GWR 54/64/74XX Chassis Kit

This chassis kit is designed as a like-for-like replacement for the Bachmann 6400 class 0-6-0PT whose bodyshell can, with a little modification, also be used to represent the 5400 and 7400 class versions. While the body of the Bachmann model is pure 6400 – and specifically numbers 6400-29 – the splashers are much closer in diameter to the 54XXs. With relatively little work they will accommodate the larger wheels of the earlier class, but for 6400 and 7400 classes, it is up to the individual modeller to decide if they wish to create new splashers whose proportions are more in scale with the prototypes. We suggest you think carefully before reaching for the scalpel - removing the existing splashers is a very difficult job and will weaken the footplate considerably. Sometimes, it may be better to leave minor imperfections well alone rather than attempting 'corrections' which, if less than totally perfect, will only draw attention to themselves.

A little history first... C. B. Collett's light 0-6-0PTs for the Great Western Railway were a close-knit family, sharing a 7ft 4in x 7ft 4in wheelbase that dated back to William Dean's long-lived 2021 class of 1897 which, in turn, was a development of much older designs. In 1930 No 2080 of the 2021 class was rebuilt with 5ft 2in wheels, larger splashers and a new design of boiler. In this guise it formed the prototype of the auto-fitted 5400 class and, after its initial trials, was renumbered 5400. A production batch of 25 locomotives based on this design was constructed between 1931 and 1935, including a second No 5400 delivered in June 1932, at which point the prototype – by then getting on in years – was scrapped. These engines had 5ft 2in diameter wheels from new and were intended for passenger work, primarily to replace various ancients that had been converted late in life from former goods and shunting engines to auto-fitted passenger locomotives.

The 64xx class of 1932-7 was another development of the 2021 class, in the wake of further experiments. This time the guinea pig was No 2062, fitted with 4ft 71/2in diameter wheels (unlike No 2080, it was not renumbered). The smaller wheels, it was felt, would make them more suited to steeply graded lines. All 40 of the production batch were fitted for push-pull working and had screw reverse and Automatic Train Control. They had the same style of brake hangers as the 5400 class and many other features in common but the smaller splashers were an obvious detail difference while the buffers were mounted noticeably higher to allow for the smaller wheels (the footplate height was correspondingly lower). Like the 54xx class, the first 30 members of the class had a pronounced lip on the front and rear edges of the cab roof, while the join between the bunker and the cab rear was a graceful curve. The final ten engines, however, anticipated the 74xx class in the lack of a cab roof angle, while the bunker top joined the cab rear at a sharp right angle.

The 6400 class was followed in 1936 by the 7400 class which continued to be built right up until 1950, representing a near-seamless development from Dean through to the Hawksworth era – there were 50 of these engines in all, with 4ft 71/2in diameter wheels. Although often found on branch-line passenger and mixed trains, the 7400s were also used as freight and shunting engines – they had lever reverse (which was easier for yard work) and lacked push-pull and ATC equipment. Their boiler pressure was higher too, which made them more powerful than the 6400s. Otherwise they were identical to the 6400 class with the exception of the brake gear, which was a style not seen on the earlier engines. Buffer/footplate height was the same as the 6400 class engines and unlike some of Collett's other pannier tanks built for shunting work, they all had vacuum brake gear.

You can find much more information on these classes in *Pannier Papers No 7: 54XX, 64XX, 74XX*, by Ian Sixsmith (Irwell Press, 2013) ISBN 1 90691 958 0

Useful comparative drawings, and a selection of photographs, are in J.H.Russell's *A Pictorial Record of Great Western Engines, Volume Two: Churchward, Collett & Hawksworth Locomotives* (Oxford Publishing Company, 1975) ISBN 0 86093 399 7

Wheels required are 5ft 2in for 54XXs (16 spoke) or 4ft $7^{1}/_{2}$ in diameter for 64/7400s (14 spoke) available from:

Alan Gibson, PO Box 597 Oldham Ol1 9FQ. Tel 0161 6781607

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.

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

Carefully remove the Frames (1 & 2) from the fret. Decide on the type of engine you're going to build – the High Level kit covers 54, 64 and 74XX classes – the former has larger wheels, but each class had different brake hanger and pivot arrangements. Use Figures 1 and 11 to identify the correct brake hanger pivot holes for the type of engine you wish to model and drill the appropriate holes 0.5mm: Note that Figure 11 shows the holes from the outside of the chassis.

If you have a rivet press, you can punch out the crescent-shaped rivet details along bottom of the frames, along with the pair just ahead front axles – be careful not to confuse any of the details with the remaining brake pivot drill starts! Forming rivets can be quite tricky – poorly executed, they'll stick out like a sore thumb, so try forming the practice rivets along the side of the fret and then, if you're happy with the results, go on to do the frames. As the process may cause the frames to distort, you may need to straighten them afterwards.

Bend the small location tabs on the Firebox Sides (3 & 4) through 90 degrees and solder the parts flat against the inside face of the frames (the face without the spring detail) then file or grind the protruding tab ends flush.

Using flat-nosed pliers, fold over the front and midway Springs (5 x4) and the rear pair (6 & 7) to make them treble thickness (see Figure 13.) 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) solder the springs in place with their detail on the inside of the frames. Clean off any excess solder.

For a rigid chassis, ream out all six of the axle bush locations in the chassis frames and solder the circular 1/8in axle bush bearings in place. Modellers building to 16.5mm gauge will need to trim some length from the rear bushes to allow clearance for the gearbox. 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. – choose the correct ones for the type of loco; 54XX holes are furthest away from the wheel centres, to suit the bigger wheels.

For a **compensated chassis**, read all of the following carefully. To make the hornblock cutaways, using a cutter in your minidrill, a fine fret saw, or a needle file, carefully make a slot up the centre lines of the axle locations, taking care not to damage the springs. 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 8 - 12) for the gauge in which you model. Open out the holes in the Front Spacer (9) to suit the wires, as shown in the Figure 2. Punch out the rivet detail in the motion bracket (10) and then straighten the part as necessary. EM and P4 modellers should now open out the large holes ('C' in Fig.1) in the motion bracket, so a length of 1.6mm OD tube is a tightish fit. For OO gauge these tubes will not be visible, so you can simplify things by fitting the Valve Gear Carrier (part 13 in Fig. 2) which should be bent through 90 degrees and then soldered into the slot in the motion bracket.

Bend the Front Body Mount (8) to shape, tack this into one side of the chassis to hold it in place. Now assemble the chassis using the front and rear L-shaped Spacers (9 & 12), followed by part 11. Clip part 10 (detail facing backwards) into its location but ***do not solder in place*** just yet.

Refer to the fret diagram, and to Figure 7. The instructions show the rods as they would be for 64/74xx locos, with a vertical step at the front face of the side rod bosses (visible to the left of the loco). If you wish to model a 54XX, build the rods as below, but reverse the valve gear rivet and, when completed, fit the rods to opposite sides of the loco, so the flat head of the rivet is on the outer face and the round bosses are visible.

Open out the holes in the Rods (14 - 23) 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 & 19 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.

Dress the top edge of the rod bosses using a fine file, then carefully open out the cork holes. Add short lengths of 0.4mm wire to the holes, solder it in place, and then trim the wires until there are proud by about 0.5mm.

For a **compensated chassis**, bend up six hornblock etches, using the separate instructions supplied with them. When the units are fitted, the horizontal ledge which protrudes from their front face (see Fig. 12) 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.

Remove the Motion Bracket (10) by springing the frames apart. 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 12) 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. 12) 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 Figure 2) is highly detailed and greatly enhances the model. If you wish, you can simplify things by using only the Radius Arms and Slidebars (parts 25 - 28 & 35 & 36) and ignoring the other smaller parts. This may be the most sensible option for OO models, as it's difficult to see between the narrower frames.

Refer to Figures 1, 2 & 4. Slot a length of 1mm wire through the reverser shaft holes 'D' in the frames, and use this, along with a short length of 0.5mm wire, to locate the Reverser Lever (24) – the rear end of the lever sits in the small notch at the top corner of the Firebox Front (11). Solder the lever to the inside of the right hand frame, and to the spacer, but do not solder the shaft in place. To represent the top pivot, trim the wire flush at the outside, leaving a small amount proud at the inside. Note, for some classes, once in place, the lever covers the brake hanger’s mounting hole, so you’ll need to drill through the lever using a 0.5mm bit.

Check the top and bottom slidebars will slide easily into their locations in parts 9 and 10, and then slide them into the motion bracket, noting that the bars are handed. Clip the motion bracket back into its location in the frames - include the bars as you do so – again, **do not solder** the bracket in place. Slide the Left hand side bars forward to locate their front ends into the slots in part 9. To fit right hand bars, which are just a fraction too long, you’ll need to unclip the motion bracket at the right side only, and ease it back, just enough to allow you to locate the slidebars.

Once they're in, clip the bracket back into its slots, push the bars fully forward and solder them in place. Go on to solder the motion bracket into its slots in the frames and then finish off by adding the Motion Bracket Top (30) to the bracket and file the top edges so the part looks solid.

Whilst still in the fret, drill out all the holes in the droplinks components (31-34), the Radius Arms (5 & 36) and connecting rod and crosshead parts (37 - 41) to suit the wires, shown in the diagram. Make the 0.7mm holes a fairly loose fit, so a wire can pass easily through them.

Noting that the two sides are different, use short lengths of 0.5mm wire to locate the droplink and radius arm parts together, and then solder them up to make a pair of Valve Gear Assemblies. This can be done more easily by locating the parts together on short L-shaped lengths of wire, which can be trimmed to length (just proud of the etches to represent the pivots) once the bits are soldered together.

For OO engines, remove the shaft and locate the ends of the valve gear assemblies in the small holes in the Valve Gear Carrier (13). Slot the reverser shaft back through the frames and valve gear assemblies, then 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.

For EM and P4 Gauges, slot the reverser shaft through holes 'D' in the frames, and use this to locate the valve gear assemblies. 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 swing the valve gear assemblies up into position and slot a length of 0.7mm wire through holes 'E', and through the assemblies - don't solder anything in place at this stage. Cut two 4.5mm lengths of 1.6mm OD tube to represent the valve guides. Slot the tubes into holes 'C' in the motion bracket, pushing them through from the front, until they locate over the small pins at the front of the valve gear assemblies. Push lengths of lightly oiled 0.8mm wire through the front spacer and into the tubes, to set the tubes at the correct angle, and then solder the tubes in place in the motion bracket. When the tubes are secured, remove the 0.8mm wires .

For all gauges, make any necessary adjustments to the valve gear assemblies, so they lie vertically and run parallel to the chassis, and then solder them to the reverser shaft and, for OO engines, solder the ends of the valve gear assemblies into the valve gear carrier. For EM/P4, carefully slide the 0.7mm wire from the rear of the valve gear assemblies - these assemblies should still be supported by the reverser shaft.

Take the Connecting Rods (37 & 38) and solder the layers of Crosshead Detail (39 & 40) to them, along with their packing pieces (41 x2), using a length of 0.5mm wire to locate all the parts, then trim the wire almost flush to represent the pin. Working from under the chassis, manoeuvre the rear ends of the rods through the motion bracket. Now push the length of 0.7mm support wire back through the frames (holes 'E') and valve gear assemblies, this time locating the rear of the rods as you do so. Swing the front ends of the rods up to the slidebars, locate the tabs in their slots and solder in place.

When both rods are in place, solder the ends of the support wire into the chassis and then trim the ends flush with the outside of the frames. Make a final check that all the components on the support wire are correctly positioned and then solder them all in place on the wire.

For the valve spindles, slot lengths of 0.8mm wire through the front spacer, into the tubes or holes in the motion bracket, and solder in place. Once you've done this you can solder the front ends of the valve gear assemblies in place.

Finish off the valve gear by pushing 2 lengths of the same 0.8 wire through the front spacer, to represent the piston rods, locating the ends in the notches in the crossheads. Use longish lengths of wire, so you can hold the ends to position them as you solder them in place and then, 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.

Chassis Details

The footplate supports, hanger braces and their various rivet details differ according to loco type. Figure 10 shows the left hand side of the engine, with appropriate parts for each class. Unless otherwise stated, the assembly sequence is the same for all types. Use the fret diagram to carefully identify the parts you need.

Starting at the front of the chassis, carefully bend the Footplate Supports Assemblies (42 & 43 or 44 & 45) into a crescent shape and then push them down into their locations, making sure they are full home in the slots. Check the tops are level, adjust the angles as necessary and then solder them in place.

For 54 and 64XXs, carefully make the bend on the small web (F in Fig.1) which is part of the Midway Hanger Mount (46 & 47 are marked 'X' for identification) and then push this part's location tab through the Rivet Detail 48, which should be pre-tinned. Holding the two parts together, slot the protruding tab through its location in the LH frame, then bend the tag forwards, to nip the both parts in place on the chassis. Check they sit straight then, using the minimum amount of solder, tack the tag to the inside of the frames. Make sure the rivet detail plate is sitting square and soldering everything in place. To further enhance the appearance, you can invert the chassis and add the (optional) tiny Brace (50) locating its tail in the slot on the support with adjacent edge resting on the underside of the ledge formed by the detail, (see diagram) and then solder it in place. Repeat this process at the other side of the loco.

The procedure is the same Rear Hanger Mounts (51 & 52) but this time, the small Braces (55 x2) rest on the top edge of the ledge formed by the Rivet Detail (53 & 54). Again, do the same at both sides and then add the Trailing Footplate Supports (55 & 56) noting the direction of the tabs, which should be bent through 90 degrees inside the chassis.

For 74XX engines, add Filler Pieces (58 x2), push them through slots from inside the chassis, then solder them in place before finally grinding the protruding outer ends flush with the outside of the frames. Add Footplate Supports (59 x 2 & 60 x2)) to both middle and trailing locations, noting the direction to bend the tags which should nip them in place to allow adjustment before soldering to the frames. Butt the Rivet Strips (61 x2 & 62 x2 - note the dot for identification) up to the parts and solder these in place, as shown in Figure 10.

For all types, bend up the Rear Beam Braces (at the bottom corners of the chassis) and then add the L-shaped rivet details (63 & 64) to them. Finally go back to the front of the chassis and add the Front Beam Braces (65) and 66 (the tags bend upwards). If you feel confident, finish off with the tiny triangular Rivet Details (67 & 68) which sit alongside the smaller part of the double supports (Fig. 7). If you prefer, these can be glued in place to avoid flooding them with solder.

Compensation

If you're building a compensated chassis, make sure a length of 1mm silver steel will pass through the holes in the spacer 9 and the small cantilever tab 'G' (also part of the front spacer) then bend the tab up so it vertical in relation to the chassis (not the spacer). 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 horizontal.

To fit the compensation beams, cut two lengths of 1.6mm O.D. tube, so they fit snugly between the firebox sides, inside the frames, but without being tight. Ream out the central hole in the Compensation Beams (69 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. Carefully smoothing off the cusps from the 'feet' of the beams (see Fig. 4) taking off the minimum amount of material (0.1mm or less).

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 and then slot a length of 0.8mm wire through the holes ('H' 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

To complete the main chassis structure you'll need to fit the Railguards (70 – 75) which differ, according to the wheel diameter. The variations can be quite confusing, so remove them from the fret as you need them, using the fret diagram for identification. Position the railguards so front edge lines up with the bottom corner of the frames and the bottom of the square mounting plate is level with the chassis' bottom (Fig.6). Solder them in place and carefully make the small bends near the ends, then strengthen these with a tiny amount of solder.

Bend the boiler (76 in Fig.4) to shape and try it in place, between spacers 9 and 11 as illustrated. Take time to get the boiler exactly to shape, so it stays in place by itself, and 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 slightly 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're aiming for (in this case 18mm) making sure there are no kinks.

The appearance of the Bachmann model can be improved by removing material from the space behind the midway splasher (filled in to hide the RTR mechanism) which reveals the etched firebox front, but think twice

before tacking this job, as it involves some tricky scalpel work and you'll probably need to finish off with a needle file, ground very thin to gain access. The cutaway should be taken back to the front, vertical face of the tank support and, as always, it's best to study photographs before you start. If you do decide to make this modification, then you'll also need to fit part 77 in order to give the firebox some depth. The part should be butted up and soldered to, the rear face of the Firebox Front Spacer (11). Once in place, make a gently radius to on the corners, as shown in Figure 7.

If you wish, you can solder the boiler in place, but a better alternative would be to fit it after painting which will make it easier to paint the inside motion and to apply the boiler bands. 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.

Before fitting the body you'll need to reduce the height of the plastic fixing pillar, situated under the cab floor. Trim it so it protrudes by 2.5mm, then offer up the chassis and fasten it to the body. Use the original fixing screws through the spacers at the front and rear – at the rear you'll need to carefully cut a new thread in the pillar using the screw; lightly countersinking the hole will make this job easier. As you fit the chassis, note that the rear face of the spacer '9' 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.

For EM and P4 models of **54XX classes** only, it'll be necessary to grind away a small amount of material from inside the splashers, in order to provide clearance for the wheels. This doesn't need to be much – a strip about 1.5mm wide, taken from the inner surface face of the top at the inside edge of the splasher. Take the thickness to about 0.5mm and make sure you don't break through the splasher. Do the same at the area under the cab where the recesses are for the wheels. Before touching up any paintwork, you may also choose to reposition the buffers further down the beams, to suit the higher ride height of these larger wheeled 5400 engines.

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. Figures 4 and 7 show the how the completed Brakegear Assembly integrates with the chassis.

Drill out the small holes in the Steambrake Lever Halves (78 & 79) to the sizes shown in Figure 1. Use a short length of 0.4mm wire, slotted through the small holes in the steambrake lever halves 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 hole to suit a length of 1.2mm O.D. bar.

Cut a length of 1.2mm bar to about 30mm long, to represent the crosshaft. Push this through the frames at location 'J' and through the Steambrake Assembly, slotting the top end of the steambrake lever into the rear spacer. Centralise the brakeshaft in the frames - it should protrude by at least 8mm each side - solder it in place and then solder the Steambrake to the shaft, and into the spacer. Now add the Journal Bearing castings (80 x2) to the ends of the cross shaft.

For 74xx locos, use oiled wire to locate the Brake Hanger Spigots (81 x6) at their locations on the frames, and solder them in place (Fig 11)

Setting up the chassis

Temporarily fit the driving wheels, including any washers that may be necessary to eliminate sideplay. As a starting point, try full etched washers on the outer axles with half-etched behind the middle drivers. 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 brake clearance of 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.

Brake Hangers
There are three types of brake hanger supplied, each being specific to one particular engine class: 54 and 64XXs are aesthetically similar, but the length of the top hanging brackets differs; 74xxs are a completely different design altogether, being mounted directly to the frames via a pin on a bolted flange.

For all types remove the inner layers (parts 82 or 83) and tin one side to make handed pairs. Before removing them from the fret, drill or ream out their holes so the wires, shown in Figure 1. will pass through their locations without being forced. For 5400s only, carefully file off the small extensions at the top of the above parts ('K' in Fig.8).

For ***all types*** of brake hangers, using the fret diagram and parts list to assist identification, select the correct pattern outer layers and ream out their holes, as described above. The parts have a small, folding tab at the tops, which spaces them the correct distance from the frames. For P4 wheels, which are narrower than OO/EM, these small pieces ('L' in Fig.8) will need to be filed off.

For ***54/64s***, take one of the Brake Hanger Outer Layers (84 – 87 or 88 to 91) and carefully make the bend at the top. Use a short length of 0.5mm wire, pushed through the middle holes, to locate hanger inner layer 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.

For the ***74XX hangers***, make the bend at the top of the hanger outer layers (92 x3 & 93 x3) and add the inner layers using 0.5mm wire to locate them, as above,

For ***all classes***, you can add the very small (and optional) hanger pivot details (note: on 54/64XX these are handed) to the tops of the hangers. If you do decide to fit these details you may need to add Crankpin Spacer Washers (99 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 or not.

For ***54/64XXs***, 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. The leading hangers are marked with an 'L' should only be fitted, as a pair, at the front wheels locations.

For ***all types***, take one of the hanger assemblies 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, at right angles, 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 one of the brake locations. 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 the top holes (Figs 1, 4 & 11). 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. To remove the assembly, slide the wire out from the top.

Repeat this process for the other two pairs of hangers - if you wish to avoid having a visible wire across the frames at the middle hanger location, remove the assembly and solder the top wire across the hangers, trim this wire almost flush with the outside face of the hangers, then carefully cut away the middle section and file the inside ends so they protrude by about 0.5mm from beyond the innermost edge at the top of the spacer tab – they can now be located in the frames by gently springing the hangers apart. Make sure you remove any burrs from the ends of the wires.

The length of the Pull Rods (100 x2 or 101 x2) differs according to wheel diameter. After removing the correct ones from the fret, refer to Figures 1 and 9 and, using lengths of wire 0.4mm, register the Pull Rods' forked end components (102 x4) as shown, then solder them together and file the wire flush so it is not visible. Make sure a length of 0.5mm wire will pass through the holes at the rear end of the rods before adding the Pull Rod Details (103 x4) so they site over the rear crosswire holes.

Assemble the handbrake parts (104 -106) as you did for the Steambrake Assembly, but before you trim the wire, add the Crank Detail (106) to the end. Open out the holes in the actuator (107) to suit the wires shown.

Brake clearances
Fit the hanger pairs to the model (see above) and then you can set the clearances for the brakes, again, don't solder anything unless specified.

Study Figures 1 and 5. At each brakeshaft journal, add a full-etched Brakeshaft Spacer Washer, parts 108 (x1 per side for P4, or x 2 for EM/OO) followed by either the Handbrake Assembly (Left) or Actuator, part 107 (Right).

With the brake hangers in-situ, slot the Brake Pull Rod Assemblies over the ends of the stretcher wires, at the bottom the brake hangers and locate the forked end of the rods over the handbrake and actuator levers, locking them in place using a single, long length of 0.5mm wire, spanning across to both sides. Slide the Set-up Bars (113 - opened out to suit the sizes in the diagrams) over the ends of the wires in the levers on the brakeshaft, using an additional wire slotted thought hole 'M' at the top of the frames to set the angle.

Invert the chassis and set the rods so they run parallel to the frames, as illustrated in Figure 5. 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. Now turn your attention to the gap between the back of the actuator and handbrake levers and the Brakeshaft Journal castings, where you may need to add extra washers so the pull rods continue to run parallel. When satisfied all is well, solder the long pull rods to the stretcher wires and the actuator and handbrake to the crosshaft. Check the Handbrake Assembly is vertical and solder the top tab into the notch 'N' in the left hand frame. Remove the set-up rods, which should be stored safely in case you need to make further adjustments. Finally trim the brake cross shaft, so the ends are very slightly proud of the levers' outer faces.

The brakegear can now be removed by pulling the supporting wires from the tops of the chassis and sliding out the wires from the rear of the chassis. When you come to refit the brakes, lift the Brakegear Assembly up into position, locating the hanger wires into their locations, and spring the ends of the outer short rods over the pins on the actuators. The rear ends of the rods should be kept in place on the levers using short lengths of wire through the forked ends, as in Figure 9. Tension in the brakegear should keep them place by itself, but a dab of paint, or nail varnish, will secure them should they loosen.

Pre-drill the holes at the bottom of the Front and Rear Sandboxes (110 - 113) and secure them to the frames using the pegs for location. For OO engines, with narrower frames, you may prefer to glue the sandboxes hard up against the rear face of the steps on the loco body, so they don't sit too far back. If you do this, make sure they are positioned at the correct height.

Invert the loco and slot lengths of 0.4mm wire into the pre-drilled holes in the 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, using epoxy, fit the balance weights according to loco type Figure 11 shows the Left of the loco - the opposite side of the engine is a mirror-image of the diagrams. If you're modelling a specific loco, it may pay to refer to photographs as this could vary between engines.). Make sure the etches lie flat and don't foul the rods then, once this is done, clean up the chassis, ready for painting.

Gearbox assembly
Study Figure 14. Before cutting the Gearbox etch (118) 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.

Solder the Stage One Spacer (119) 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.

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)– test for free running and then secure the ends of the shaft with a tiny amount of glue.

Slot the idler gearshaft through the gearbox, slipping on the thin 20T.Gear, two Spacer Washers (120) and the Collar (121) 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 washers at the left hand side of the box, as shown. Temporarily fit the axle, along with the brass 20T. gear and check that all the gears revolve smoothly.

Some brass worms 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 (or Superglue will be fine) 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 5mm 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 (99 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, so the gear is positioned centrally in relation to the idler gear, and then test the chassis under power. When the chassis is running smoothly, fit the body and test run the completed loco.

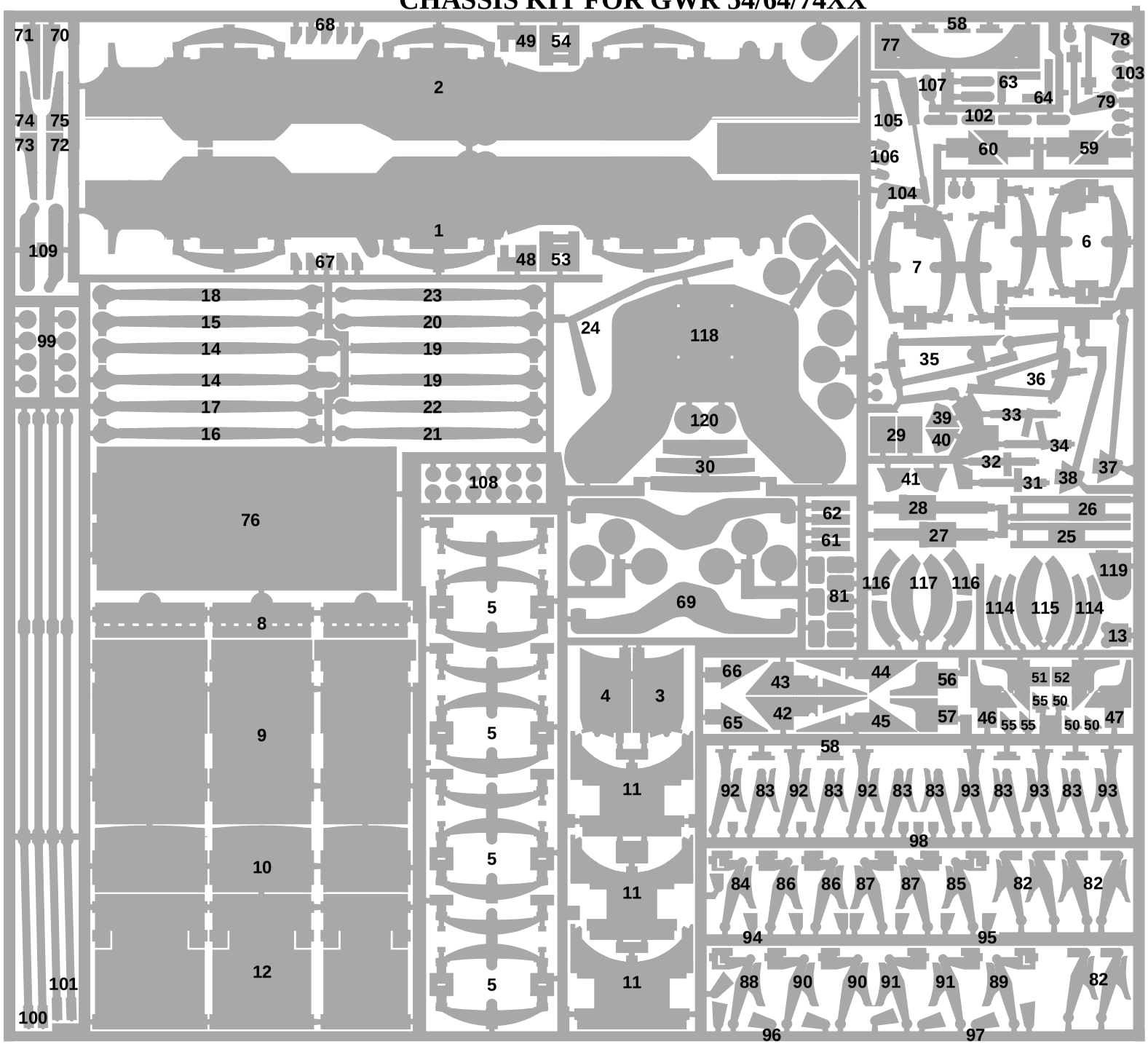
For all types, try the body in place. As the wheels rotate, you may notice that the bosses on the coupling rods come close to the underside of the footplate. There should be clearance if the chassis is central, but you can always gain a bit extra by careful grinding if there's a problem.

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.

PARTS LIST

1. Frame – LHS
2. Frame RHS
3. Firebox Side - LHS
4. Firebox Side – RHS
5. Spring Backing – Front/ Midway (x4)
6. Spring Backing - Rear, LHS
7. Spring Backing – Rear, RHS
8. Front Body Mount
9. Spacer – Front
10. Spacer/Motion Bracket
11. Spacer/Firebox Front
12. Spacer – Rear
13. OO Valve Gear Carrier
14. Front Coupling Rod, Middle Layer (x2)
15. Front Coupling Rod, Inner Left
16. Front Coupling Rod, Outer Left
17. Front Coupling Rod, Inner Right
18. Front Coupling Rod, Outer Right
19. Rear Coupling Rod, Middle Layer (x2)
20. Rear Coupling Rod, Inner Left
21. Rear Coupling Rod, Outer Left
22. Rear Coupling Rod, Inner Right
23. Rear Coupling Rod, Outer Right
24. Reverser Lever
25. Bottom Slidebars - LHS
26. Bottom Slidebars - RHS
27. Top Slidebars - LHS
28. Top Slidebars - RHS
29. Slidebar Spacers (X2)
30. Motion Bracket Top
31. Droplink, Outer - LHS
32. Droplink, Inner - LHS
33. Droplink, Outer - RHS
34. Droplink, Inner - RHS
35. Radius Arm - LHS
36. Radius Arm – RHS
37. Connecting Rod - LHS
38. Connecting Rod - RHS
39. Crosshead Detail - LHS
40. Crosshead Detail - RHS
41. Crosshead Packing (x2)
42. Front Support Ass- 54/64 LHS
43. Front Support Ass – 54/64 RHS
44. Front Support Ass - 74 LHS
45. Front Support Ass - 74 RHS
46. Midway Hanger Mount 54/64 LHS
47. Midway Hanger Mount 54/64 RHS
48. Midway Rivet Detail – 54/64 LHS
49. Midway Rivet Detail – 54/64 RHS
50. Midway Hanger Brace – 54/64 x 2
51. Trailing Hanger Mount 54/64 LHS
52. Trailing Hanger Mount 54/64 RHS
53. Trailing Rivet Detail – 54/64 LHS
54. Trailing Rivet Detail – 54/64 RHS
55. Trailing Hanger Brace – 54/64 x 2
56. Trailing Footplate Support – 54/64 LHS
57. Trailing Footplate Support – 54/64 RHS
58. Slot Filler 74XX (x2)
59. Midway/Trailing Support – LHS 74XX (x2)
60. Midway/Trailing Support – RHS 74XX (x2)
61. Support Rivet Strips – LHS 74XX (x2)
62. Support Rivet Strips – RHS 74XX (x2)
63. Rear Beam Brace Rivet Strip LHS
64. Rear Beam Brace Rivet Strip RHS
65. Front Beam Brace – LHS
66. Front Beam Brace - RHS
67. Triangular Rivet Detail LHS
68. Triangular Rivet Details RHS
69. Compensation Beams x 2
70. Railguard – LHS Front 54XX
71. Railguard – RHS Front 54XX
72. Railguard – LHS Rear 54/ Front 64/74
73. Railguard – RHS Rear 54/ Front 64/74
74. Railguard – LHS Rear 64/74
75. Railguard – RHS Rear 64/74
76. Boiler
77. Boiler Sides
78. Steambrake Half LHS
79. Steambrake Half RHS
80. Brakeshaft Journal (x2)
81. Brake Hanger Spigot - 74XX (x6)
82. Hanger Inner Layer – 54/64 (x6)
83. Hanger Inner Layer – 74XX (x6)
84. Hanger, Outer layer, Leading – LHS 54XX x 1
85. Hanger Outer Layer, Leading – RHS 54XX x 1
86. Hanger, Outer Layer, Mid/Trailing – LHS 54XX x 2
87. Hanger, Outer Layer, Mid/Trailing – RHS 54XX x 2
88. Hanger, Outer layer, Leading – LHS 64XX x 1
89. Hanger Outer Layer, Leading – RHS 64XX x 1
90. Hanger, Outer Layer, Mid/Trailing – LHS 64XX x 2
91. Hanger, Outer Layer, Mid/Trailing – RHS 64XX x 2
92. Brake Hanger Front Layer – LHS 74XX x3
93. Brake Hanger Front Layer – RHS 74XX x3
94. Hanger Detail – 54XX LHS x 3
95. Hanger Detail – 54XX RHS x 3
96. Hanger Detail – 64XX LHS x 3
97. Hanger Detail – 64XX RHS x 3
98. Hanger Detail – 74XX x 6
99. Crankpin Washer (x6)
100. Brake Pull Rod 54XX (x2)
101. Brake Pull Rod 64/74XX (x2)
102. Pull Rod Fork (x4)
103. Pull Rod Detail (x4)
104. Handbrake Lever
105. Handbrake Lever Detail
106. Handbrake Crank Detail
107. Actuator
108. Brakeshaft Spacer
109. Set-up Bars (x2)
110. Front Sandbox LHS
111. Front Sandbox RHS
112. Rear Sandbox LHS
113. Rear Sandbox
114. Balance Weight, Front/Rear 54XX (x4)
115. Balance Weight, Midway 54XX (x2)
116. Balance Weight, Front/Rear 64/74XX (x4)
117. Balance Weight, Midway 64/74XX (x2)
118. Gearbox
119. Stage 1 Spacer
120. Idler Shaft Spacers

CHASSIS KIT FOR GWR 54/64/74XX



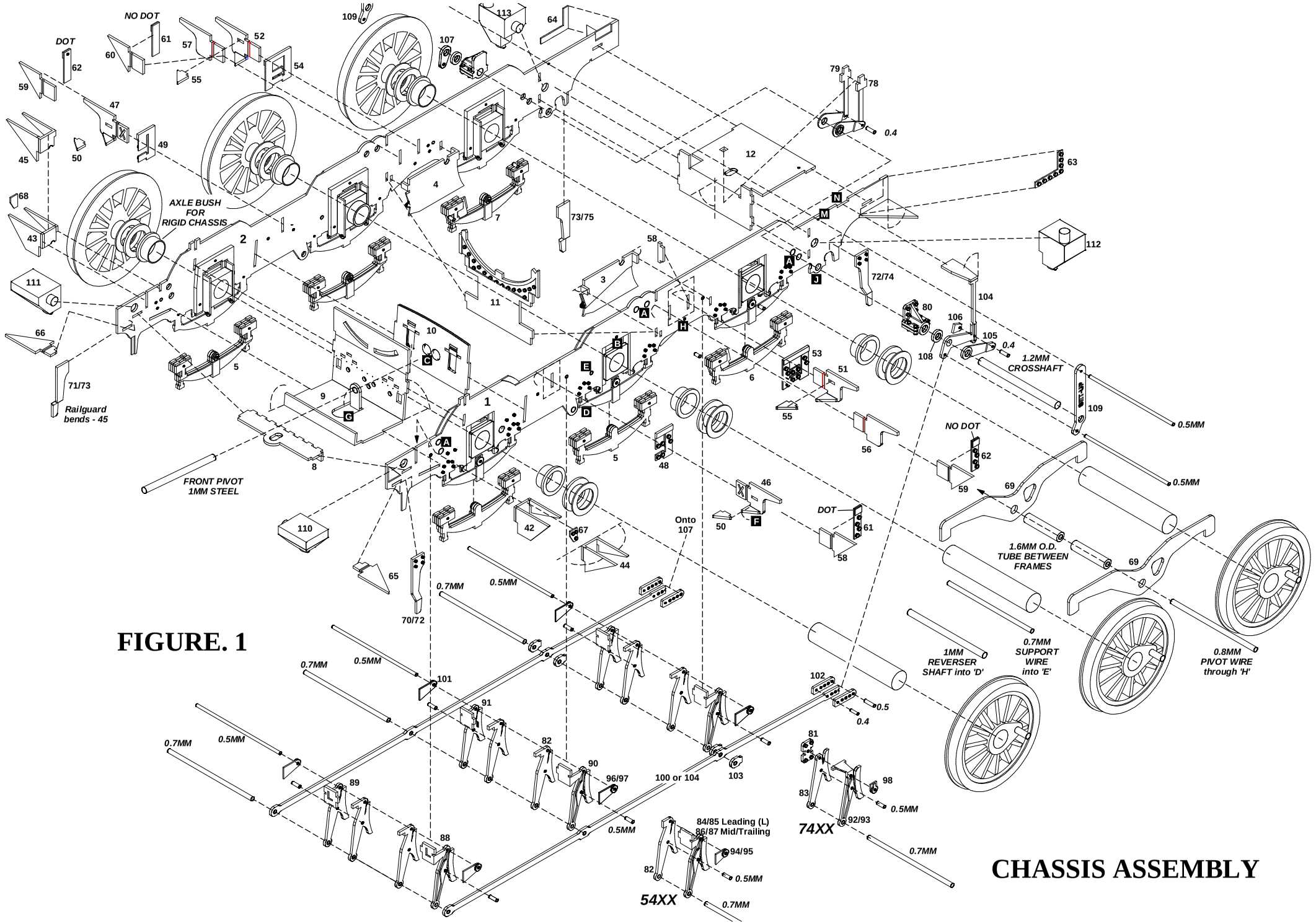


FIGURE. 1

CHASSIS ASSEMBLY

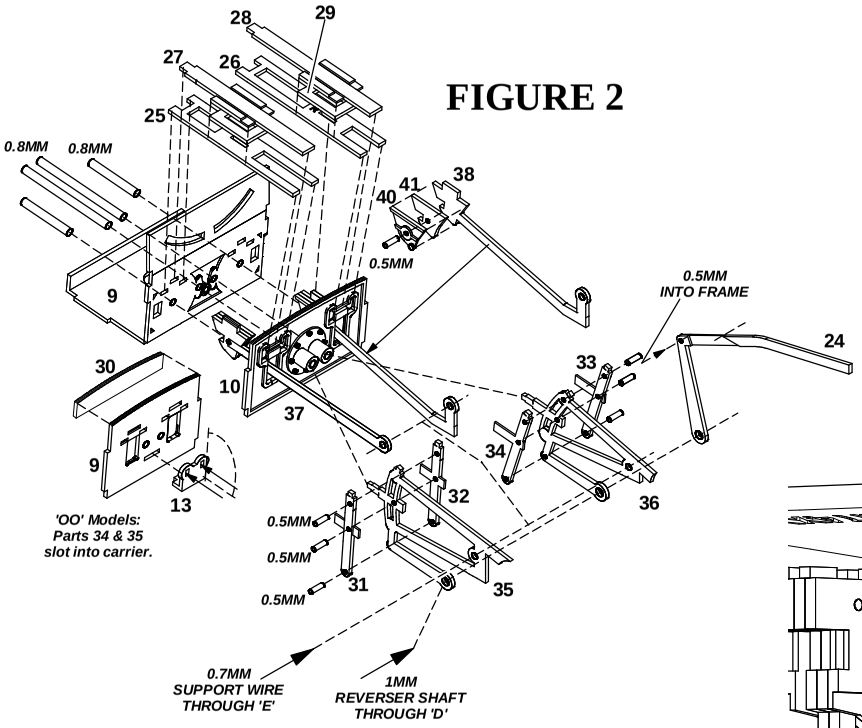


FIGURE 2

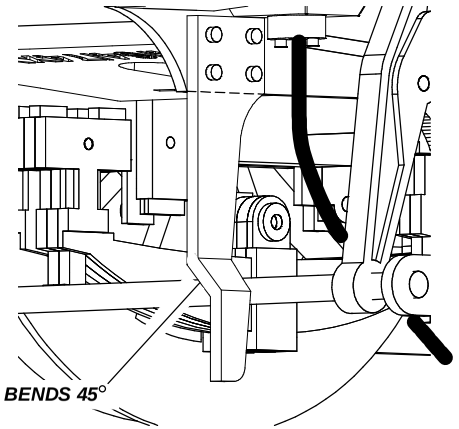


FIG.6

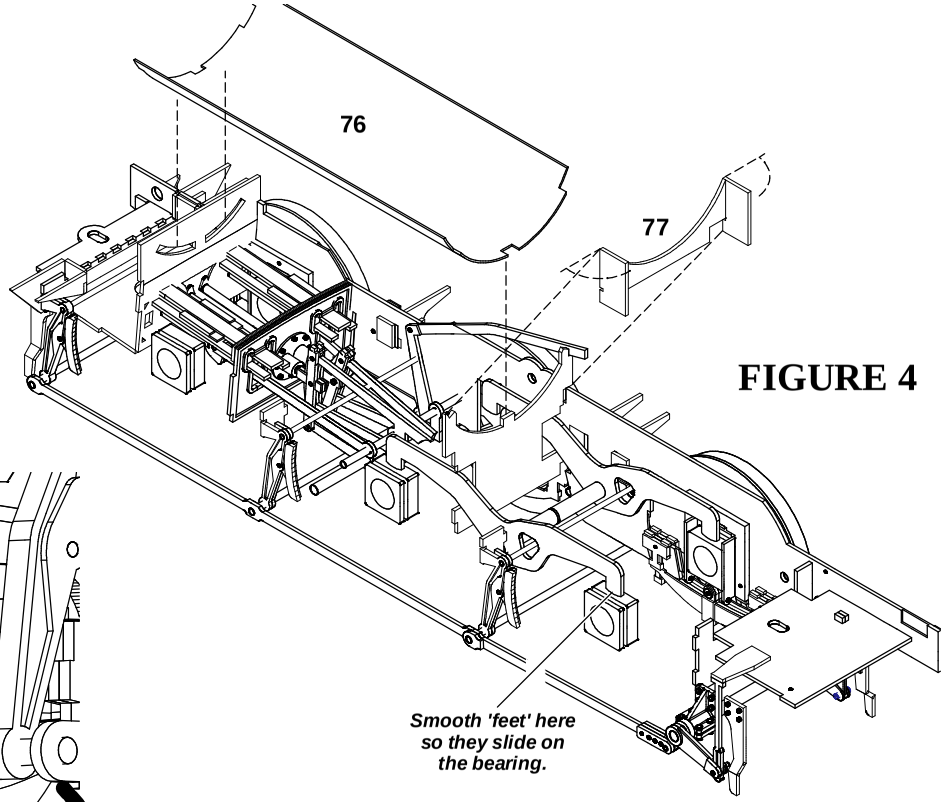


FIGURE 4

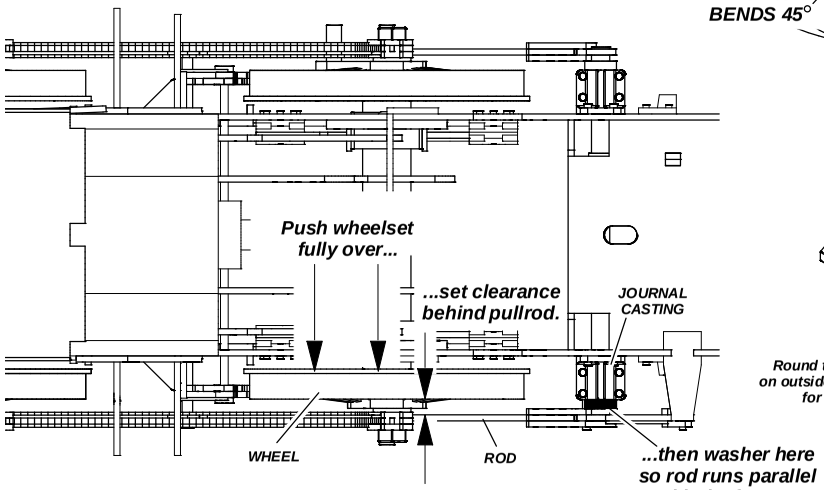


FIGURE 5

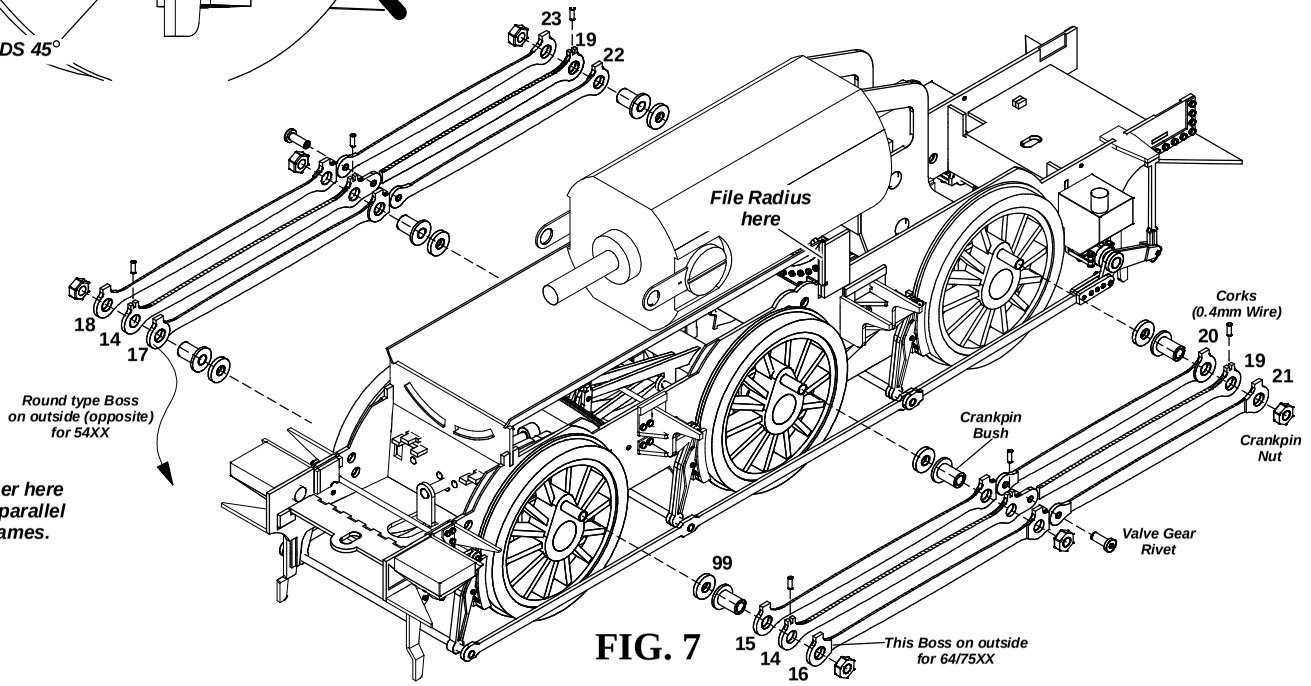


FIG. 7

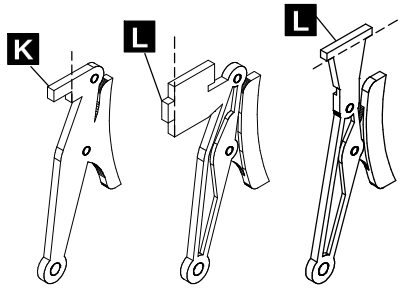


FIG.8

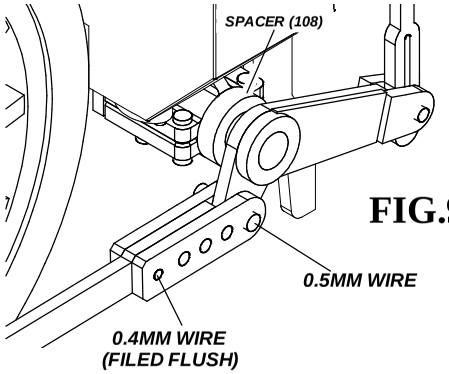
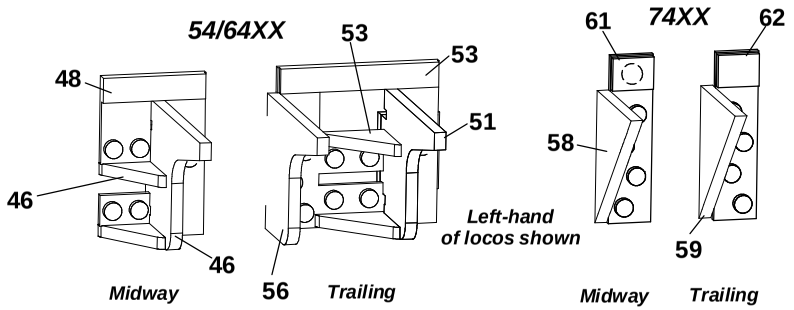


FIG.9

FIG.10



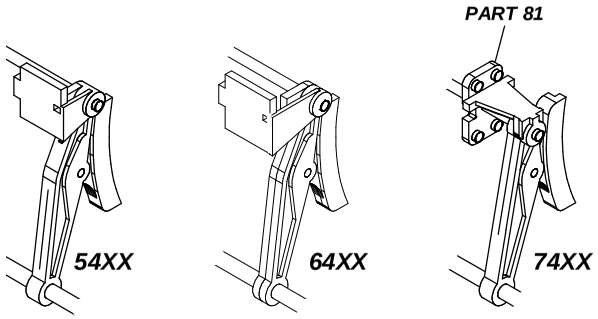


FIGURE 11

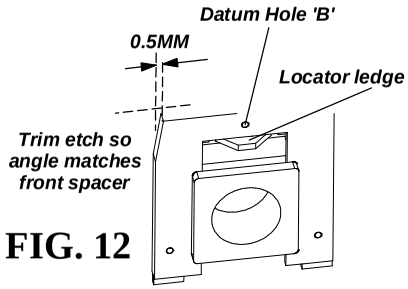


FIG. 12

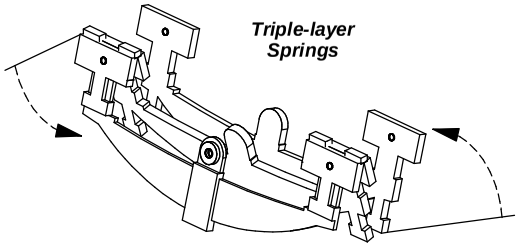


FIG. 13

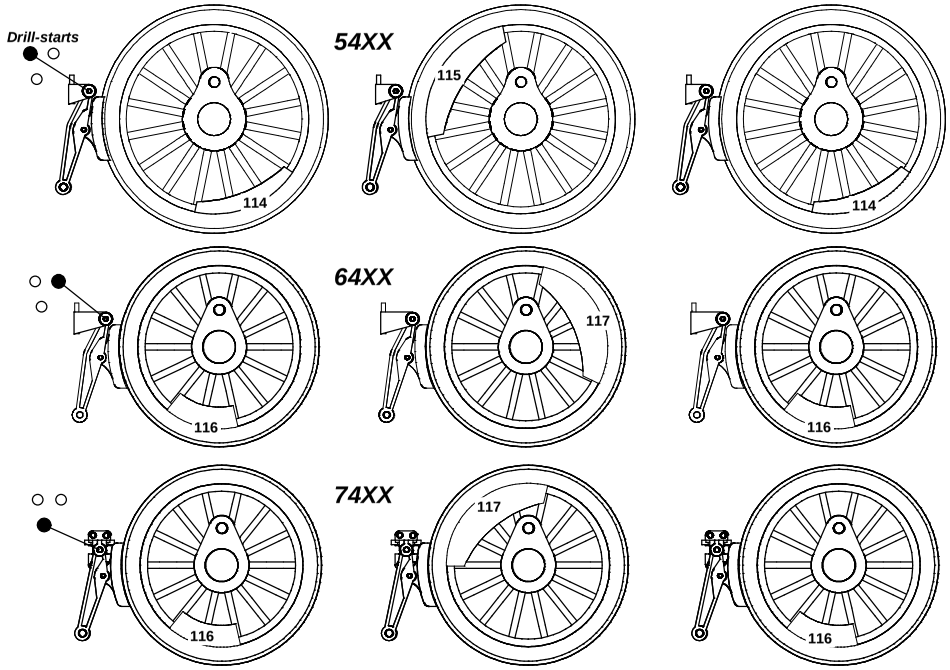
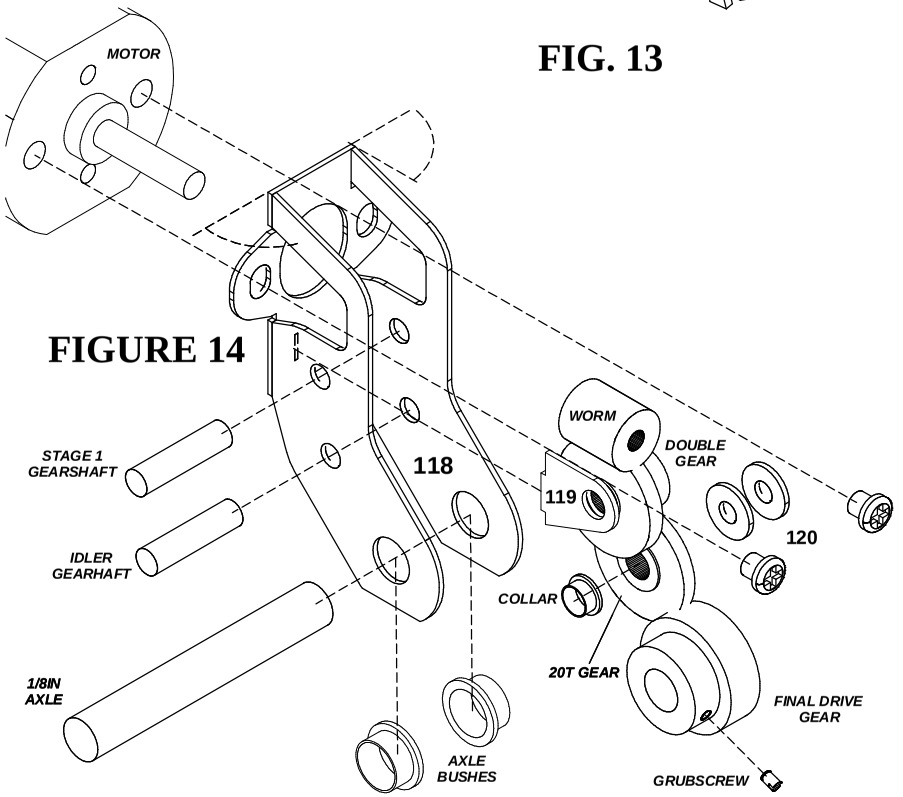


FIGURE 14



HIGH LEVEL

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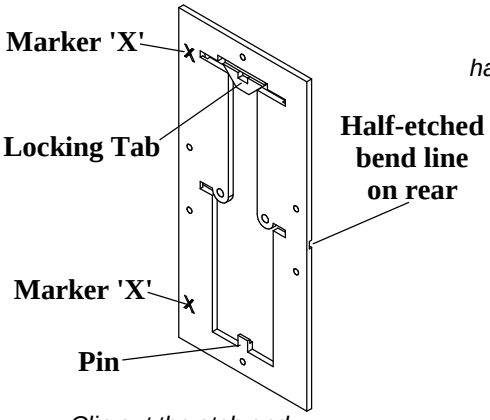
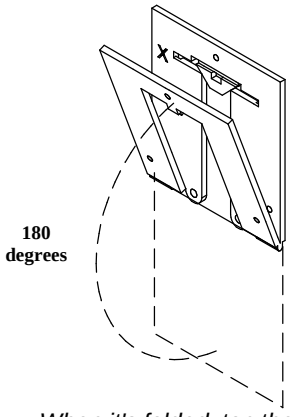


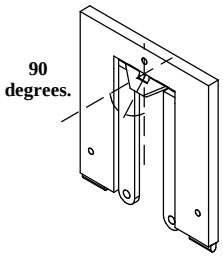
Clip out the etch and clean off any mounting tabs.

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

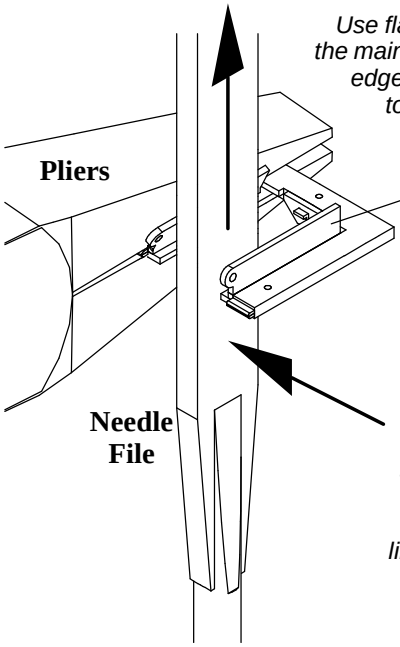


When it's folded, tap the layers between two pieces of hardwood, so they sit absolutely flat.

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

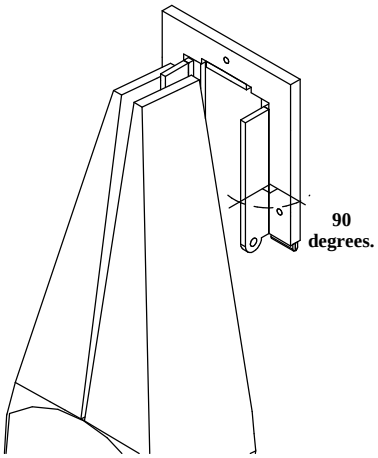


The end of a flat, pointed needle file is a good tool for this job. The tab locks the layers together, eliminating the need for solder.



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



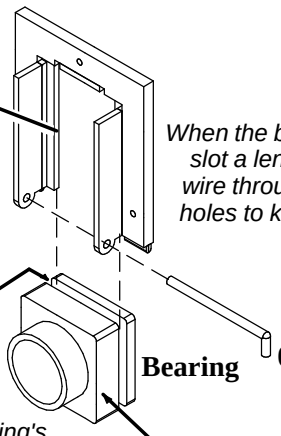
Finish off the horncheek bends so they are at 90 degrees. Check this through a magnifying glass and adjust as necessary.

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.

If the bearing's tight in the etch, check that these edges aren't 'bottoming out' in the groove...

...If they are, use a file to remove the sharp 'cusp' from the edge of the etch...

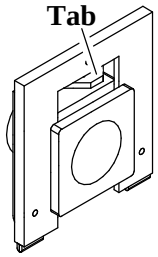
... so there is clearance in this groove...



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

...then polish the bearing's side faces until it's a smooth, sliding fit in the etch.

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 top edge of the cut-outs on most loco chassis is 4mm above the axle centre. If the Standard Hornblock's tab is butted up to the top of the cut-out, the unit will sit at the correct height.

For MiniBlox, the top edge of the tab is 3mm above the axle centreline.

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