. Check this through a magnifying glass and adjust as necessary.

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.
TEL. 0191 3882112.