CONNOISSEUR MODELS

0 Gauge Locomotive Kit

LNER Class J68 0-6-0 Tank

General Instructions & Chassis Assembly

Prototype. This kit has been designed to build one of the ten passenger engines built with full condensing gear and air brakes. Alternative parts are provided to represent a loco from early LNER days until withdrawal between 1959 and 1961. With some simple modification of the parts it should be possible to represent one of the 20 locos of the class built for shunting work.

Kit. The body is etched in brass with nickel silver being used for the chassis. Slide bars and valve gear are represented between the frames. Cab interior is detailed and a cast back head is provided.

This kit has been designed to provide a set of quality components, that will allow the modeller who has basic kit building skills to build an 0 gauge model of the prototype, to a standard of detail that is suitable for operating models on most 0 gauge layouts.

Parts Required To Complete

3 Sets 4', 10 Spoke Driving Wheels (Slater's Catalogue Numbers 7848NE)
Plunger Pickups if desired (Slater's Catalogue Number 7157)
Handrail Knobs if desired as a replacement for split pins (Slater's Catalogue Numbers, Short-7952)
Available From Slater's Plastikard, Old Road, Darley Dale, Matlock Derbyshire, DE4 2ER, Telephone 01629 734053.
Mashima 1833 Motor and 40/1 Gear Set.

Connoisseur Models, 1 Newton Cottages, Nr Weobley, Herefordshire, HR4 8QX, Telephone 01544 318263

GENERAL INSTRUCTIONS

Please read this section carefully especially if this is your first etched brass kit. Many modellers fight shy of working in this medium but the basic skills are relatively easy to acquire. Once you've learned how to form and solder brass you'll find all kinds of modelling possibilities will open up for you.

Assembling an etched kit involves exactly the same skills that a scratchbuilder uses – the only difference is that the cutting out of the parts is already done for you. Some filing and trimming will be necessary from time to time. Where this is the case I have highlighted it in the instructions.

The main skill to master is soldering and I would recommend a Weller 40 Watt soldering iron. This has a 6mm diameter removable copper bit. The bit is shaped like a screwdriver and has a bright coating of solder (tinned). This combination of iron and bit shape is ideal for running fillet joints and has a good reserve of heat that is so necessary for soldering small parts onto large components. Note the shape and condition of a new bit as this won't last long and will need restoring back to this condition.

It is important to keep the bit clean and in good condition as you work. Get a soldering iron stand containing a damp sponge as old oxidized solder is wiped off on this before picking up fresh solder for each joint. If you haven't made a joint for some time you may find that a hard black crust has formed on the bit. Remove this with a brass wire brush (suede brush) and then feed some multicore solder onto each side of the bit to restore a bright surface (referred to as wetting or tinning the bit). After about 8 hours use you will find the bit is in poor condition with holes and a ragged edge. File the bit back to its original shape using a hand bastard file and then polish the surfaces on emery cloth. Coat the bit with Fluxite Soldering Paste (traditionally used by plumbers) and this will prevent the bare copper oxidizing as the iron heats up. Then feed multicore solder onto the bit to form a generous coating and leave to bubble away for a couple of minutes before wiping the excess off to give a bit almost as good as new.

A smaller Antex 25 Watt iron with a 3.2mm screwdriver bit is very useful for small assemblies and detail work such as handrails, but will have insufficient heat reserve for main assembly work. The Antex has a plated iron bit and after a little use with 145° solder a grey oxide appears on the bit that will prevent you from picking up the solder. Touch the bit to some multicore solder and it will flash over the bit wetting it so that you can continue picking up 145° solder. I have found no problems with mixing the two solders in this way.

I use 145° solder for virtually all assembly work. I prefer it in wire form, available from many tool merchants, but it is also produced in stick form by Carrs. I find that its lower working temperature helps to give a quick clean joint and limits the build up of heat which may cause distortion in components. I find that I can hold parts together with my finger ends and make a joint before heat reaches my fingers or other etched parts drop off.

I use 60/40 tin/lead fluxed multicore electrical solder (melting point about 190°) mainly to keep the iron bits in good condition. As it gives a slightly stronger joint than 145° I sometimes use it for small spot joints on handrail wire, lamp brackets etc, but still use extra liquid flux.

For all brass and nickel silver work I use Carrs green label liquid flux. You will soon get the feel for how much to use but more problems are caused by too little flux than too much.

Before soldering components together thoroughly clean both surfaces along the join line with a glass fibre burnishing brush. Using your tweezers or a knife blade etc, hold the parts together in the correct position and with an old paintbrush run some flux along the area to be joined. Still keeping the parts correctly aligned, pick up a small quantity of solder on the tip of your iron and carry it to the joint (unlike electrical soldering when you feed solder into the joint). Hold the iron against the joint just long enough for the solder to flash between the parts. Don't let go of the parts until the solder has cooled – this takes from five to ten seconds. To run a fillet of solder along a joint, wait until the solder flashes between the parts and then pull the molten solder along the joint with the iron tip. Don't load the iron tip with a lot of extra solder work the joint in 1" lengths bringing in small quantities of solder.

Brass is a very forgiving material and if you get something out of alignment use heat from the iron to desolder the joint before starting again. For complicated assemblies it is a good idea to only tack solder parts together. You can then make adjustments by desoldering until you are happy with the location of parts and then solder solid.

When you need to laminate two or more layers of brass together align the parts then carefully clamp them together either in the vice or by holding them with miniature crocodile clips. Run flux around the edges and then go around with the soldering iron. Clean up thoroughly afterwards.

To fit small parts and overlays on to a larger assembly, such as strapping to a wagon side, when you need to prevent finely detailed areas such as planking becoming clogged up with solder tin the back of the small component first, then hold in place on the model and apply flux. Carefully wipe the tip of your iron on a sponge to remove any solder from it (dry iron), and then touch it against the parts to be joined. After a few seconds you'll see molten solder bubbling from the edges. Still holding the parts in place remove the iron and allow the joint to cool. An alternative is to use solder paint (I would recommend Carrs 188 solder paste). As the name suggests this is a flux and solder in one. Simply apply a thin coat of solder paint to the back of the component instead of tinning. Still apply a small amount of liquid flux before you solder the part into place.

Any surplus solder should be removed using a craft knife, I find No 10 curved scalpel blades ideal, then burnish clean with a glass fibre brush. With practice you'll learn how to use the minimum amount of solder to do the job. Flux is corrosive so after each soldering session give your model a good scrub with washing up liquid or Jif. After a day or two any remaining flux residues will show as a green film which should be washed away.

To cut parts from the fret use a sharp Stanley knife on a piece of hardboard or a pointed scalpel blade on a block of softwood. Remove tags and burrs with a fine file.

Three-dimensional parts are formed by folding. On an etched brass kit the fold lines are normally half-etched on the inside of the fold. You'll be able to fold most parts using smooth-jawed pliers. For longer parts folding bars are desirable.

Other useful tools include a bench vice, a good pair of tweezers, a set of Swiss files (get a full set of cheap ones and then buy quality replacements for the three that you use the most), a pin vice with a selection of drills from 0.5mm to 2.1mm plus a few larger sizes that you use regularly (2.6mm for axle bearings etc), some square-nosed pliers and some very pointed-nosed ones, preferably with smooth jaws. Buy cheap tools first and duplicate the most used ones with quality.

Try to complete all high-temperature soldering before attaching any of the cast whitemetal parts. These can be attached with two-part epoxy resin such as Araldite Rapid. Ensure the surfaces to be glued are clean and free of grease.

A better alternative is to solder your white metal castings using Carrs 70 degree low melt solder and Carrs red label white metal flux. The iron should be run at a much lower heat so that you do not melt the castings. I have a domestic light dimmer switch and plug socket fixed to a piece of wood, wired up with a lead and standard mains plug fused at 3 amps to the input side of the dimmer switch and the output of the dimmer switch into the plug socket (remember to continue the earth). Plug your 40 Watt iron (25 Watt iron won't work) with a clean and freshly tinned bit into this and experiment with adjusting the switch until you find the range of temperature at which the solder melts but a scrap casting does not. **Note** as the iron is running at a lower voltage it will take longer to heat up, so when you think the adjustment is correct do check a few minutes later on another scrap casting to see that it doesn't melt. Then scribe a mark on the switch knob to indicate this position.

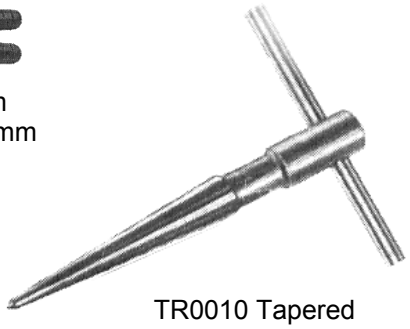
When attaching white metal fittings to brass the surface of the brass must be tinned with 145° solder to allow the solder to grip. The surface of the casting at the joint should be burnished bright. The casting can then be soldered into place with 70° solder and fillets of solder run into any gaps with no risk of melting the casting. Virtually all castings will be improved by a little extra fettling work. Flash can be cleaned out using a sharp pointed knife blade, part lines removed by scraping back with a curved blade and then blending in using a fibreglass brush. The casting moulds tend to distort when metal flows in so check castings for square and even thickness.

SPECIFIC INSTRUCTIONS FOR LOCOMOTIVE KITS

Hole Sizes. Because of the etching process holes will normally be found undersize, for example the turned brass bearings will not fit holes in chassis sides, and a simple fitting operation is required. The best tool for opening up holes of this size is a cheap tapered reamer available at most model railway shows from tool suppliers. By rotating this gently in the hole you quickly open holes to correct size, without risk of tearing the metal. By trial and error on the first hole you will soon establish how much material requires removal. For smaller holes, such as those for the location of casting's etc these are best opened up using a set of cheap tapered broaches, or by twisting a small round file in the hole.

BRC250 6 Piece Cutting Broach Set 0.7-2mm
BRC300 12 Piece Cutting Broach Set 0.65-4mm

TR0005 Micro Drill Reamer 1mm-5mm



TR0010 Tapered Reamer 3mm-12mm

Three very useful tools purchased from SQUIRES, 100 London Road, Bognor Regis, West Sussex, PO21 1DD, Telephone 01243 842424.

Forming Parts. While the boiler in this kit is pre-formed, other forming is best achieved as construction progresses as this enables the parts to be adjusted to each other. To make a tight curve at full metal thickness, such as tank front, bunker rear etc, take a piece of rod slightly under size of the curve required (a drill shank is ideal). Place roughly on centre line of bend, holding in place with thumbs and pull upwards with fingers, forming approximately 30 degrees of the bend. Check with eye and adjust if necessary before forming 60 degree of bend then offer part to model. Final adjustment of fit is easily made on last stage of bending.

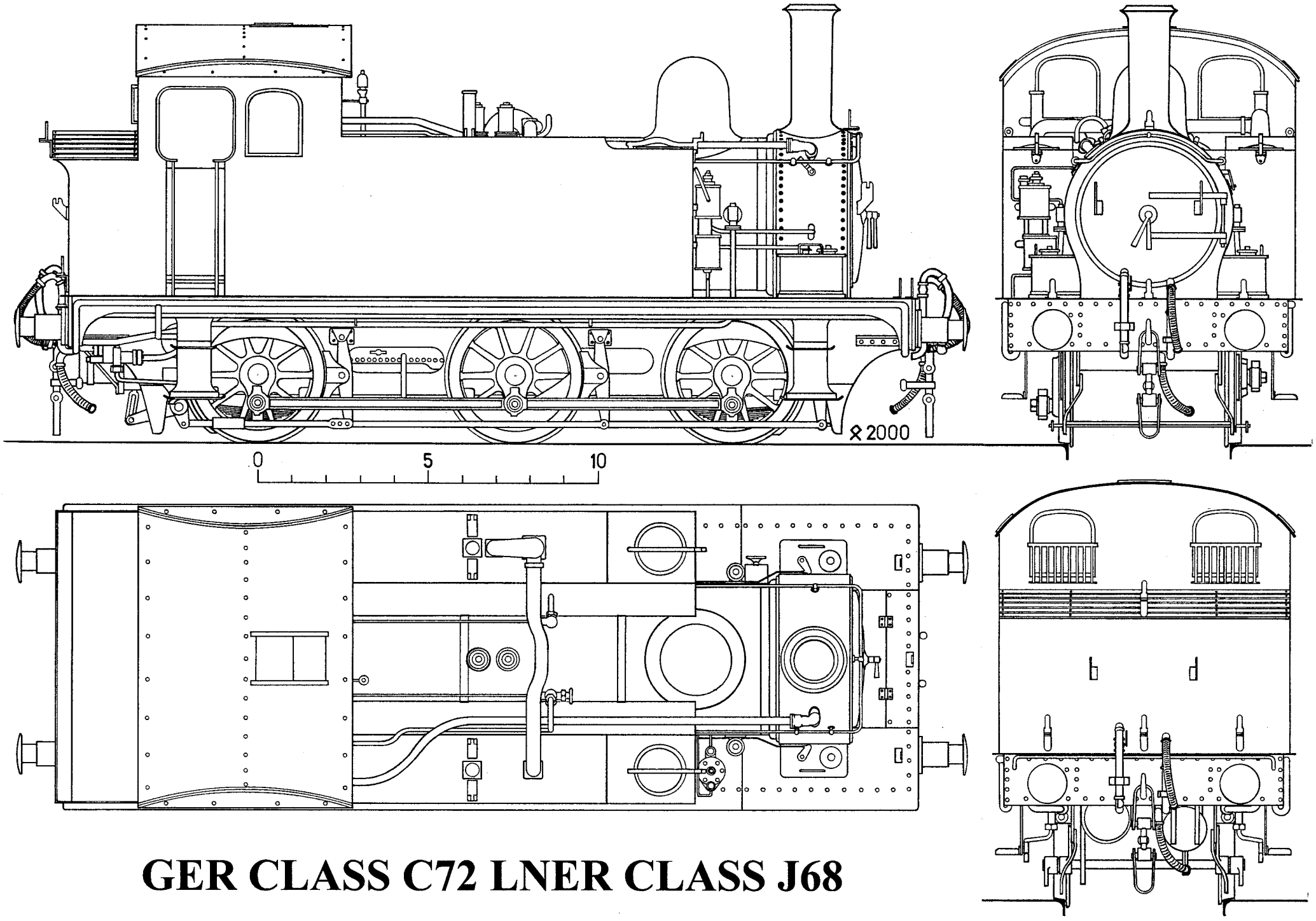
To form shallow curves, splasher tops, smoke box wrappers etc, use a piece of pipe or broom handle. Diameter is not crucial, a piece of one-inch water pipe covers cab roof to smoke box wrapper. Place part over tube and hold in place with finger and thumb of one hand. Work the metal in stages over tube with finger and thumb of the other hand until correct radius is formed.

A technique you may find useful in working metal is to soften and remove the spring from the metal by heating (called annealing). The part is held with pliers and heated in a gas flame. (The gas cooker is ideal). Alternatively use a pencil torch that runs off lighter fuel. Heat part until a purple band appears close to the edges and then remove from heat. Do not overheat part as it will then become too soft and unworkable. Remember you can reheat if not workable. Allow part to cool naturally in the air.

Damaged Parts and Shortages. If you damage an etching during construction it is not possible to replace individual pieces, but I am quite flexible in providing at minimum cost replacement frets (this will contain all the brass or N/S parts). Where a casting is damaged individual items can be replaced as I have full control of production. Because of the complexity of the product, combined with the low volume way it is produced, I try to exercise a high degree of quality control in production and packing but if you find you are short of an item or find a sub standard part please approach me for a replacement.

Fibreglass Scratch Brush. The scratch brush is like a propelling pencil holder into which a fibreglass refill is fitted and which will give a vigorous abrasive action. I find this tool indispensable for cleaning up and removing solder. One very useful tip is to soak the refills in dilute PVA glue (Evostick resin W wood glue let down 50/50 with water and a spot of washing up liquid) and then drill holes in a block of wood and stick the ends of the refills in the holes while they harden off. This will make the refills much more abrasive and longer lasting and also stops the fibres breaking off and ending up in your fingers. You will need to give the refill a good rub to get it started but if you use green label flux you will soon have plenty of rusty tools that need cleaning.

A fibreglass brush and most other general modelling tools can be obtained from Squires Model and Craft Tools, 100 London Rd, Bognor Regis, West Sussex, PO21 1DD, Tel 01243 842424. They do a free catalogue and a very good mail order service.



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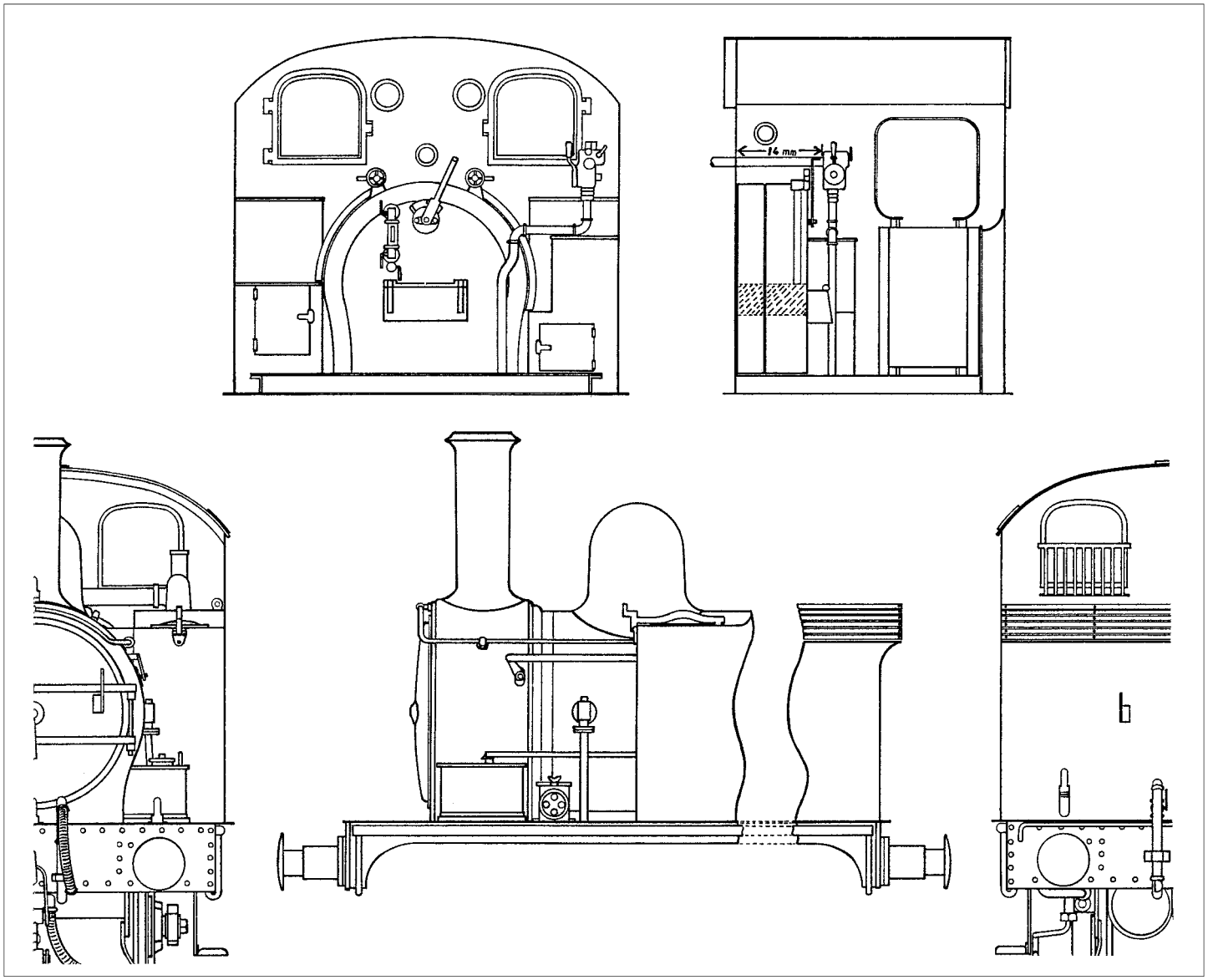
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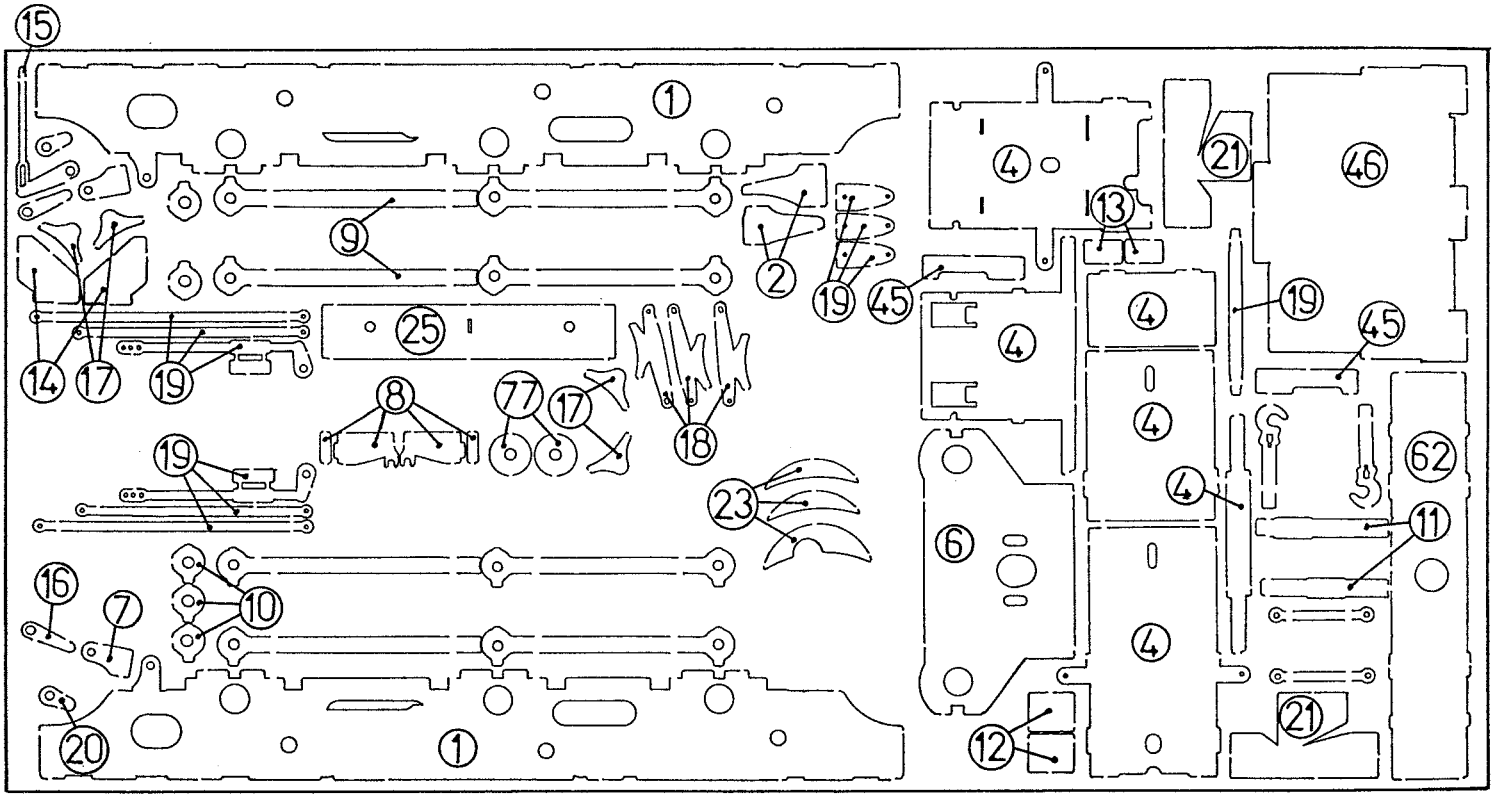
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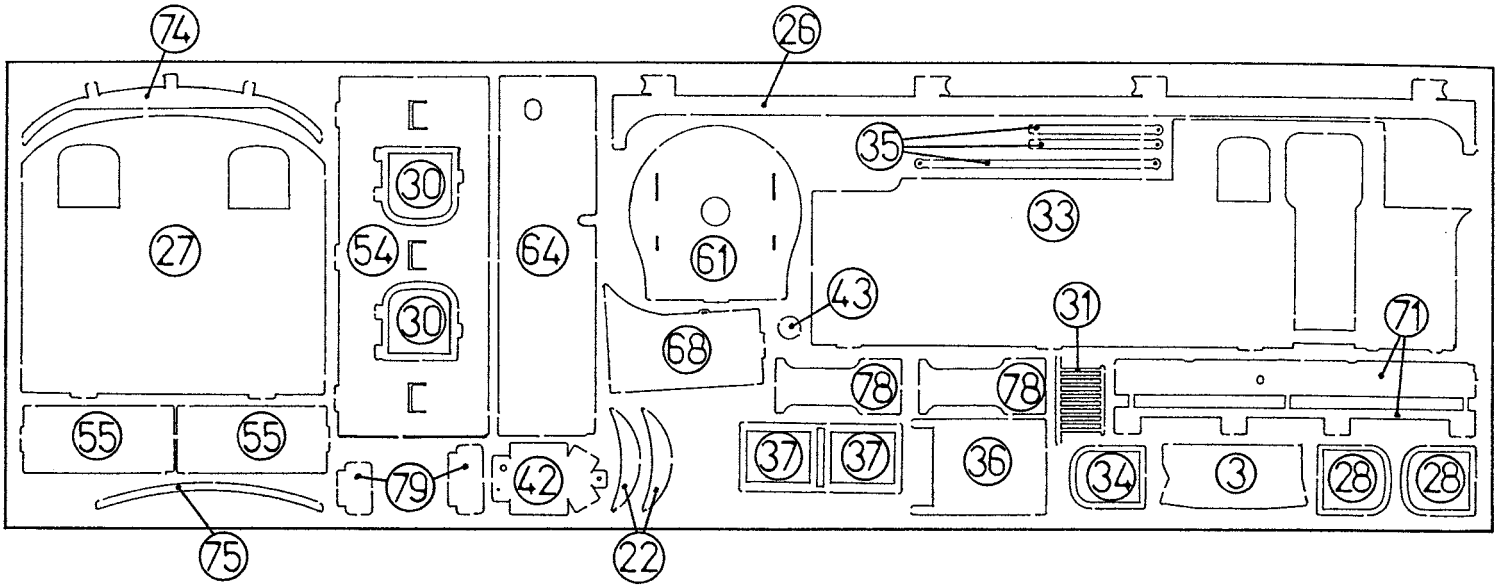
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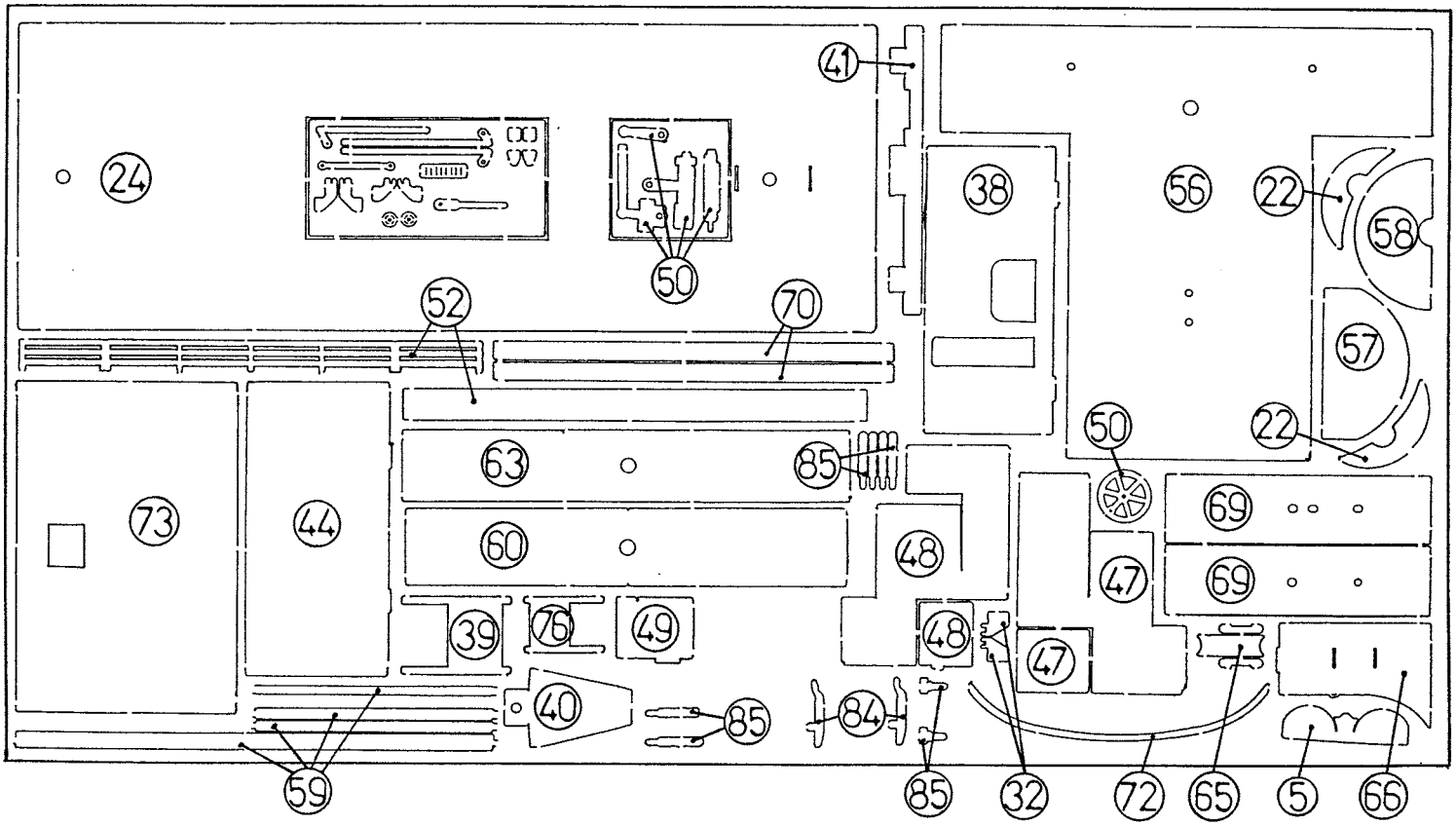
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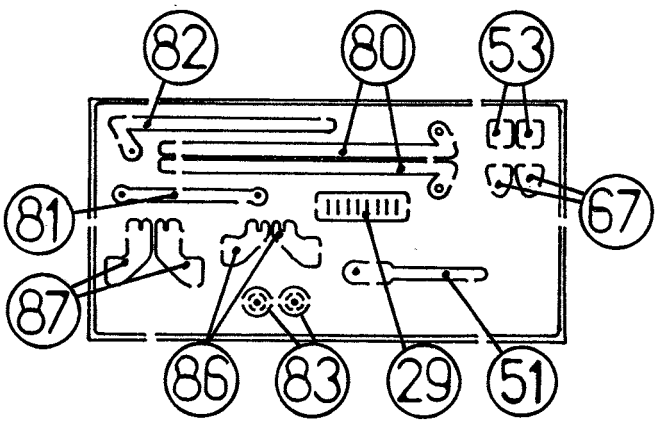
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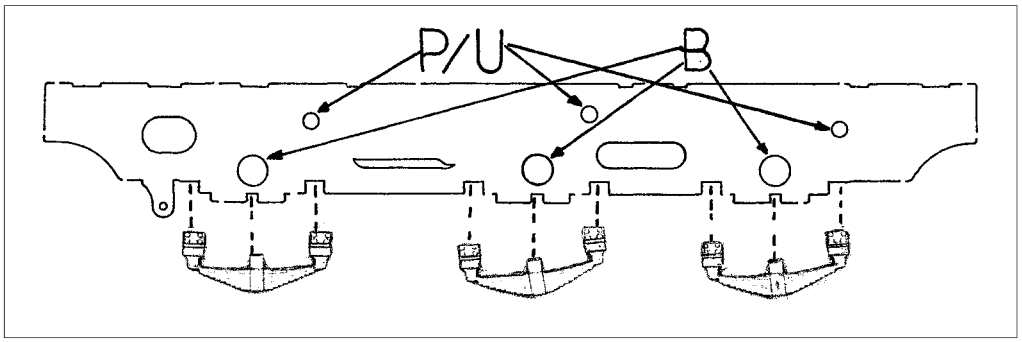
Chassis Construction

These instructions cover the complete construction of the chassis before detailing the body construction. In practice you may find it desirable to construct the basic chassis up to fitting the wheels and then start constructing the basic body. You can then use the chassis to check against the body and vice versa. In this way you can check clearances as you complete the construction of the body and chassis.

Please have a quick read through the instructions before starting construction. Dont worry if there is anything that you are not sure about as these will hopefully make sense when you have got the physical construction to that point. As there is a number of alternative parts to suite different periods in the locos life. You may find it useful to note which ones you wish to use before construction commences.

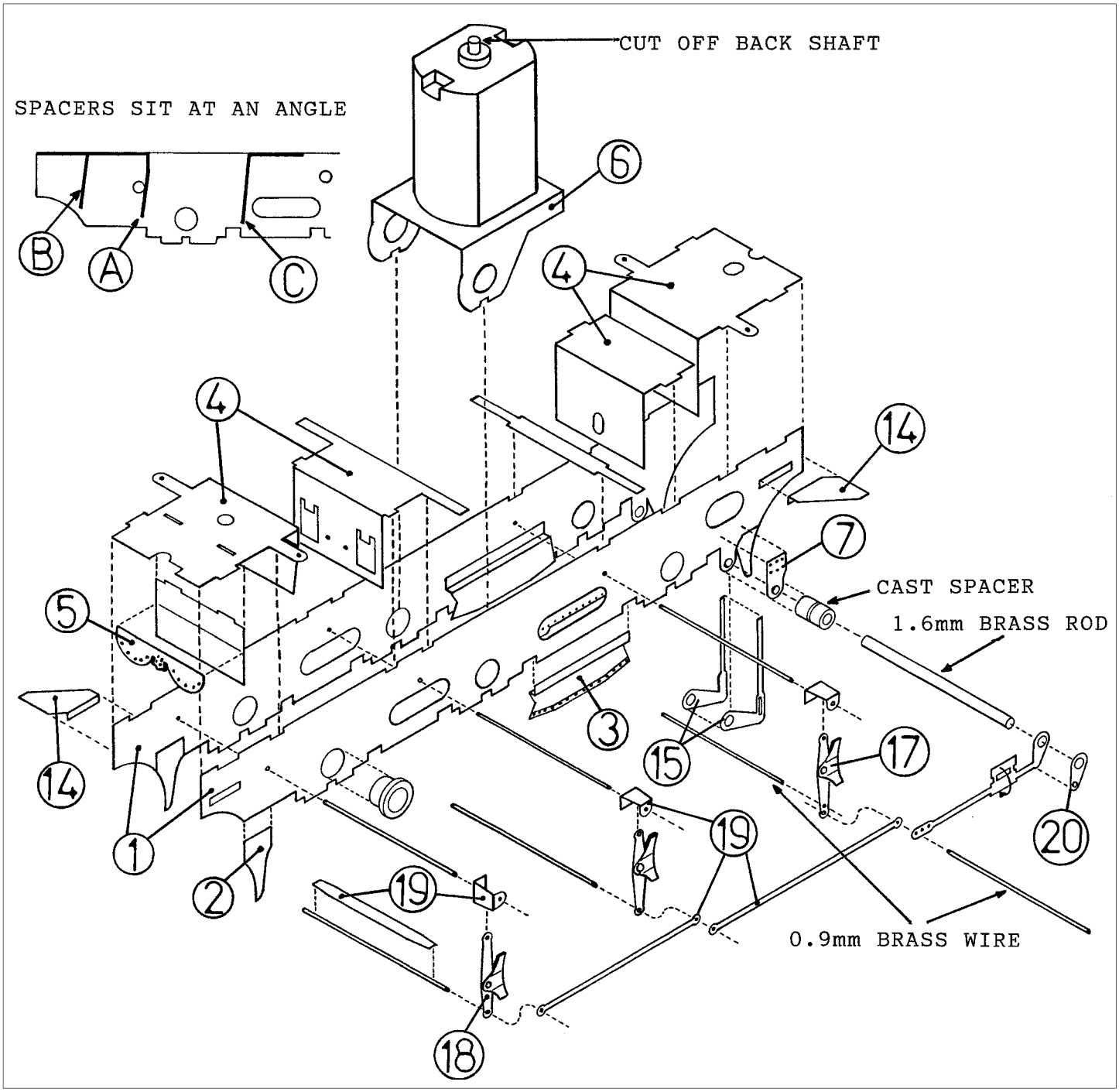
1) Take the two chassis sides, parts 1, and open out with a tapered reamer the holes to take the turned axle bearings. If fitting them, open out the holes for the plunger pickups. Take a spring casting and offer this up to the notches on the bottom of the chassis sides below the axle hole. File these notches until the spring casting is a snug fit but dont deepen the centre notch. The castings will be fitted later.



2) Solder the guard irons, parts 2, to the inside face of the chassis sides. These are marked F & R for front and rear. There are etched marks to help with location. As the guard irons are to be formed up later by bending with long nosed pliers. I soldered them in place using 60/40 electrical solder to give the joint a little more strength than 145deg solder would have provided. Hold the guard irons in place with the end of a flat file. Use plenty of flux and heat so that the solder flows all around and between the two parts.

3) Form up and then solder the ashpan sides, parts 3, to the inside face of the chassis sides. There are etched marks to help with location. Drill a 1.2mm hole in the half etched firebox side of the R/H chassis side. A drain pipe made from 1.2mm copper rod will be fitted into this hole later.

4) Take one chassis side and using drawing pins through the axle holes fix it to a straight square block of 2"X1" wood. I have several different length blocks on my workbench and find them very useful to support assemblies during construction. If you go to a good timber merchant (not B&Q, etc) you should be able to get a few feet of square planed and straight wood to make some blocks from. Check that each block sits square on a flat surface or you will build a twisted chassis. Pin down the chassis side so that the top edge slightly overhangs the side of the block. Fold chassis spacers, parts 4, A,C, D and E, then solder them to the chassis side. Note that spacer A & C are set at a slight angle. There are etched marks on the chassis side to help set this angle.

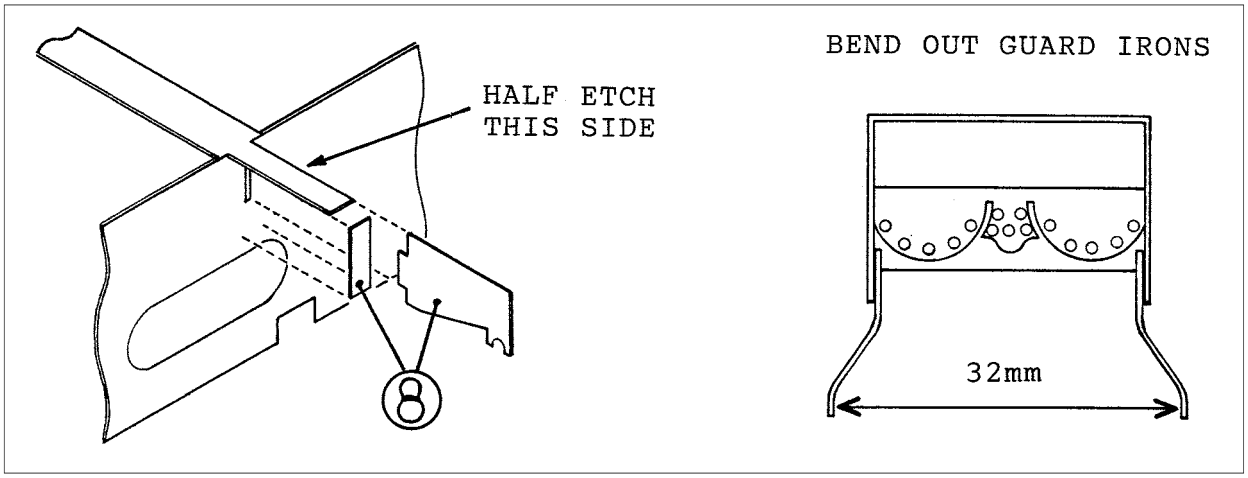


Now fit second chassis side to spacers. Tack solder only at the tabs that locate the top of the chassis side. Put a single tack on spacer C and D. Then check with a square at the ends of the chassis sides to ensure that they are opposite each other. Then tack solder the tabs on spacers A and E. Check by eye that the chassis is not twisted and lay a straight edge along it to check that it is not bent or banana shaped. By unsoldering and resoldering the tabs you can make adjustments until you are happy.

Remove the chassis from the block of wood and solder all joints solid. Work from the centre spacers to each end, not from one end to the other. As this may cause distortion. Solder cylinder end detail, part 5, to spacer B, the top level with the etched line on the spacer and then fit spacer at a slight angle.

Open out the bearing holes in the motor mounting plate, part 6, and then fold up. Position plate between chassis sides. A couple of bearings popped lose in the holes will help with positioning. Solder the top of the plate to each chassis side. Be generous with the solder joint as this plate not only makes the centre of the chassis rigid but if there is any flexing of the plate the motor gearset will try to climb out of mesh.

Fit spacer F, so that the half etched edge lines up with the slot in the chassis sides.



5) Push out bolt head detail on the brake cross shaft brackets, parts 7, and solder to chassis sides. Fit footplate support brackets, parts 8.

6) Now fit brass axle bearings. Take an axle and check that it fits freely into each bearing. If necessary dress the inside of each bearing with a round file to remove any burrs. Lightly smear the axle with oil and then fit the two front bearings opposite each other. Pass the axle through the bearings and this will help to keep them square as you solder the bearings into the frames. Solder on the inside face of the chassis side and try to get the solder to flow all around the bearing. Fit rear bearings in the same way.
For the centre motor drive axle we need to reduce the side play to enable the gear wheel to stay in mesh. I have provided some etched brass packing washers to pack out the bearings from the chassis sides which you may wish to use. I prefer to slide the bearings out on the axle and then solder them proud of the chassis sides. If in doubt have a dry run with a pair of wheels fitted to an axle. You want just a little bit of clearance so that the wheels dont bind (especially if you have a wobbly wheel, best place for it on the centre axle).

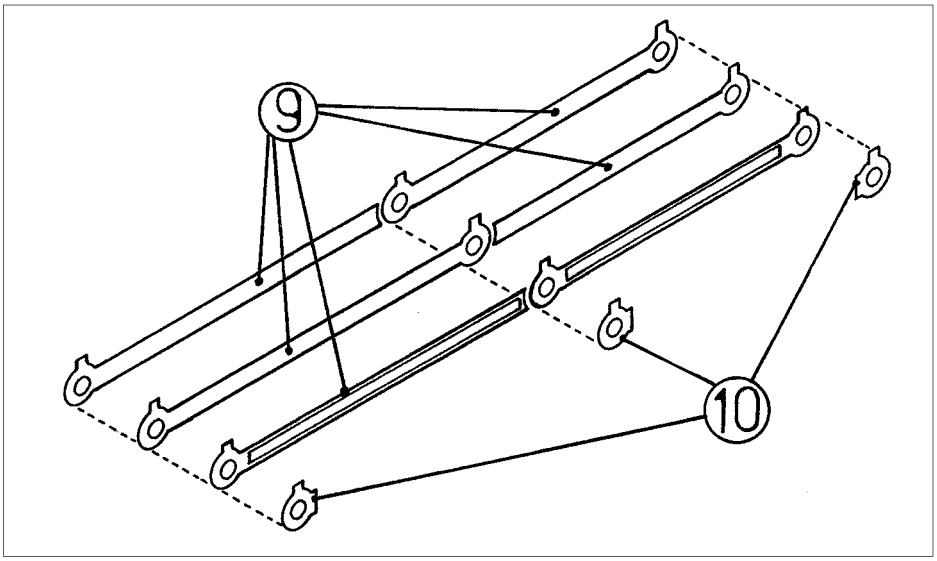
7) I now prefer to introduce a little bit of compensation onto the back axle. Fit axle into bearings and then pass a length of 1.6mm brass rod through the oval holes in the centre of spacers D & E. Solder the rod so that it presses down onto the axle. Remove the axle and using a sharp half round file. File the top and bottom of the bearing until you have an oval bearing hole. Keep checking with the axle end until you have about 0.010" up and down movement. Fit the axle and you should find that it rocks up and down slightly pivoting on the brass rod in the centre.
There should be no fore and back movement as this will cause the coupling rods to bind. This slight compensation does wonders for electrical pick up but is not essential if you dont fancy it.

8) Now prepare the Slaters wheels. Remove any plastic flash or moulding pips from the backs of the wheel by rubbing them flat on a piece of fine emery cloth (this flash can sometimes interfere with the plunger pickups). The crankpin screw head needs to be flush with the back of the wheel (it will jamb on the cast spring otherwise) so it will be necessary to drill a countersink hole. Use a 2.5mm drill in a hand held pin chuck. Drill gently and keep checking with the head of the screw until the hole is the correct depth. The screw is designed to self tap into the plastic and then lock itself. I dont trust this and prefer to screw it in until the head is just proud of the wheel back. I then fill the countersink hole with Araldite and then screw it in until it locks. Leave the wheels until the Araldite has set and then clean of any excess Araldite by rubbing the wheel on the emery cloth. This should leave the screw head embedded in Araldite.

You may find that the square axle end is a tight fit into the centre of the wheel and this needs correcting. With a fine flat file gently dress each of the four sides of the axle end. I find it helps to lay the bottom flat of the axle end onto the edge of a block of wood. This helps me keep the file parallel as I file the top flat. Offer the axle end into the wheel centre and repeat if necessary. You are aiming to get a gentle push fit but with no rocking or movement on the square. A good guide is to get it so that you can remove the wheel from the axle with just your finger nails around the steal tyre. If you have to grip the tyre with your finger ends to pull it off you will find it difficult to remove the wheels to paint the chassis. You can not get a good pull when the wheel is surrounded by the brake gear.

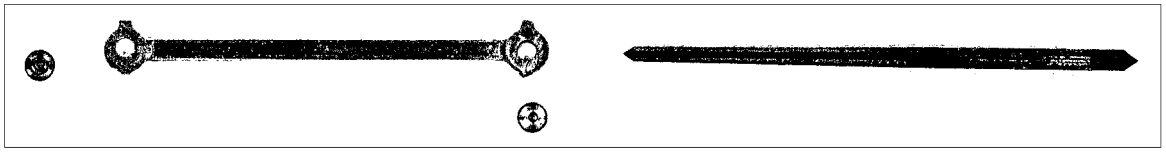
9) Now fit the cast springs. They will need a little filing in the centre to sit down snugly. The front ones require a little trimming at the ends to clear the chassis spacers. Where the other springs sit against the ashpan you will have to thin down the spring ends by filing a little from the back. Tack solder the springs in place first and then use a wheel mounted onto an axle to check clearance. In this way if you find that the spring fouls the wheel you can move it back before soldering solid. I also bend out the guard irons at this stage using long nosed pliers. Use the wheelset as a guide.

10) Now make up the coupling rods from parts 9 & 10. The coupling rods are made up in two halves from a laminate of 3 etches. With an overlap joint on the central crankpin. The way I do it is to separate one half section of 3 laminates, parts 9, from the etch at a time. Clean of the tabs so that the 3 laminates will fit together flush along there length. I then use 3 miniature electrical crocodile clips, one in the centre and one at each end just inside the crankpin holes, to hold the laminates together. I then pass drill shanks through the crankpin holes to line up the 3 laminates. Check by eye that the drill shanks are parallel and square to the rod.
Then using plenty of flux solder along the top edge of the rod. start in the centre and work out towards each crankpin hole. This reduces the risk of the laminates distorting and bowing apart with the heat. You should find that some solder has run between the laminates to the bottom edge (if it starts dripping out the bottom you are using to much solder). Reposition the crocodile clips and solder the bottom edge. Only use a little solder on the iron and you should find that it pulls any excess solder from the top edge. Through the laminates to the bottom edge leaving you with a neat top and bottom edge. Try to keep the overlap joint clear of solder (it can be cleaned out with a knife point). Remove the drill shank from the outer crankpin hole and reposition the centre crocodile clip so that it clamps the end boss tightly together. Solder around the boss until a little solder bubbles out into the centre of the crankpin hole. Repeat for the second half of the coupling rod.



Now fit the bosses, parts 10. These are only cosmetic and the central hole is slightly larger than the crankpin hole so they only need to be lined up by eye. Hold them in place with a knife point and use plenty of flux. With a little solder on the iron you should find that you only need to touch one edge and the solder will then flow under the boss to give a good joint. Now gently clean up and file all the edges so that the cusp of the 3 laminates blend in to give the impression of one solid piece.

This is not the only way to make up the rods. Some people tin all the surfaces (or use solder paint) of the laminates. Then using a rod as a guide drill through the crankpin holes squarely into a block of wood. They then use the drill shanks to peg the three laminations together before sweating them solid.



Now open out the crankpin holes in the rods to accept the brass top hat bearing bushes. This is best done with a tapered broach or tapered engineers reamer (I have one that tapers from 3mm to 2mm and is 40mm long, see Yellow pages for a good engineers tool merchant, not cheap but will last a lifetime). With the reamer gently work from both sides of the rod until the bush is a smooth free fit into the hole.

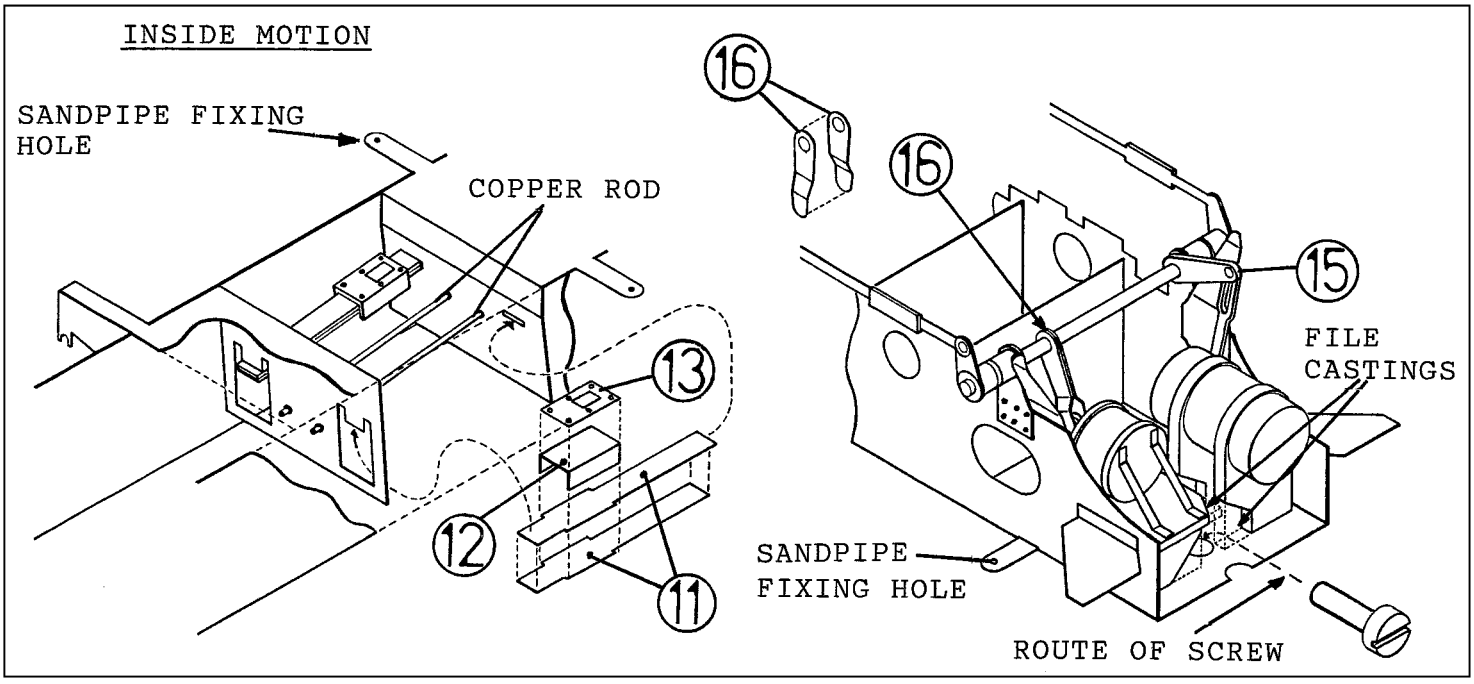
We now have to reduce the length of the bush a little (about 0.015") to prevent sloppy side play in the rods. Place a bush onto a block of wood then place a coupling rod fluted face down over the bush. By pressing down on the rod with your finger you should be able to gently file the bush down without it flying off across the bench. File the bush until it is 0.010" to 0.015" proud of the rod. These bearing bushes are not soldered into the rods but locked onto the crankpin with a nut and washer. So it is important that they will revolve freely in the holes in the rods.

11) Now fit wheelsets into chassis. Remember to quarter the wheels (the crankpins on one side should lead the other by 90deg). Fit rods and check that the wheels will turn without binding. If you do have a problem the best way to find it is to just fit the front rods and check these. Then remove them and then fit the back rods, checking these (in effect checking out two 0-4-0 chassis). Revolve the wheels until you hit the tight spot then check the rods. You should find that one rod still moves freely on the crankpins and this side is OK. You should find that the rod on the other side is tight on the crank pins and this is where the problem is.

Normally the problem is a crankpin screw that is not square in the wheel (unless you have reamed the hole in the rod out of square) if it is on the centre wheel, swap it for an end wheel. With a round file gently file oval the hole in the rod until it fits freely onto the crankpins. Refit all rods and check chassis again.

At this stage dont worry about slight tight spots. If you can push the chassis along the bench without the wheels skidding along all is OK. Because the wheels are best removed for painting the chassis the chances are that they will not go back on in the same place. The correct point to make final adjustments is after painting and fitting pickups but before fitting the motor. If you have filed a crankpin hole oval it is worth marking this wheel so that you can match them up again on reassembly.

Note that the centre wheelset is deliberately raised by about 0.010". The centre crankpin hole in the rods is slightly off centre to correspond with this. This is to prevent the loco rocking backwards and forwards on the centre wheels on uneven track. This is essential for smooth running on a rigid chassis. This is now a logical point to start constructing the body.



12) I have provided a representation of the top of the motion to go between the frames. Laminate slide bars together, parts 11, then make up the top of the crosshead from parts 12 & 13. Solder crosshead onto slidebars and then solder the front of the slidebars into the slot in spacer A. Solder the back of the slidebars to the top of the motion bracket, spacer C. Fit two lengths of 1.2mm copper rod through the central holes to represent the valve rods.

13) Push out bolt head detail. Then fold up and fit into the etched rebates. The four buffer beam bracing brackets, parts 14.

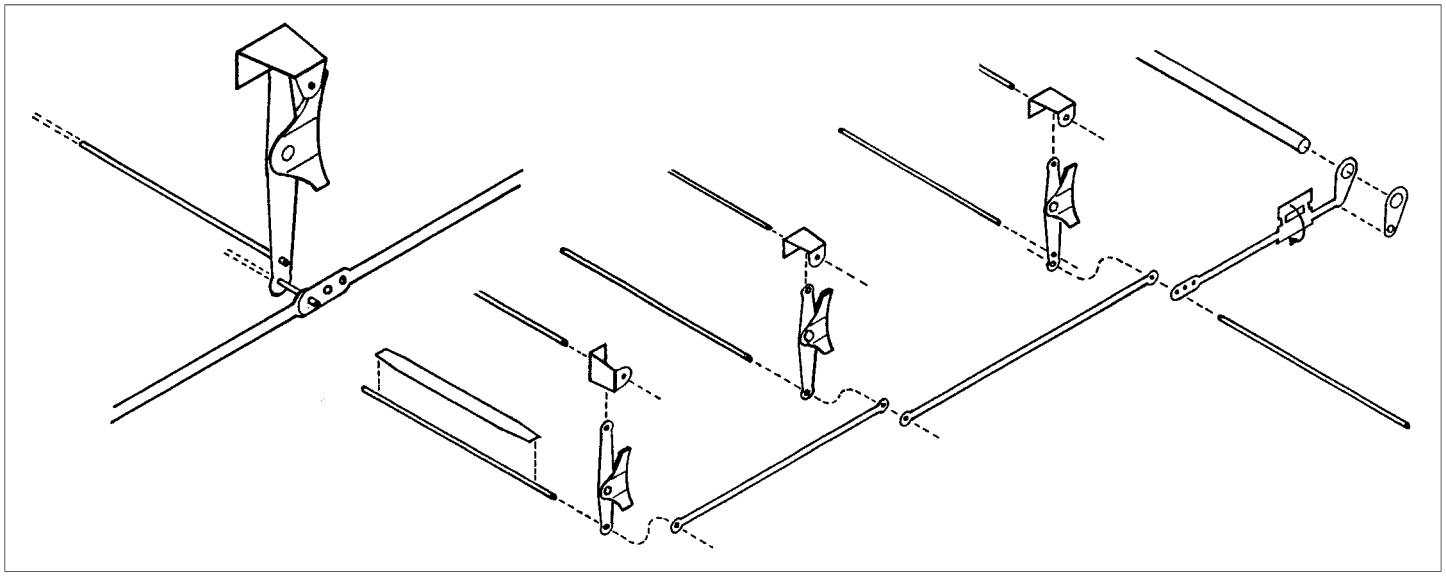
14) Solder together the two parts of the hand brake linkage, parts 15. Bend a set in the ends of the air cylinder linkage, parts 16, so that when they are laminated together they will form a fork around the end of the cast cylinder plunger. Tin these ends and then laminate together. Tin around the hole in the brake cross shaft brackets on the chassis sides. This tinning is necessary for low melt soldering castings later. Cut a length of 1.6mm brass rod (about 50mm but it will be trimmed to the correct length later) to form the brake cross shaft. Pass rod through one chassis bracket, thread parts 15 & 16 onto rod. Then pass rod through second bracket and then solder in place. Solder handbrake linkage to cross shaft and inside face of chassis side (it runs upwards at an angle). Part 16 is left to swing on the cross shaft at this stage.

Now using an old coarse file or junior hacksaw. Cut and file the support legs of the cast air reservoir and brake cylinder support stool. This is to provide clearance for the rear fixing screw head (the masters for these castings are standard to a number of my GER locos and I did not want to damage them by doing this modification on the master). You should be able to get the screw into the hole as you offer the chassis to the body and then get a thin screwdriver between the castings to screw it up.

Solder brake cylinder onto its mounting on the support stool. There is two bracing straps from the back of the cylinder to the stool. I forgot to include these on the etch but there is some 1mm wide waste strip from between the coupling rods, that is ideal to make them from. Now solder the stool in place. Solder the forked end of part 16 over the brake cylinder plunger and then solder the top to the cross shaft. Then solder the air reservoir in place.

Drill a 1.6mm hole through the cast cross shaft spacers. Drill from both ends and use a little spit on the drill to prevent it wondering. Slide castings over the ends of the cross shaft and solder to chassis brackets (tinned earlier).

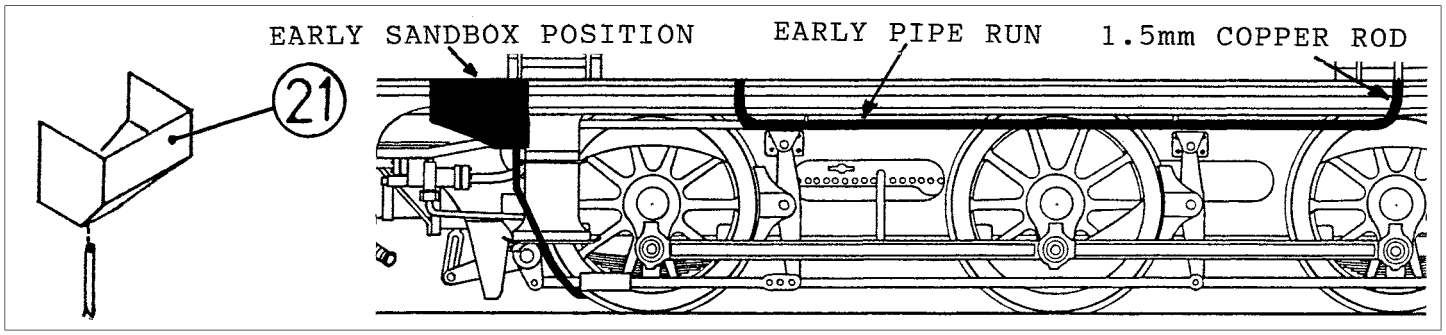
15) Now make up brake hangers. Solder brake blocks, parts 17 to brake hangers, parts 18. Make up 3 L/H and 3 R/H ones. Push out bolt heads in the brake hanger brackets, parts 19 and then fold up. Fit 3 lengths of 0.9mm brass wire (about 50mm but to be trimmed back flush with the front of the brake hanger brackets later) through the holes in the chassis and spot solder on the inside face of the chassis. Now thread the back side of the bracket onto the wire. Followed by a brake hanger and then the front of the bracket. So that the brake hanger is between the two faces of the bracket. Solder the back of the bracket to the chassis side. The brake hanger can be swung out of the way and packed out by a scrap of card. This should prevent solder creeping up the wire and soldering the brake hanger solid. Note that the front brackets are vertical and the others horizontal. The brake hangers with two holes at the bottom are for the rear wheels.



Now spot solder the brake hanger to the wire so that the brake blocks line up with the wheels. I grip the bottom of the brake hanger with a crocodile clip and this gives me more control in holding it in the correct position. Because of the side play on the wheels I find it best to push the wheel hard against the bearing. Then solder the brake hanger so that the brake block is in line with the front face of the tyre. Hopefully when the wheel is pushed out the flange wont catch on the back of the brake block.

Now solder 0.9mm wire through the bottom holes in the brake hangers. First fit a wire through the top extra holes of the rear brake hangers. Solder and then cut the wire flush with the front face of the hanger. Then fit a second wire through the bottom holes. The centre section of wire can be cut out after all the brakegear is assembled. Fit wire through centre hanger. The front wire is soldered into the etched groove in part 19 before being sprung between the front hangers. The brake hanger holes are slotted and the wire should be fitted at the top of the slot. If you later find that the coupling rods hit the brake pull rods. You can reheat the solder joint and move the wire down the slot to get extra clearance. Fit drain pipe made from 1.2mm copper rod into side of firebox.

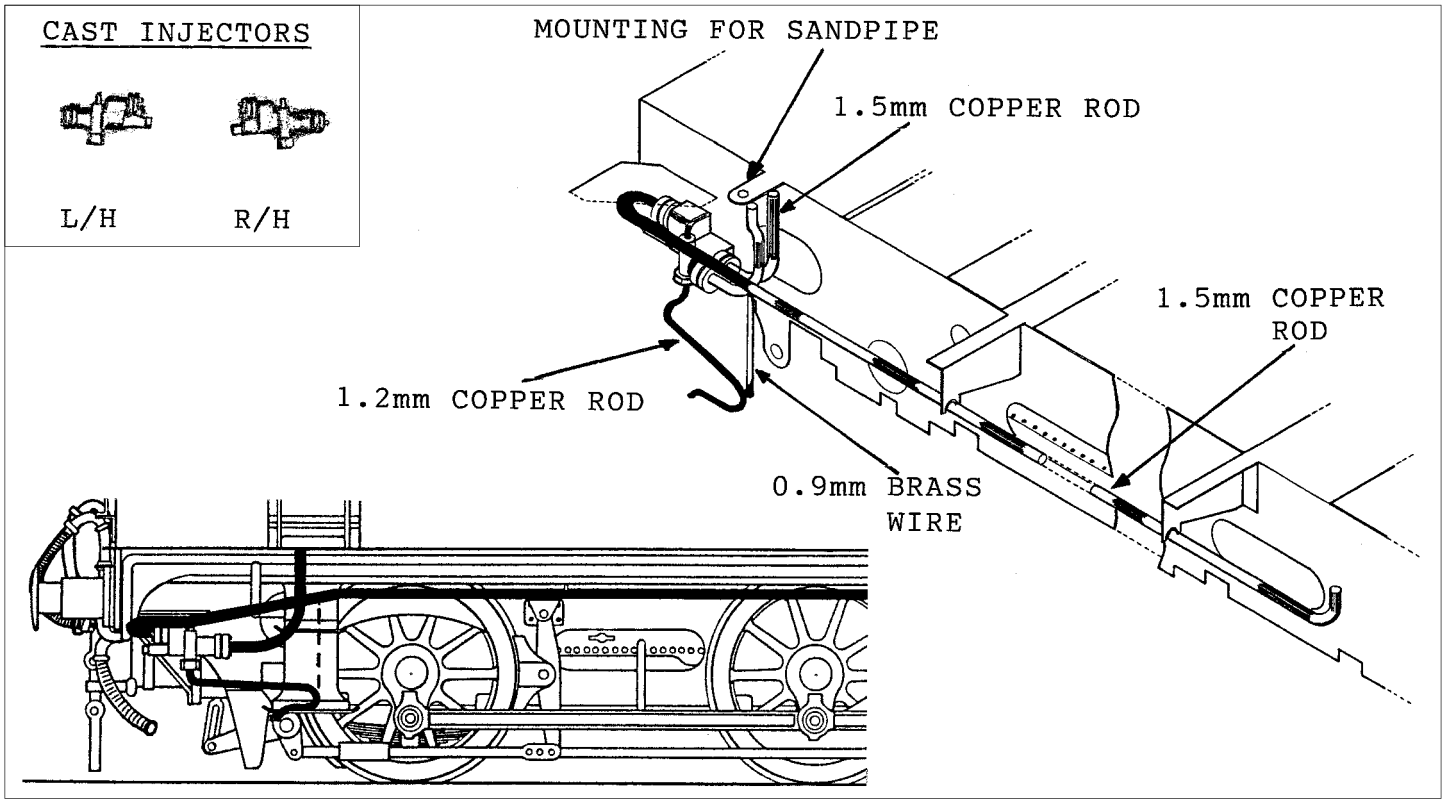
16) Now fit brake pull rods, parts 19. Solder crank detail overlays, parts 20, to rear pull rod crank and tin the back around the hole. Fold over and solder the etched rectangle to represent the brake adjuster. Fit front pull rods on each side first and work towards the back. Check that the front of the wheels just clear the pull rods and that the coupling rods dont hit the pull rods. Now cut the cross shaft (1.6mm brass rod) flush with the ends of the pull rod cranks. Cut the top 0.9mm wire flush with the front face of the brake hanger brackets and the bottom wires about 1mm from the pull rods.



17) If you are modelling a loco in early condition (roughly pre war) the rear sand boxes were mounted onto the chassis sides just back of the steps. Make up these sandboxes from parts 21 and fit to chassis sides. There are a couple of small etched marks at the top of the chassis side to help with position. The injectors were mounted out of sight behind the footplate valance, so the pipe run is simple. For later periods the sandboxes were mounted in the sandboxes were mounted in the cab and the injectors moved to the chassis side below the bunker.

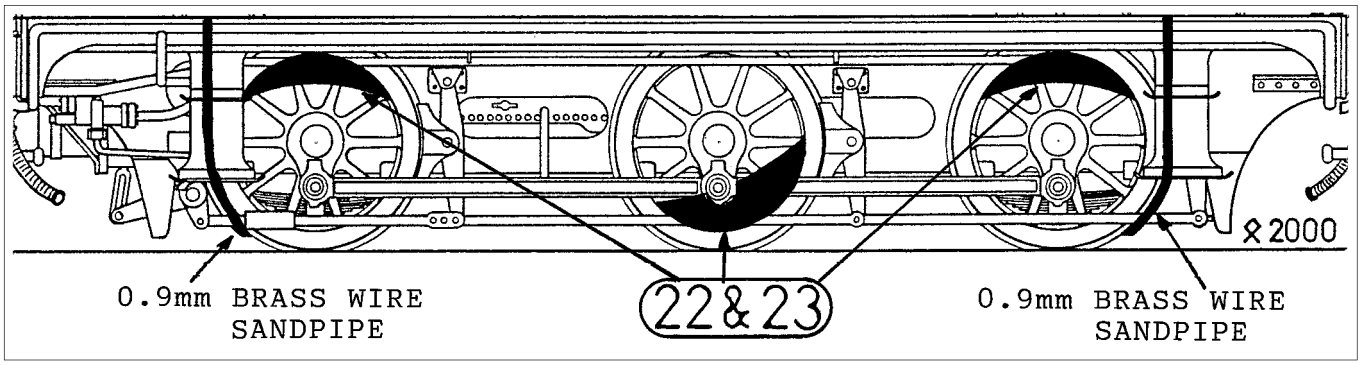
Take the injector castings and drill three 1.5mm holes about 2mm deep for the main pipes. Then drill a 1.2mm hole for the bottom drain pipe before mounting the injector onto the chassis side. I think that the drawings show the pipe runs better than words can describe them. Fit the two short curved pipes first. Soldering them at the top to the extensions of the chassis spacer. The 0.9mm wire sandpipe runs through the middle of these two pipes so set them apart to give sufficient clearance. Then fit the long pipe run. Repeat for other side. Check that the coupling rods wont hit this pipe run. Also check that the chassis will still fit the body. There is a tight clearance between this pipe run and the back of the cab steps.

Now fit the bottom drain pipe made from 1.2mm copper rod. On the prototype loco this was bracketed to the back of the step. So that we can still split the body and chassis. Get it to stand about 1mm from the back of the step and solder a length of 0.9mm brass wire between it and the main pipe run to give it a strong fixing. The pipe runs are made from copper rod and I bend them using a combination of round and long nosed pliers. If you make the pipe runs longer than necessary you will have something to hold on to as you solder them in place, then trim them back to the correct length.



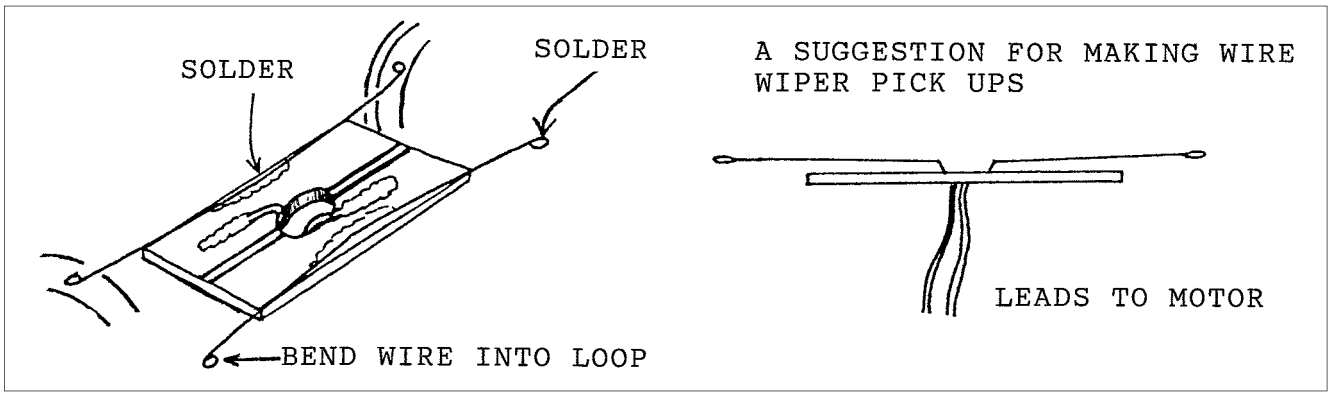
I should have provided enough rod to give you a second attempt at a pipe if you make a mistake. I get this rod by striping out the conductors from flat twin and earth electrical wire, 1.5mm will give you 1.2mm rod from the earth and 1.5mm rod from the main conductor. If you clamp one end of a 12" length in the vice and give a good pull with a pair of pliers. It will straighten and work harden. If you are having difficulty get some cable from B&Q and have as many practice goes at the pipe runs as you wish. Try to get the pipe runs as neat as you can but if you look at photographs of the prototype locos. This pipe work looks as if it was plumed in using a coal hammer so dont be afraid to bend a bit of a kink in it to clear the coupling rods etc.

18) Now fit sandpipes made from 0.9mm brass wire. The top of the wire is soldered into the holes in the spacer extension brackets at the top of the chassis sides. I spot solder the rear pipes to the cross shaft casting for strength. The front pipes run in front of the brake block before curving to line up with the wheel. Now refit the coupling rods and check that everything runs OK. Watch out for the rods catching on the pipework or brake pull rods and wheel flanges rubing against brake blocks.
Now remove rods and wheels. Remove each wheel one at a time from the axle. There is just enough room to wiggle them out from between the brake gear and sandpipes but go gently. Now give the chassis a good wash ready for painting.



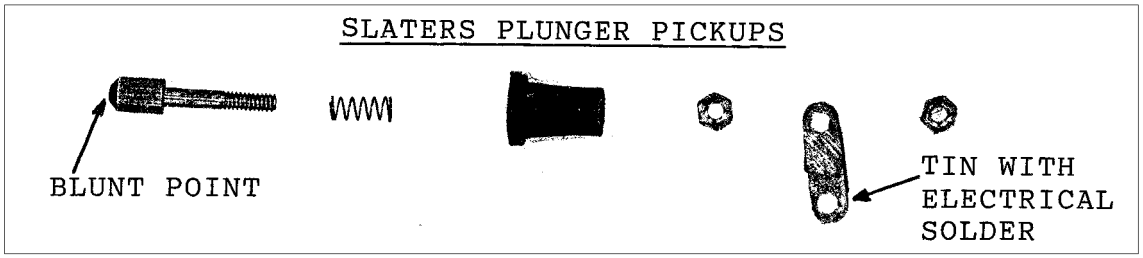
19) Now make up wheel balance weights from parts 22, brass front face and parts 23, nickel backing. The nickel backing is a slightly smaller radius than the brass front and should be lined up on the inside edge only. You may have to dress the outside radius slightly to match the inside radius of the steal tyre. A little plastic needs cutting from the two spokes next to the crankpin on the centre wheels to allow the balance weight to sit down flat. Also the cutout may need enlarging a little with a round file. I glue the weights to the wheels with Araldite.

20) If you are using wire wiper pickups I have provided some PCB sleeper strip and 0.45mm hard brass wire to fabricate them from. You may wish to glue the PCB across the chassis with Araldite and mask off the copper before painting the chassis. I prefer to use Slaters plunger pickups and if this is your first loco I suggest you give them a try first.
Now paint the chassis and front faces of the wheels. I use spray tins of car touch up paint. Use cellulose grey primer first (Simoniz gives a fine spray but some of the cheap makes are a bit thick) then a couple of light coats of satin black (I find matt black a bit lumpy). A light coat of matt varnish is also a good Idea (I use Railmatch enamel spray matt varnish). Try to warm the chassis up first by putting in the airing cupboard and warm the paint tin by putting on a radiator or standing in warm water (about 35°C). This helps to give an even coat without runs. Try to spray in the dry and at about 25°C (dont use the kitchen unless you are a bachelor). You can mask off the wheel treads and put a twist of paper into the bearing holes if you wish or scrape off before the paint has gone really hard. Also scrape slidebars down to metal.



21) Fitting Slaters plunger pick ups. Some people dont like using these but I have found them very good and fit them to all my locos. First I drill out the back hole in the plastic housing 1.4mm. I then run a 2.4mm drill down the inside of the plastic housing twisting the drill between finger and thumb. This will deepen the hole slightly and also remove any wisps of plastic that may jamb the plunger. By twisting the drill between finger and thumb there is no risk of the drill binding and drilling right through the end. With a file blunt the point of the plunger. Then fit spring onto plunger and fit into housing running a nut onto the back end. When fully depressed the plunger should sit virtually flush with the end of the housing. It is important that you use the etched solder tag that is locked between two nuts on the end of the plunger. If you try to solder the electrical wire direct to the plunger you will melt the threaded end into the plastic housing. This will cause the plunger to jamb in use even if it feels free before fitting (this is probably what the people who dont like plungers have done). I tin one end of the etched tag with electrical solder before locking between the nuts. In this way I can solder the tinned end of an electrical wire very quickly onto the tag with no risk of heat getting to the plunger.

If you are a little unsure you can solder the wire to the tag. Then lock it between the nuts and thread the wire and plunger through the hole in the chassis. Once the plunger is fitted into the chassis I run a ring of Araldite around the housing on the inside face of the chassis side. Now fit wheels and rods (fitting gearwheel onto centre axle). Check for smooth running.



22) Cut off the back shaft of the motor. I use a slitting disc in my mini drill for this. Hold the motor in the vice with its front shaft and make small nibbles (as if you were chopping a tree with an axe) into the back shaft with the slitting disc. In this way there is less risk of the disc snatching and shattering unlike trying to cut through in one go.

The worm gear is pushed onto the motor shaft until the end is flush with the end of the shaft. I push the worm ⅓ onto the shaft, then pick up some supperglue on a piece of wire and coat the inside bore of the worm, then push the worm home.

Mount motor (dont drop the screws as they come with the motor and I dont know how to get replacements) and connect up wires. The motor mounting holes are slotted to enable you to make adjustments in gear mesh for the best running. A little light oil on the bearings and motor bearings is a good idea. You should now have a completed sweet running chassis. The motion bracket, crossheads and valve rods were painted red.