



LYR Battery Electric Locomotive

Battery electric locomotives were cheap to build and economical to operate, finding favour with a wide range of industries and public utilities. Some looked like nothing on earth but the little 'steeple cab' engines were very appealing. Though varying in size and shape, all followed a similar pattern and our model depicts one built by the Lancashire & Yorkshire Railway in 1917. Carrying the number 2, it worked at the LYR-owned power station at Clifton Junction, which generated current for the Manchester-Bury electrified line.

LYR No 2 was 21ft 11in long over buffers, weighed just under 18 tons and had a wheelbase of 9ft. It was driven by two 18hp traction motors supplied by British Thompson Houston, who were responsible for much of the power station's electrical plant. The battery locomotive was designed to handle up to four 20T bottom-discharge hopper wagons at a time. These steel-bodied wagons, specially designed for supplying coal to the LYR power stations, were vacuum-fitted and No. 2's braking system used electrically driven vacuum exhausters, which was unusual for a small industrial locomotive. Its maximum speed would have been about 15mph, which is about the same as the model's.

Around 1933 the loco was despatched to Scotland but by 1948 it was on the scrap line at Derby, still in its unique (and by then very faded) LYR 'passenger' livery of black, lined in white and red and carrying small L&Y crests on the bonnet sides - originally they had been to the left of the cab doors. It was unquestionably the last working engine in Britain to retain pre-group livery.

Little is known about this locomotive and no drawing appears to survive. The dimensions of the model have been derived from careful study of the few available photographs. Although we know of no exact equivalent in industrial service - and certainly none that was vacuum-braked - its general appearance is typical of many battery electric locomotives built between 1910 and 1940. There were overhead-supply locomotives of very similar outline which could be modelled using the High Level kit as the basis.

This kit is designed to take the Mashima 1220 can motor and 12mm diameter, 10 spoke wagon wheels - the prototype had solid-spoke wheels, but most other locomotives of this type had the open-spoke pattern.

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 way they go together. We have tried to make these instructions as comprehensive as possible, which may make some assembly sequences appear more complex than they actually are. The kit can be built to OO/EM/P4 without modification.

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. Except where you have a visible outside edge, such as along the footplate, it is advisable not to file off the cusp around the edges of components, especially with dimensionally-critical parts such as the cab and bonnet frames. The slight alteration to their dimensions could be enough to affect the way they integrate with other parts.

We built a number of kits from test etches - and revised the artwork accordingly - before we were satisfied that every part fits as it should, first time. Other than the routine filing-off of tabs as parts are detached from the frets, you shouldn't need to modify any of the components in any way. If something isn't right, think twice before reaching for a file. Any problem getting parts to fit is likely to be caused by errors earlier in the assembly sequence. Backtrack through your work and look for things like excess solder blocking location slots, tabs not fully filed off or alignments that are not quite true. If you try to 'correct' any of the components, you might well make more trouble for yourself.

The brass sheet material used for etching is supplied as a roll, and this can cause some of the components – particularly the larger, half-etched parts – to curve slightly when separated from the main fret. Check all etched parts for flatness and tweak as necessary before use.

All fold lines are etched on the inside of the bends. When soldering parts in place, tack-solder first in one spot only, and then check that everything is as it should be before final soldering along the joint. Moving a part that isn't aligned correctly can be difficult if it has been tack-soldered at more than one point. As always, plan ahead and think through every move before soldering parts together. If you are patient and careful, you will find that building this scale model locomotive becomes an immensely rewarding experience.

We recommend solder assembly throughout, using a resistance soldering unit and/or a 25w iron. If you prefer to glue the details, do so only when soldering of the main superstructure is complete. Heat from the iron will destroy glued bonds.

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 BODYWORK

Remove the various details from the centre of the footplate (1) and solder M2 nuts over the holes, as shown in Figure 1. The easiest way to do this is to push the bolt through first and then tighten the nut until it is almost home. Put some oil on the thread and then fully tighten the nut - the oil will keep solder away. Make sure the flats on the nuts are positioned so they don't overhang the bonnet location slots in the footplate.

Cut a length of stripwood (a lolly stick is perfect) about 45mm long. With the footplate held in a vice or in bending bars, use it to bend up the footplate strengtheners (A). Hold the stick parallel with the footplate, along its length and bend up all the strengthener at one go.

Refer to Figure 12. Remove the washers from the centre of the cab frame (2) and store them. Bend the switchgear boxes (3 & 4) to shape, clip them in place on the inside faces of the cab frame ends (the same side as the bend lines) and secure them with solder. The narrower box should be fitted to the end with the circular marker 'B'.

Now bend up the cab frame – sides first, then the ends. Fit the tabs along the bottom edges into the slots in the footplate (Figure 1) check they are all fully home and then solder from below. If necessary, run a little solder along the inside corners, eliminating all gaps. Be careful not to get any solder in any of the other slots.

Cut glazing material (not supplied) so it fits snugly into the window spaces in the cab frame (when the cab overlays are fitted a rebate is formed). Put this 'window glass' to one side until painting is complete. Now position the cab overlays (5 x2 & 6 x2) accurately over the cab frame - ends first, followed by the sides. Carefully solder them one at a time from the inside, through the openings in the frame, using the lolly stick to hold them in place. The outer edges of the cab ends should be flush with the frame sides and the cab sides should overlap the ends, as shown in Figure 13.

The small circular marker 'B' at the top of the cab frame shows the end of the loco to which the handbrake should be fitted. Using the drill start 'C' in the cab end overlay, drill a 1mm hole through into the cab frame and then deburr the hole. The handbrake wheel (part 7 – see Fig. 2) can be soldered into the hole now, or glued in place after painting.

Bend the bonnet frames (8 x2) to shape and fit them in place. There's no need to solder along the top surface of the bonnet frames, where they meet the cab. Now fit the bonnet sides (9 x2) (10 x2) into their location slots. Make sure the tabs are fully home and then, using the lolly stick to hold them in place, solder the sides to the frame.

Clean out any slots that may have become clogged with solder and file off any tabs, so that the underside of the footplate is completely smooth. Give the body a good scrub with household cleaner, paying particular attention to the inside of the body to get rid of all built-up flux deposits.

While the parts are still in the fret, scribe a fairly deep line ('D') across the bonnet tops (11 x2) as shown in the fret diagram, and also in Figures 1 and 2. Now remove them from the fret and form the curves in the bonnet tops by bending the half-etched ribbed area around a rod of approximately 1/8in diameter (ribs on the inside of the curve). Do these curves a bit at a time, trying them in place on the bonnet sides as you do so. Use flat-nosed pliers to get the vertical portions to the correct angle. The tabs on the bonnet tops locate into the slots in the cab fronts. Pay particular attention to the shape and position of the bend, otherwise you could end up with a gap at the top and bottom edges.

When satisfied with their shape, solder the bonnet tops in place from inside the cab, and then solder the front section into the slots in the footplate. Working from inside the bonnet, solder the bonnet frames to the tops for extra strength. Once again, thoroughly clean the inside of the bodyshell to get rid of all flux deposits.

Note the orientation of the holes for the cab fittings and clip the cab floor (12) into place and solder from below.

Form the rivets on the bufferbeams (13 x2) - a row of practice rivets is included along the edge of the fret. For an industrial engine, which wouldn't have had brakepipes fitted, file off the small pipe brackets, along the bottom edge of the beam. Solder the beams in place in the rebates, on the underside of the footplate. Add the coupling details (14 x2) to the beams. Add the coupling hooks (not supplied) - finescale or 'working'.

Carefully fold up the bottom steps on the side valances (15 x2) and then offer them up, tucking them in behind the buffer beams - depending on the fit of the beams, you may need to trim the valance ends very slightly.

Attach the valances to the footplate, making sure the footplate is flat while you are doing this. Tack-solder at one end first, check for distortion then do the same at the other end, and then at the centre. Now tack-solder at regular intervals along the valance. Check that the footplate is still level, that the valances are straight and that there are no gaps between valances and footplate. When satisfied, work on a short length at a time and run the tacks of solder into one another - heat only short lengths of the valance at any one time to prevent buckling. Solder the end (16 x8) and middle (17 x4) footsteps in place and check everything is square. Note that the centre footsteps are wider than the others.

Open up the buffer locations so the buffers (18 x4) are a snug fit. Make sure the mounting bolts on the buffer flanges are in the correct position - i.e. one at 12 o'clock and one 6 o'clock - and then solder them in place. Grind the excess locator pegs off so they are flush at the back.

Form the rivet detail on the sideframes (19) and drill out the step brace holes ('E') to 0.5mm. Bend the frames to shape, making sure the sides are at a true right angle. Position the locator tabs accurately in the slots under the footplate and then solder the whole unit in place.

Add the cast spring/axleboxes (20 x4) and file the mounting stubs flush (Fig. 2). Drill out the holes in the axleboxes and fit a short length of 0.5mm wire into them. Use the wires to locate the axlebox covers (21 x4) and secure in place. Now trim the wires so they protrude about 0.4mm beyond the covers.

Working from above, drill out the four sandbox filler location holes in the footplate, using the drill starts provided ('F' - Fig 1). Drill them right through, and then use the same drill-bit to open out the 6 brace holes (G) in the steps.

Refer to Figures 2 and 14. Take a length of 0.5mm wire, approximately 30mm long, and make a short bend of about 75° at one end. Slot the straight end of this wire through the sandbox filler hole 'F' in the footplate and then manoeuvre the bent end through the hole 'G' at the back of the steps. Use pliers to pull the wire through until the bend is right up against the back of the steps. Check the steps are vertical, adjust if necessary, and then solder the wire into the steps. Now solder the top of the wire into the footplate and then tweak the top portion so it is vertical.

Slot a sandbox filler lid (22 x4) over the top end of the wire, solder in place on the footplate and then trim the wire so it is about 0.7mm proud of the sandbox lid. Finally, grind the bottom end of the wire flush with the front face of the step (or leave it slightly proud to represent a bolt head). Repeat this whole operation at all four corners of the loco.

To brace the middle steps, push a short length of 0.5mm wire through the holes in the steps and into the hole 'E' in the sideframes, solder in place and then trim the wire, as above.

Make a bend in 2 short lengths of 0.4mm wire and solder these in place to represent the cab door handles as shown in Figure 2. Do the same for the bonnet handles (x4). Use straight lengths of the same wire for the bonnet catches (x4) which should sit very slightly proud of the bonnet surface.

Handrails

Refer to the fret diagram and locate the handrail jig (H). Drill out the small holes to 0.5mm, solder three short lengths of wire into them and then cut the wires so they protrude by about 1mm at one side of the etch (see Figure 15). Open up the larger hole until a length of 2mm rod is a push fit, solder this in place and trim as above. You now have a jig, which can be used to bend the handrails to shape.

To form the handrails, first, pull a length of 0.4mm wire (not annealed) tightly around a separate length of the 2mm rod to make a 180° bend. Now place this wire on the jig, as shown, and make the two sharper bends. For the bonnet handrails bend the wire at 'J' and for the cab sides use 'K'. Finally, remove the wire, tweak it as necessary and trim the 'tails' to length.

Drill out the handrail locations, illustrated in Figure 2, to 0.4mm. Slot short lengths of 0.4mm wire into the 4 holes (L) on the cab sides, but do not solder these in place. These wires are braces for the long cab handrails. A stronger, although much more obtrusive, alternative would be to fit a short handrail knob (not supplied) at these locations.

The bonnet side handrails have small triangular braces (23 x4) which should be slotted onto the wires after bending, but before fitting.

To fit the handrails, slot the 'tails' into the small notches in the motor bogie sideframes (this allows the handrails to be soldered in place from the inside and avoids getting solder on the sideframe detail) and the tops of the wires into their locations in the cab or bonnet sides. Solder the handrails in place, making sure they are vertical and straight.

Carefully position the bonnet side handrail braces (which should already be slotted onto the wires) and solder them to the top surface of the footplate, and then to the handrails themselves. Butt-solder the short brace wires to the back of the cabside handrails and into the cab side, then trim off the excess from inside the cab.

Shape lengths of 0.4mm wire to form the short handrails at the bonnet ends and solder these in place so there is a gap of about 0.5mm behind them.

Final details

Refer to figures 2 and 14. If you're building a LYR loco, solder the vacuum pipes (24 x2) in place on the bufferbeams. You may need to file small cutaways at the footplate ends in order to allow the pipes to be soldered hard up against the beam faces. Omit this stage for a purely industrial engine. Bend a length of 0.7mm wire into an 'L' shape. Now trim the ends of the wire to length, so that one end butts up against the vertical vacuum pipe while the other runs along the inner edge of the sideframe. Solder the wire in place, onto the small lugs on the beam, and then trim the bottom of the vacuum pipe flush with the wire. Both beams are exactly the same.

Refer to Figure 1 and locate the drill starts 'M' under the footplate. Choose the one at the same end of the loco as the circular marker 'B' and drill it out to 0.7mm. Now shape a length of wire 'N', as illustrated in Figures 2 and 17. Push the wire into the hole and position it so it sits at about 45 degrees to the footplate edge and about 3mm below it. The long end of the wire should run through the frame cutaway. Solder the wire in place and trim or bend the end of the wire so it doesn't foul the mechanism.

Bend the cab lamp irons (25 x2) through 90 degrees, drill out their location holes and then using an iron with a small tip, solder them in place on the cab fronts (Fig. 2). Use tweezers to slot the 'L' shaped footplate corner lamp irons (26 x 4) and the 'T' shaped footplate centre lamp irons (27 x2) up through the footplate and secure them into their locations. Industrial locomotives may not have carried these.

The number plates (28 x2) can be soldered on now, or glued on after painting. Position them so they sit centrally on the cabside sections, with the middle of the plate about 8mm above the footplate.

Before any more detail goes on, it might be a good idea to add weight to the body - chop up some lead flashing and pack it inside the bonnets, being careful to leave sufficient clearance for the mechanism. Secure by dribbling on plenty of impact adhesive or PVA and leave to dry. The ideal weight of the completed loco should be in the region of 100g (3 1/2 - 4 oz). You could make it considerably heavier, but there is little to be gained from this and it will probably place an undue strain on the motor. See how it runs with the body in place and decide for yourself.

Although the following detail parts can be added now, we recommend that you do so after painting. This allows the loco and details to be painted separately. Paint the loco body the colour of your choice. The cab interior should be a lightish colour, but we recommend that the (false) cab floor should be matt black so it 'disappears' into the darkness. When the loco is dry fit the glazing into the rebates inside the cab.

Detail the consoles (29 x2) using 0.4mm wire to locate the controller levers (30 x2) and a short, bent length of the same wire represent the brake handles. Paint the console assembly and the equipment box details (31 & 32) and then glue them in place, onto their boxes inside the cab. The narrow detail should be fitted at the end of the loco with the circular marker (B).

Finally, bend the cab roof (33) to shape and, using a suitable adhesive, fix it centrally on the cab.

ASSEMBLING THE MOTOR BOGIE

Before cutting the motor bogie (34) the rear motor anchor (35) and compensation beams (36) from the fret, carefully open up the holes to the sizes shown in the fret diagram, using a tapered cutting broach or a rat-tailed file rotated anti-clockwise. Gearshafts and bearings should be a tight push-fit - check they will fit snugly, but don't on any account make them too loose. Deburr, using a drill bit of much larger diameter than the hole size.

In order to accurately align the motor, it is essential that the motor fixing screws are a good fit in their holes, Carefully open out the motor mounting screw holes until the screws supplied with the motor are a snug fit in them.

Study Figures 3 – 6 before folding up the motor bogie etch (Figure 3) - use bending bars if you have them, smooth-jawed pliers if you don't. Form the end pieces first, followed by the front motor mounting plate, then the sides and finally engage the tabs with the slots. Watch out for the small crosshaft pivots – they should fold down as the sides fold up.

Check everything is square and true, then solder all the tabs using a piece of wood to push the joints together where necessary. Push the length of silver steel rod through each pair of gearshaft holes to confirm everything is square - if it won't go through, the shell of the motor bogie hasn't been folded up accurately enough. Light finger-tweaking should put things right but, whatever you do, don't open out the holes any further as this will result in poor gear meshing.

Fit 2mm bearings into the four axle holes, but only solder the rear pair in place. Fit an axle through the front pair, then cut a 12mm length of 1.5mm diameter rod to act as a pivot. File one end to a wedge shape to clear the gear (see Fig. 4) and push it through the hole in the front of the motor bogie so it rests on the axle, overhanging by no more than 0.5mm. Check the bearings haven't come loose and then solder the pivot rod in place. Remove the axle and front bearings.

Curve the traction motor covers (37 – Fig. 7) to match the profile of the motor bogie and put them to one side (they are best fitted after the gears). Making a smooth bend on short lengths like this can be tricky. An easy way of doing this is to bend the cover around a rod, which has a much smaller diameter than that which you require. Use pliers to tweak the ends as necessary. Now press the cover over another rod which has the diameter you are aiming for (in this case about 9mm), rolling it on the bench to iron out any kinks. The cover should now be a good fit on the motor bogie.

Solder the 1.5mm bearing to the rear motor anchor and then fold it to shape, as shown in Figure 3. Check for squareness by pushing a length of rod through the shaft holes. Solder one 2mm bearing into each of the compensation beams and file the non-shouldered end of the bush flush with the etch.

Drill out the crossshaft components to suit the wire sizes shown in Figure 16. Cut a 20mm length of 1mm diameter wire (to represent the brake crossshaft) and slot this through its location at the centre of the motor bogie, fitting the brake lever (38) as you do so (also see Figures 4 & 7). Make a sharp bend in a short length of 0.5mm wire, slot the straight end up into its location hole in the underside of the motor bogie and then fit the bent end into the small hole in the end of the handbrake lever. Adjust the lever until it sits approximately horizontal and runs parallel with the motor bogie sides, then solder it in place on the shaft. Solder the wire into the lever and into the underside of the motor bogie and then trim the end so it is just proud of the lever face.

The spacing arrangements for the crossshaft components are different, depending on the gauge modelled. Whatever gauge you model, study Figures 8 and 9, and read both sections (below) before starting work.

For a 'OO' motor bogie, fit a small spacer washer (39 x2), followed by an actuator lever (40 x4) and then finally a journal (41 x2), onto either end of the cross shaft (Fig. 8). Push a lightly-oiled length of 0.5mm wire through the top holes (including the holes in the motor bogie) to line up the parts, which should be pushed hard up against the motor bogie sides with the actuators lying vertically. Now carefully solder the parts to the shaft, taking great care not to solder the top wire in place. Remove the 0.5mm wire and trim the ends of the cross shaft so they are just proud of the journals.

For EM/P4, first, trim the material from the bottom of the dummy actuators (which are part of the motor bogie) shaping the bottoms into a semi-circle, as illustrated in Figure 9. The rest of the procedure is similar to above, but with an additional actuator lever at either side (see Figure 9). Slot the parts onto the crossshaft and position them – this time, away from the motor bogie sides (see gap 'X'). Slot the top wire through to line up the bits and then carefully solder the components in place on the shaft. As with the 'OO' model, take great care not to solder the wire in position.

Give the completed motor bogie a good scrub and paint the outside of it matt black, along with the traction motor covers and the rear motor anchor. Set aside to dry. There's no need to paint the compensation beams.

Fitting the gears - forward (compensated) end

Study Figures 7, 10 & 11. Identify the four spacer collars - to avoid confusion, it's a good idea to 'colour code' them using felt tip pens. Cut four 13mm lengths of 2mm diameter rod. Check the axle will pass easily through the bushed holes in the compensation beams and ease the holes if necessary.

Insert the stage 1 gearshaft at the front end of the motor bogie and thread on the No.1 collar and one of the 27/10T. gears. The larger diameter part of this gear should be exactly centred on the shaft, directly under where the worm will run. Check that it doesn't foul the pivot beam - if it does, file a bit more off the top of the beam until it clears (see Fig 4). Now fit the stage 2 gearshaft, along with the compensation beams (shoulders on the bushes facing inwards) a No. 2 and a No. 3 spacer collar and the 20/10T. double gear.

Before fitting the 18T final drive gears, you may wish to ease the holes very slightly with a reamer - they are an interference fit on the axle, and may be too tight for comfort.

Using fine wet-and-dry paper, remove the chemical blackening from the tyres of the wheels - this will improve current collection. Remove both wheels from the axle and file off the pin-point ends and file a small chamfer on the axle ends - this will make it easier to push through the gear.

Push the axle through the right hand side of the motor bogie, through the bush in the right hand compensation beam and into the 18T gear, which should be held in place between your fingers. This gear meshes with the 20/10T. gear and the thicker boss should be on the left. Hold the motor bogie over a firm flat surface, left side up, and, looking down through the axle holes, line up the axle end (now 'started' in the 18T gear) with the holes in the left-hand compensation beam and in the hole in the motor bogie side. Position your thumbs as close as possible to the axle hole (to prevent the motor bogie side from buckling) and apply downward pressure to the motor bogie, forcing the axle up through the gear, and then through the left-hand beam and sideframe. Do this a bit at a time, constantly checking the position of the gear as you go. When there are equal amounts of the axle visible at either side of the motor bogie, and the 18T. gear is approximately central on the 10-tooth portion of

the stage 2 gear, then the axle and gear are in the correct position (Gap 'A' in Figure 11, should be approximately 0.75mm).

Fitting the gears rear (rigid) end

Fit the rear stage 1 gearshaft, along with a 27/10T. double gear and No 4 collar, slotting the shaft through the motor anchor holes at the same time. Now fit the stage 2 shaft along with the 20/10T. gear. Finally, fit the drive axle and 18T. gear as described for the forward end - this time there are no compensation beams to worry about. This 18T. gear prevents the first and second stage gears from 'wandering' along their shafts. It should be positioned so as to allow a small amount of sideplay for the double gears, when the axle is central in the motor bogie (Gap 'B' in Figure 10, should be no more than 0.3mm)

Finally, add an appropriate number of washers or plastic tube (cut to length) to eliminate all sideplay and fit the wheels at both ends of the motor bogie. Test the motor bogie by pushing it along the track - it should freewheel without sticking.

Fitting the motor

Check that the worms will fit the shafts. Some worms supplied to us are fractionally tighter than others and if they aren't a comfortable push-fit, they can be eased with a tapered reamer. Solder leads to the motor terminals, using the insulated wire provided.

Position the worms on the motor shafts, as shown in Figure 4. Push the rear end of the shaft through the bearing in the motor anchor (which should be tilted up at an angle, as shown in Figure 5). Now swing the front end of the motor down into position, passing the shaft through the slot in the mounting plate, and secure with the screws that came with the motor. Both worms should now mesh with the stage 1 gears. To keep the motor anchor at the correct angle and to stop it 'chattering', push a length of 0.7mm wire through the motor bogie and anchor arms.

When you're happy that everything fits and aligns properly, pull out the motor anchor wire, remove the motor and glue the worms in place on the motor shaft (Cyano or Loctite 601 recommended). Wipe off all surplus adhesive and leave to cure for an hour. In the meantime, secure all the gearshafts with a tiny spot of the same adhesive, making sure the motor anchor can still pivot back and forth - a drop of oil applied on the inside should stop any stray adhesive seeping through.

Fine tuning

When the adhesive has gone off, assemble the mechanism as before, and test-run for half an hour or so, without any additional lubricant. You may find it beneficial to slacken off the motor screws (probably no more than half a turn) until you hear the motor speed up. If the motor runs hot, suggesting extreme friction at the rear motor anchor bearing, then this should cure the problem.

Check there is nothing pressing or pulling on the motor when the body is fitted. Lubricate the gears using a small amount of plastics-compatible grease. 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 Searle ultra-adhesive oil.

Pick-ups.

Fitting pick-ups to the motor bogie is very straightforward – suitably shaped wiper pick-ups (phosphor-bronze or 0.33 hard brass wire) can be run to the wheel rims from copperclad strips glued to both sides of the motor bogie. After being cut to length (allowing a reasonable amount of slack) the motor leads can be run straight down and soldered to the strips.

When you're happy that the model is running OK, bend the ends of the motor anchor wire though 90 degrees and then trim them so they don't short on the wheels. In OO you may have to cut the wire ends flush and secure it in place with a tiny amount of adhesive or tape.

Fit the body temporarily in place and give the loco a test run on the track. You may need to trim some length from the back of the couplings hooks in order to get the bogie to fit. Finally, secure the traction motor covers using a small amount of Cyano adhesive.

Assembling the brakegear

While the hangers (42 x2, 43 x2) are still in the fret, drill out the holes to suit the various wires, as illustrated in Figure 16. Make sure they are a sliding fit in the holes or you'll bend the delicate components when you're trying to assemble them.

Remove the hangers from the fret, fold them over and then bend over the gauge spacers at the top end so they locate on the tabs. Check the assemblies are parallel (try a wire through the holes) tweak as necessary and then solder the tabs in place, keeping the small holes clear. Trim the gauge spacers down to the first stop if modelling in OO - for EM trim off the end stop and for P4, leave them as they are. To represent the brake shoe pivots, push short lengths of 0.5mm wire through the middle holes, solder in place and then trim almost flush at either side.

Slot a length of 0.7mm wire through the top brake hanger holes in the motor bogie and then, noting the brake hanger assemblies are handed, locate them onto the 0.7mm wires and slide them hard up against the motor bogie sides. Check that both sides are hanging vertically and in line with one another, and then solder them in place on the wire – do not solder the wire into the motor bogie. Trim the wire ends almost flush.

The gap between the brake shoes and the tyres will depend on the exact diameter of the wheels you use. To reduce the risk of shorting you can add small pieces of Plasticard suitably shaped, and glued behind the etched brake shoes. As well as providing electrical insulation, this will improve the appearance of the blocks.

Noting that the top (44 x2) and bottom (45 x2) brake rods are different, fit the rods into their locations between the actuators and then slot wires through the holes to hold them. Do not solder the rods in place.

To represent stretcher rods, push a length of 0.7mm wire through the lower holes in the brake hangers, and also through the ends of the brake rods, which should be swung up into position. After checking the hangers are vertical, solder the wire into them and then trim the outer ends so they are just proud of the outer faces of the hangers. Now solder the brake rods in position on the 0.7mm wire - they should run parallel with the motor bogie sides. In OO gauge, the rods must run tight up against the motor bogie as there is very little clearance behind the wheels.

Trim the wires at the bottom of the actuating levers, so the ends are just proud of the outer faces. The top wires don't need to be as short because they are not visible when the body is fitted. Both wires should stay in place themselves, although they can be secured using a tiny amount of varnish at one end only. If, for any reason, the wheels should need to be removed then the wires can be pulled out of the actuators, which will allow the hangers to be swung away from the wheels.

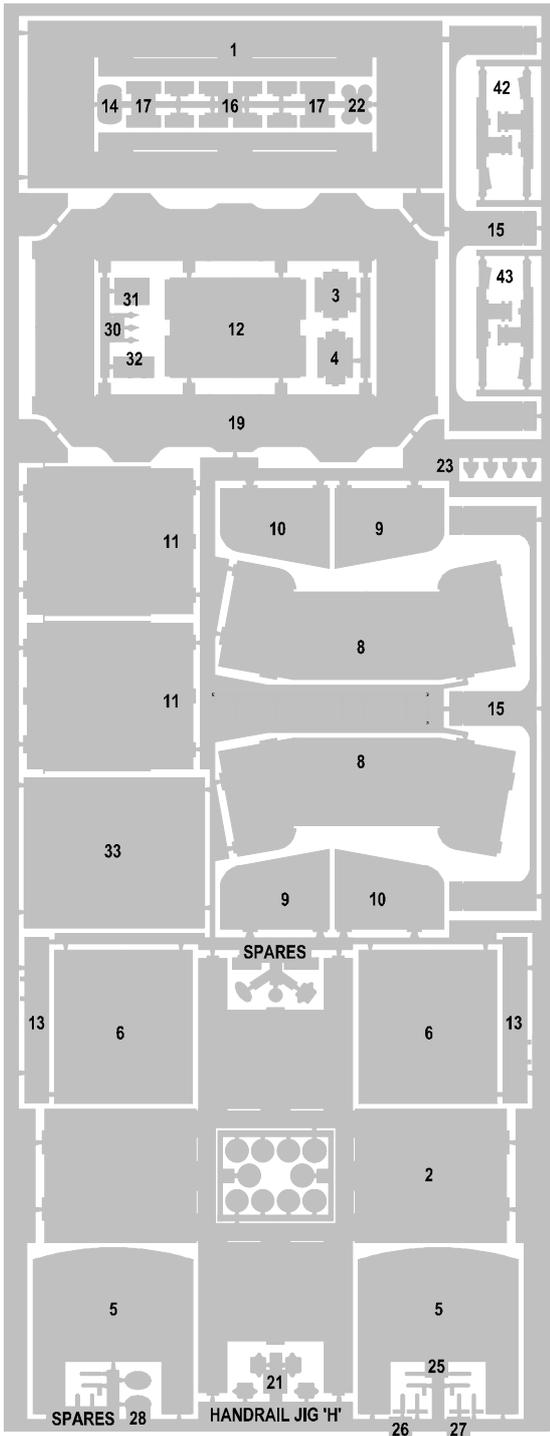
Clean off flux deposits with a cotton bud soaked in meths and give the wheels a wipe at the same time.

Bend up the strengtheners on the sandpipe hangers (46 x2) and then solder two 10mm lengths of annealed 0.5mm wire into each, as illustrated in Figure 6. Slot these assemblies onto their locations at the motor bogie ends and secure using 14B.A. nuts and countersunk bolts (cut to length). Don't over tighten them. Bend the brakepipes to shape, as shown in the diagram, and trim to length.

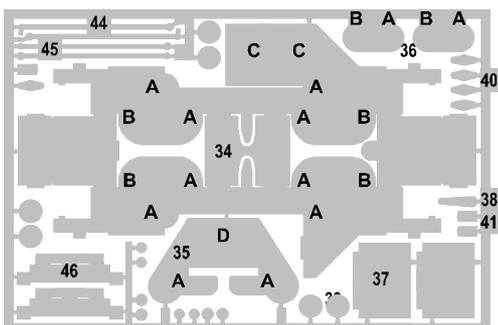
Finally, use two M2 bolts to secure the motor bogie to the body. The brake lever on the motor bogie crossshaft should be at same end of the loco as the brake wheel in the cab. Add any small parts that may still remain to be fitted (number plates, cab fittings etc.) and complete the paintwork.

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LYR BATTERY ELECTRIC LOCOMOTIVE



1. Footplate
2. Cab frame
3. Wide equipment box
4. Narrow equipment box
5. Cab end overlays (x2)
6. Cab side overlays (x2)
7. Handbrake wheel (L/W)
8. Bonnet frames (x2)
9. Bonnet sides (x2)
10. Bonnet sides (x2)
11. Bonnet tops (x2)
12. Cab floor
13. Bufferbeams (x2)
14. Coupling details (x2)
15. Side valances (x2)
16. End footsteps (x8)
17. Middle footsteps (x4)
18. Buffers (x4) (W/M)
19. Sideframes
20. Springs/axleboxes (x4) (W/M)
21. Axlebox covers
22. Sandbox filler lids (x4)
23. Bonnet side handrail braces (x4)
24. Vacuum pipes (x2) (L/W)
25. Cab lamp irons (x2)
26. Footplate corner lamp irons (x4)
27. Footplate centre lamp irons (x2)
28. Number plates (x2)
29. Consoles (x2) (W/M)
30. Controller levers (x2)
31. Wide equipment box detail
32. Narrow equipment box detail
33. Cab roof
34. Motor bogie
35. Rear motor anchor
36. Compensation beams (x2)
37. Traction motor covers (x2)
38. Brake lever
39. Small spacer washers (x2)
40. Actuator levers (x4)
41. Journals (x2)
42. Brake hangers (x2)
43. Brake hangers (x2)
44. Top brake rods (x2)
45. Bottom brake rods (x2)
46. Sandpipe hangers (x2)



MOTOR BOGIE HOLE SIZES

- A – To suit 2mm shaft
- B – To Suit 2mm axle bearing
- C – To suit motor fixing screws
- D – To suit 1.5mm motor shaft bearing

BODY ASSEMBLY

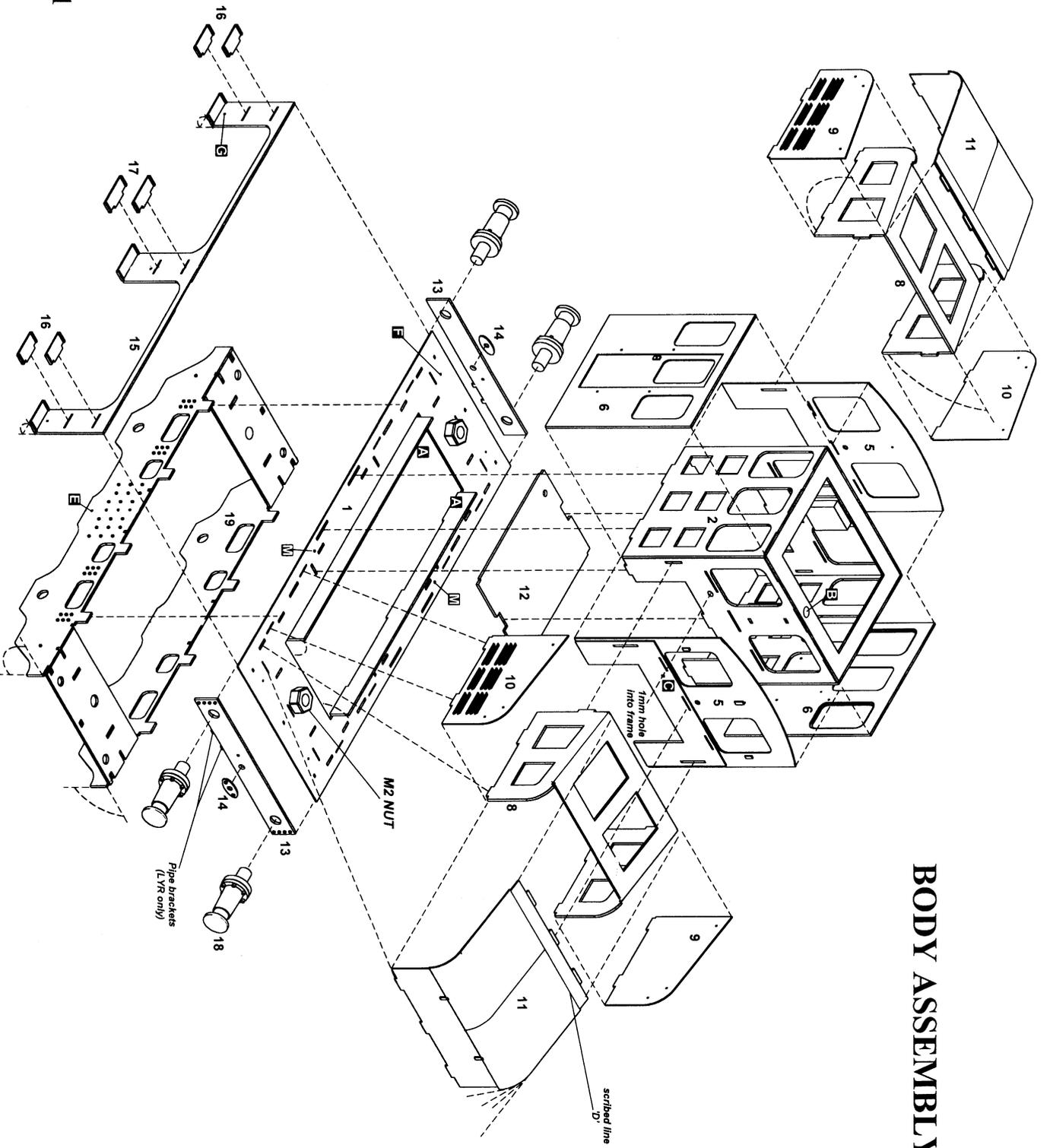


FIGURE 1

BODY DETAILS

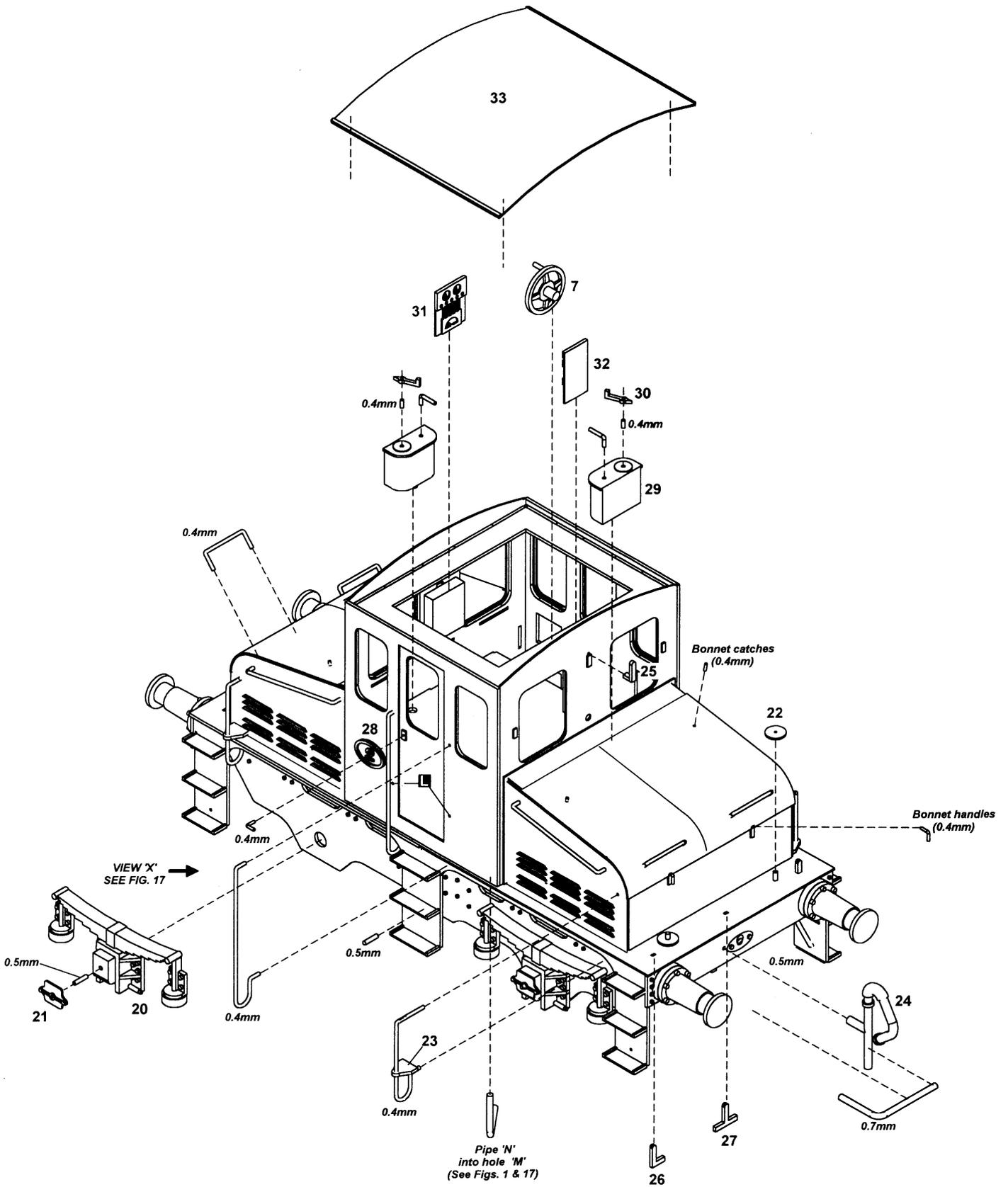


FIGURE 2

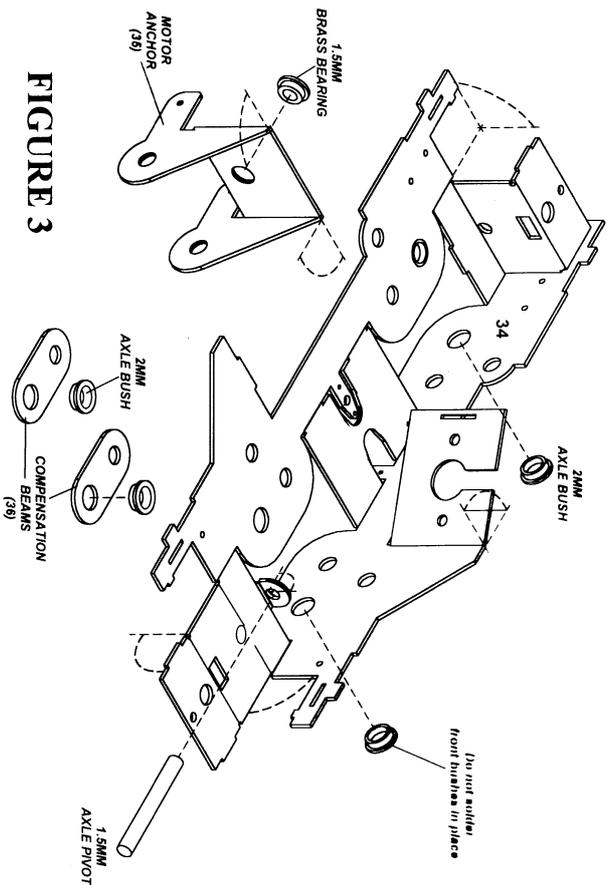


FIGURE 3

MOTOR BOGIE ASSEMBLY

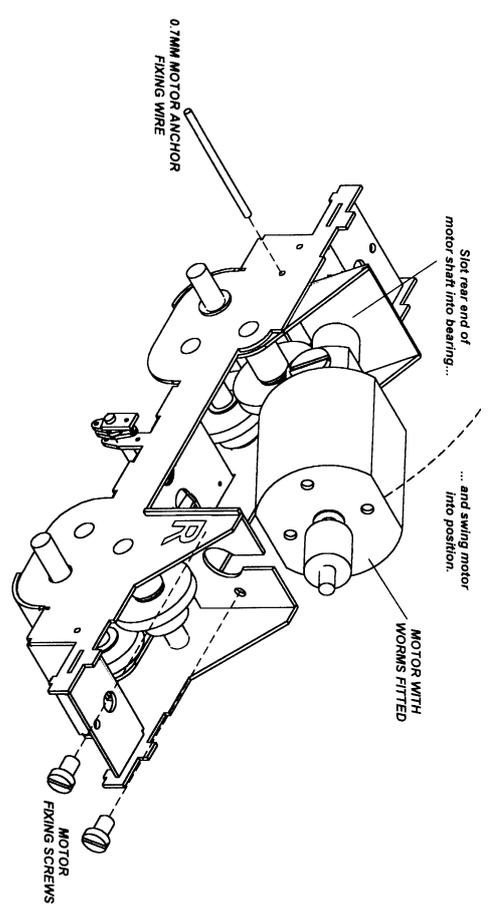


FIGURE 5

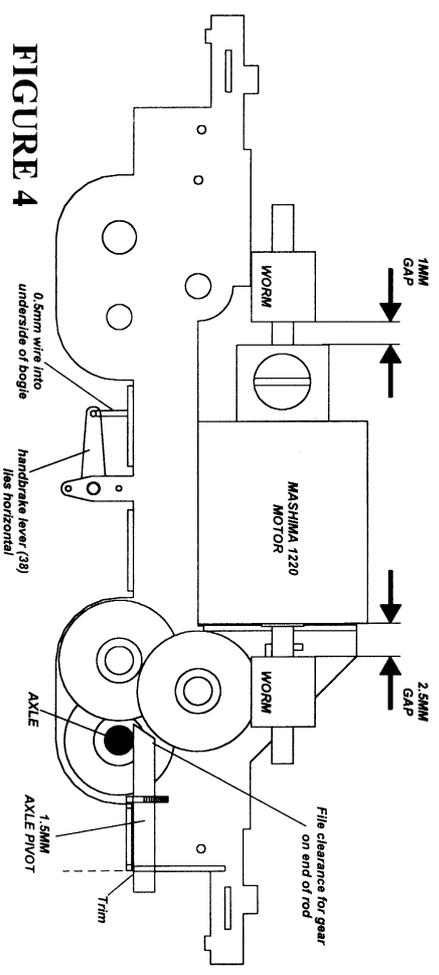


FIGURE 4

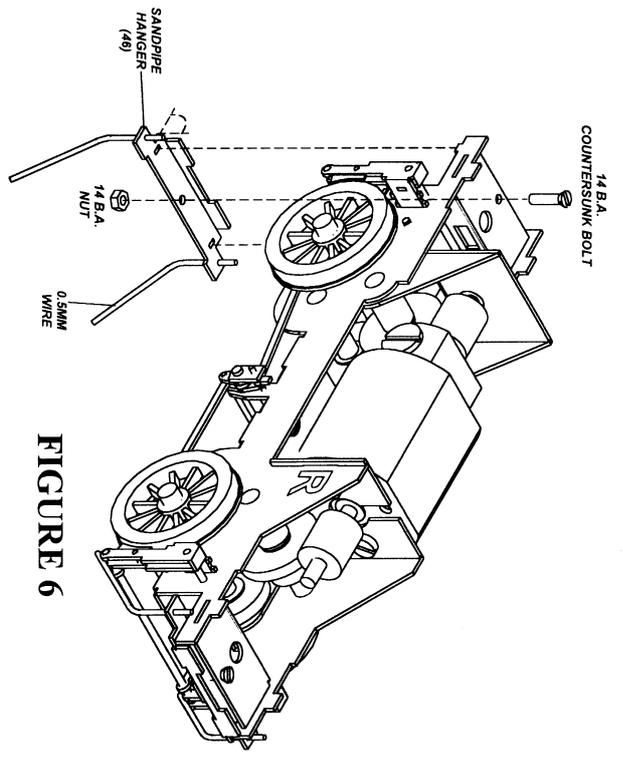
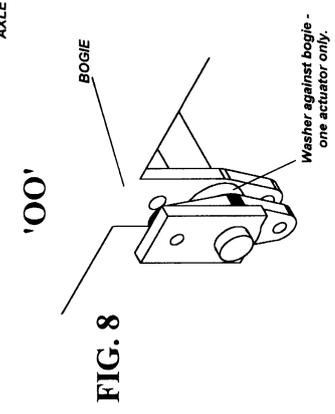
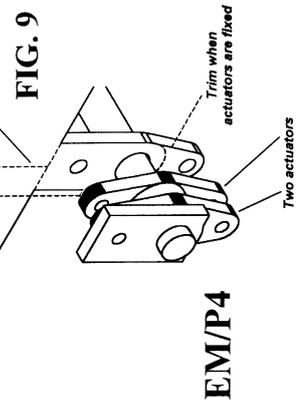
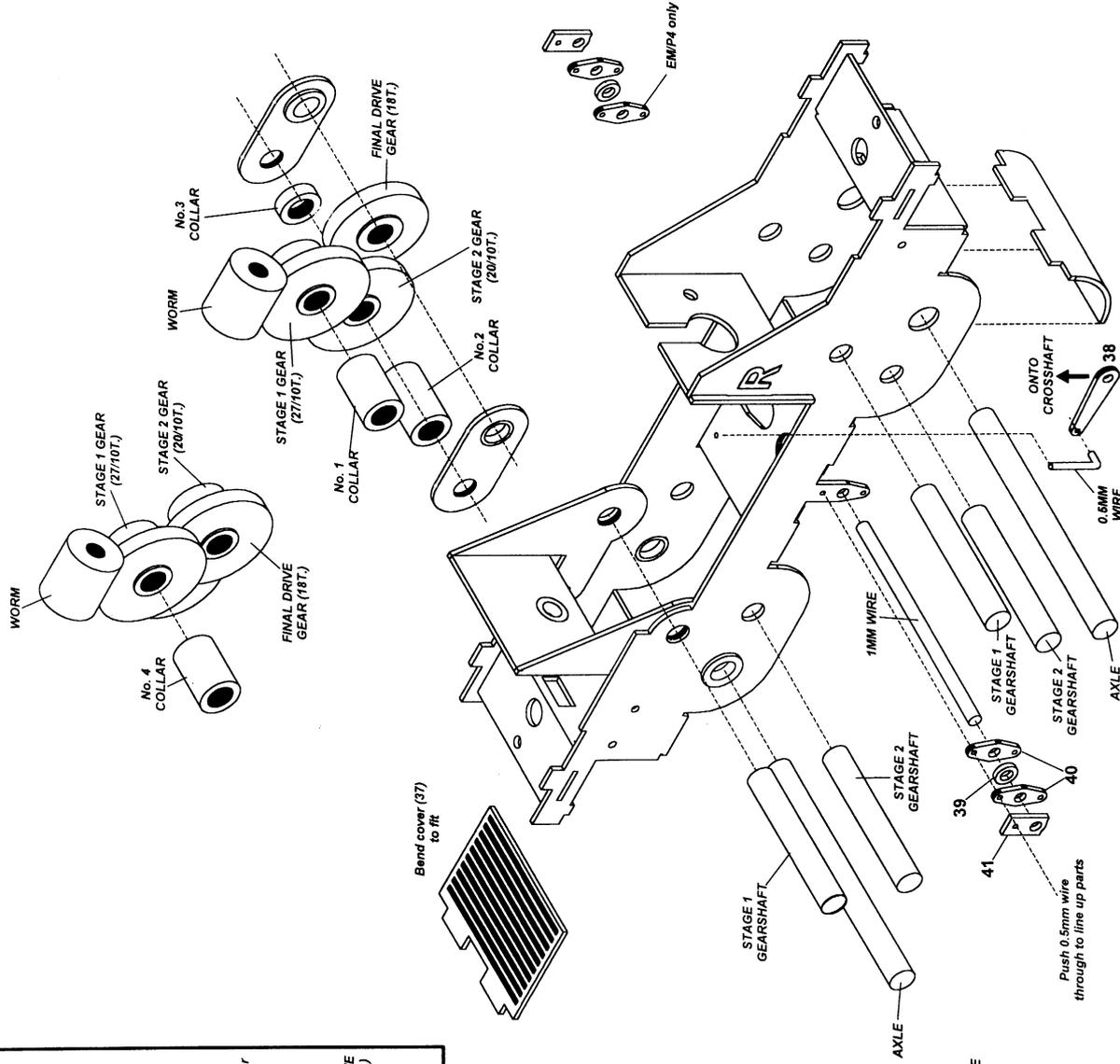
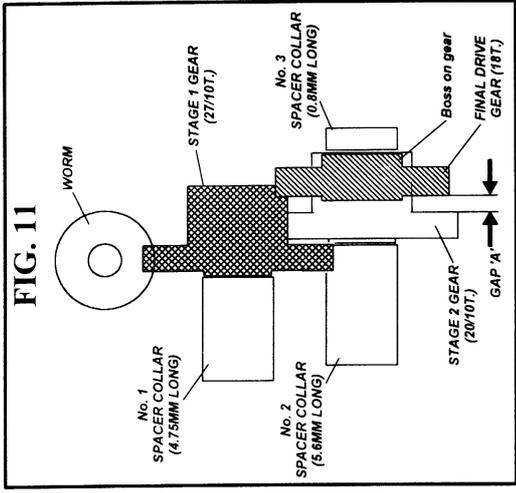
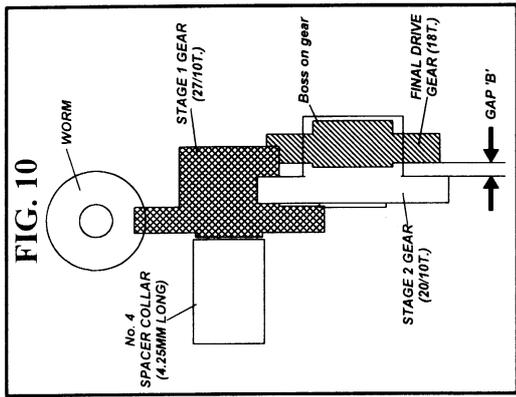


FIGURE 6



FITTING PARTS TO MOTOR BOGIE (FIG. 7)

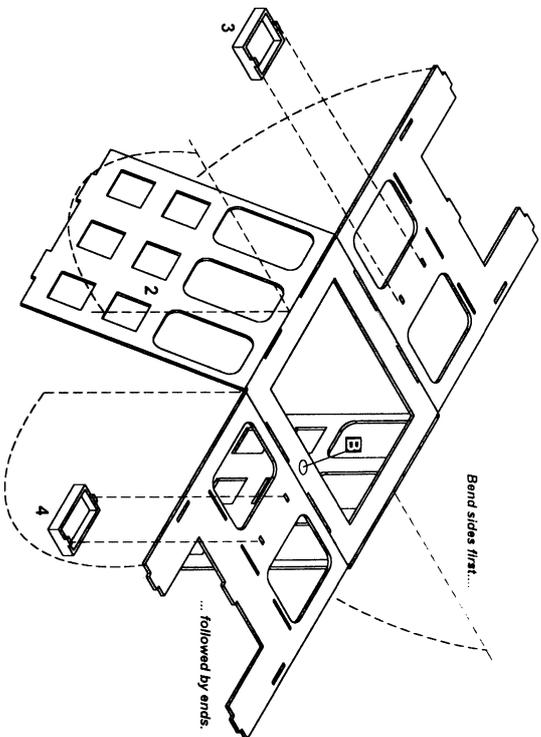


FIGURE 12

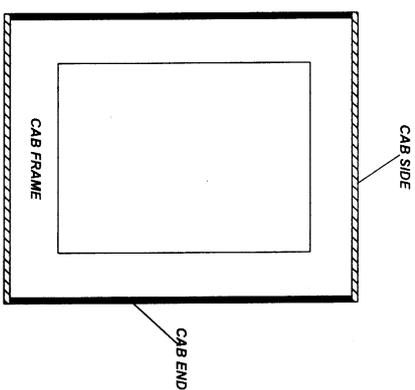


FIGURE 13

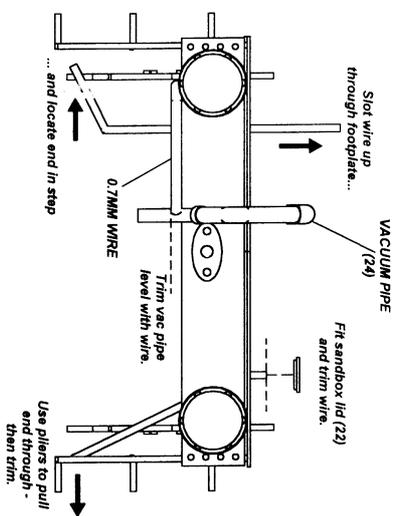


FIGURE 14

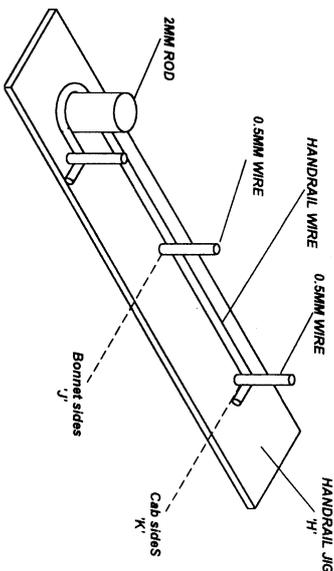


FIGURE 15

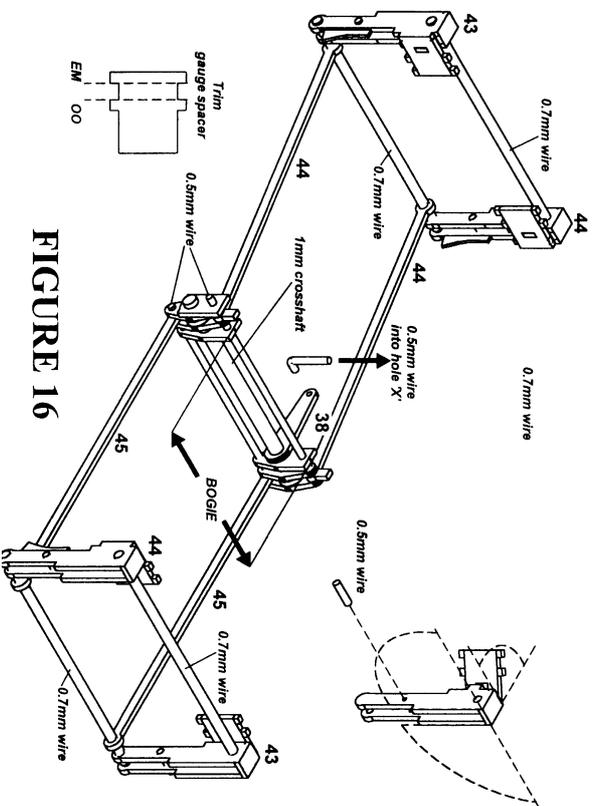


FIGURE 16

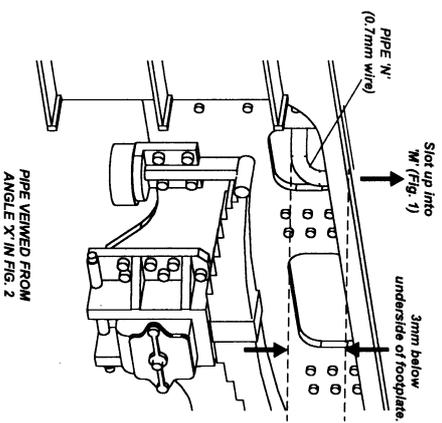


FIGURE 17