

Brassmasters

Scale Models

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LONDON & NORTH EASTERN RAILWAY

**A3 4-6-2
(Left-hand drive)**

LOCOMOTIVE KIT

Designed by Martin Finney

**4MM SCALE
OO - EM - P4**

**INSTRUCTIONS
AND PROTOTYPE NOTES**

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SECTION 1: BRIEF HISTORICAL DETAILS

Just before Grouping in 1923, Nigel Gresley introduced his 4-6-2 design on the G.N.R. There were only two engines of this class in service at the end of 1922, but a further ten had been ordered by the G.N.R. and these were completed in 1923, the L.N.E.R. classification being A1. On Gresley's appointment as C.M.E. of the L.N.E.R. this class was adopted as standard and a further forty (twenty by the North British Locomotive Company) were constructed in 1924-25. In 1927 two of the class were rebuilt with higher pressure boilers to become the first of class A3 and eventually, by 1948, all but the first engine was dealt with in this fashion. These engines were all built with the driving position on the right-hand side. Between 1927 and 1931 the original valve gear with short valve travel (S.T.V.) was replaced with a new design with increased travel. (long travel valves - L.T.V.).

During 1928-35, twenty-seven new A3s were built with the driving position on the left-hand side. These engines had the long travel valves and were built under three Engine Orders as follows:

E.O.	Numbers	Built	Boiler	Dome	Bogie
314	2743-52	8/1928-4/1929	94HP	Round	Swing links
317	2595-99 2795-97	2/1930-7/1930	94HP	Round	Swing links
331	2500-08	7/1934-2/1935	94A	Banjo	Helical spring

During 1952-54 the remaining fifty-one of the original engines were eventually converted to left-hand drive.

So from this kit, which is for left-hand drive engines, the twenty-seven new A3s can be built in their original condition and the remaining engines can be built after their conversion to left-hand drive.

For a detailed history of this long lived class, Part 2A of Locomotives of the L.N.E.R. published by the R.T.C.S. is essential reading. Other valuable sources of information and photographs are:

Locomotives Illustrated 25 - Ian Allan

The Gresley Pacifics - O.S.Nock - David & Charles

Yeadon's Register of L.N.E.R. Locomotives - Volume One - Irwell Press

East Coast Pacifics at work - P.N.Townend - Ian Allan

The Power of the A1s, A2s and A3s - J.S.Whiteley & G.W.Morrison - Oxford Publishing Co.

Variations/Modifications incorporated into the kit

Chimney: original type and double chimney fitted to most of the locomotives from 1958 onwards.

Dome: original types and later banjo dome.

Frames: Differing frame lightening hole arrangements. All locomotives had the hole ahead of the cylinders. In addition, Engine Orders 314 and 317 had four circular holes, 12" in diameter (marked L in Fig. 2). E.O. 331 had only the hole ahead of the cylinders. The locomotives originally built as A1 had the four larger oval holes.

Frame rivets: The original engines were built using countersunk rivets and so give a smooth appearance to the frames. Many photographs show a gradual change to rivets with a visible head as frames were repaired or replaced.

Bogie: The locomotives built with the swing link bogies were soon converted to the helical spring type circa 1933-34.

Front end cover plates: Small cover fitted from 1933 onwards and larger sliding cover from 1945.

Front footsteps: Fitted from 1935 onwards.

Rear spring retaining brackets: Fitted later.

Firebox crown washout plugs/door covers: Originally square ended plugs and from circa 1936 onwards circular covers.

Anti-vacuum valve plate - Two types provided.

Cab seats: original type replaced with bucket seats from circa 1935 onwards.

Cab sides: original cut-out increased in height by 11" at the same time as bucket seats fitted.

Lamp irons - footplate: second lamp iron on R.H.S. removed from 1931.

Lamp iron - smoke box door: two different types.

Trough type smoke deflectors: fitted to 55 of the locomotives from 1960 onwards.

Reversing rod: Different shape depending on whether Doncaster or North British built.

Frame guard irons: Removed in the period 1952-54.

SECTION 2: CHASSIS DETAILS

Note that many of the components for both chassis and body are handed left/right and care must be taken to ensure the correct component is used. I have not always identified left/right components separately but with care and common sense no problems should arise.

Before construction can commence you have to decide which chassis you are going to construct. The options are:

1. Gauge 00, EM or 18.83.
2. Suspension Rigid, sprung, compensated.
3. Pick-ups Scraper, plunger or the 'American' system.

No pick-up material is provided. The options are:

Scrapers attached to printed circuit board fixed between the frames.

Plunger - drill out 3 of the holes P1 or P2 on each side and fit according to the manufacturer's instructions.

The 'American' system with the wheels on the loco are shorted out on one side and the tender on the other. I have produced some etched shorting strips, as an additional item, for this purpose. The drawbar between the loco and tender can be used to carry the current.

SECTION 3: FRAMES

Having decided which chassis to construct you can now start construction by preparing the frames (parts 1 & 2). First emboss, using photographs as a guide, the appropriate rivets.

For a rigid chassis open out the main axle holes to accept 1/8" top hat bearings (not provided) and solder them in place. If you are going to fit sprung horn blocks, you should remove the axle holes by cutting up the half-etched lines, leaving a standard 6mm wide slot and then follow the manufacturer's instructions.

To construct the kit as designed with a compensated chassis. First decide which of the two possible compensation arrangements you prefer (Fig.1). Remove the appropriate axle holes as described above. Carefully widen the slot in the hornblocks (part 9) until the Flexichas bearings are a good fit. I find a significant variation in the bearings and once I have fitted a hornblock to a bearing I mark the bearing and hornblock so that they can be later assembled together. A good fit between hornblock and bearing is essential if the chassis is to run well.

For the fully compensated arrangement, which gives a much smoother ride to the chassis, drill out holes P1 for plunger pick-ups and C1 (1/16") for the compensation beam and solder the rear hornblocks to the inside of the frames aligning them with the half-etched line and with the bottom of the frames.

For the simpler system, drill out holes P2 and C2 and solder top hat bearings in place for the rear axle.

Drill holes B for brake hanger pivots - 0.45mm. If you are not fitting the front guard irons drill out holes G - 0.45mm. Bend the lubricator linkage brackets along the fold lines at right angles and strengthen with a fillet of solder. The front bracket will need relieving slightly to clear the driving wheel. Fold up the centre sandboxes as shown in Fig.4. Solder in place parts 84,93 & 94 and the brake hanger pivots from 0.45mm wire (Fig.3).

SECTION 4: FRAME STAYS AND ASSEMBLING THE CHASSIS

Remove parts 5, 6, 7, 8 & 83 to suit your chosen gauge. Open out the holes for the front compensation beam in part 7 to 0.8mm. Fold up parts 5, 7 & 8 making sure the half-etched fold line is on the inside and that each bend is a right angle.

Check that all tabs on the stays fit properly in their corresponding chassis slots so that the rest of the stay is hard up against the inside of the frames. Tap the cylinder fixing holes in part 8 10 BA. Solder one of the longer 10 BA bolts through the hole in part 8, for the bogie pivot.

Now assemble the frames and stays. Note the shorter side of part 83 is on the left. Start by tack soldering part 7 to both sides. Check that everything is square and that the stays are hard against the frames. Put an axle (or better a longer piece of 1/8" rod) through the rear bearings and place the chassis on a piece of graph paper to check that the axle is square to the frames. If all is well solder the remaining stays to the frames checking constantly that the chassis is square and the frames are straight and checking that the rear of part 5 will be vertical. Solder part 95 in place and add part 96 to the lower edge of part 83 and trim to length. Attach the bogie splashers (parts 102 & 103) locating them in the frame cut-outs.

SECTION 5: COUPLING RODS

The coupling rods are now made so that they can be used as a jig to align the remaining hornblocks accurately. First drill out all the crankpin holes to a convenient size which is well undersize for the crankpins and the fork joint holes so that the 1mm nickel silver wire is a tight fit. Remove all burrs caused by the drilling. Now drill a hole, with the drill used for the crankpin holes, in a small block of wood and leave the drill in the wood with its shank projecting. This projecting shank is used as a mandrel to accurately align the laminations of each rod.

Place the laminates over the mandrel and using plenty of solder and flux solder the two laminates together. You will now have rods with the crankpin and fork joint holes aligned. Carefully file the edges so that the 'laminated' effect is lost and the rods appear to be made from one piece of metal.

The crankpin holes now need carefully opening out until they just fit, with no free play, the ends of the hornblock alignment jigs (available from London Road Models or Markits).

The fork joints are now pinned using the 1mm nickel silver wire. Retain the pins, which should be a tight fit, by lightly soldering on the inner face of the rods. The correctly assembled rods should now have a completely flush inner face.

SECTION 6: FITTING THE FLEXICHAS HORNBLOCKS

Prepare the remaining bearings and hornblocks as described in section 3 and slide them over the hornblock alignment jigs with the springs between the bearings. Carefully compress the springs and clip the hornblocks between the frames and place the prepared coupling rods over the ends of the jigs. Make sure the hornblocks are square to the chassis and that their bottom edge aligns with the lower edge of the frames and then solder them in place.

SECTION 7: FITTING THE COMPENSATION BEAMS

For the fully compensated arrangement solder a piece of .8mm wire through the holes in part 7. For the rear beams cut a piece of 1/16" brass rod so that it fits through the holes C1 and is flush with the outside face of the chassis frames. Cut two equal pieces 3/32" tube which together fit between the frames and solder the rear beams (part 10) to them close to one end. Modify the Flexichas bearings on the two rear axles as shown in Fig.1 and temporarily fit the beams.

For the simpler system fix both beams (part 10) centrally to a piece of 3/32" tube as shown in Fig.1.

Temporarily fit all the wheels and axles and confirm that the compensation works properly and check that the chassis is sitting level. Retain the beam pivot by fitting part 114 over the brake hanger pivots as shown in Fig.3.

SECTION 8: REAR FRAMES & RADIAL TRUCK

Fold in the radial truck hornguides on part 3 (Fig. 7). Now make all the bends on part 3 - all 90° and with fold lines inside - then solder in place on the rear of part 5 ensuring that the rear frame will be level. Emboss the rivets on the outer frames (part 85) and form to fit. Fold up part 4 and locate between the rear frames. Check all is fitting correctly before soldering the rear frames in place. Detail the rear frames by adding parts 86,87,88,89 & 90 together with the Cartazzi axlebox ties from 0.7mm wire.

Bend part 92 to shape and solder around part 91 to make the lower firebox. Add the washout plugs at the corners from 0.5mm square wire and the blowdown tap (part B7) before soldering in place on top of part 3.

Fold up the spring wire brackets and side play stops on part 17. Fold up part 18 and attach part 17 and check for free, but not sloppy, movement in the hornguides. Solder the small top hat bearings in place and fit the radial truck wheels using the washers (part 117) to eliminate any side play. Bend up the spring wire to give some downward pressure and solder in place through the bracket on part 3 and the hole in part 5. The radial truck is retained with lengths of 0.5mm square wire.

SECTION 9: BOGIE

Emboss all the frame rivets as shown in Fig. 10 and solder the top hat bearings in place. Fold up the guard irons (part 101) and solder in place on the inside of the frames. Fold up the frame stay (part 100) and reinforce the spring wire retaining brackets with a fillet of solder. Solder the frames and frame stay together and add parts 15 and 16. Form the dust shields (part 104) to shape and solder in place.

Using appropriate washers (part 117) fit the wheels so that there is a minimum of side play. Bend up the spring wire to give some downward pressure and solder in place through the holes in part 7. The bogie is retained with a 10 BA nut.

SECTION 10: COMPLETING THE CHASSIS MECHANICALLY

Fit the crankpins to the wheels making sure the screw heads do not foul, countersinking them if necessary. Attach the balance weights to the wheels as in Fig. 16. Assemble the wheel sets, bearings and motor/gearbox selecting 1/8" axle washers of appropriate thickness to control side play. Side play on the leading axle should be kept to a minimum to avoid clearance problems with the valve gear and connecting rod.

The cranks on the right hand side should lead the left by 120° I find the easiest way to achieve this consistently on all three axles is by looking through the wheels with a magnifier against a strong light and lining up corresponding spokes. The wheels have 20 spokes which gives 18° between each spoke. 120 is unfortunately not

a multiple of 18 but $18^\circ \times 7 = 126^\circ$ which is close enough. So you simply adjust the wheel sets until the right hand side is 7 spokes ahead of the left. This method is surprisingly accurate and, for me at least, gives by far the best results. Now connect the motor to your pick-ups and test run.

Check all the holes in the cylinders (part 26) against the appropriate components and open up the holes if necessary. If you are building a EM or 18.83 chassis reduce the width of the inside cylinder faces to the etched lines provided so that the cylinders are a good fit in the slots in the frames. Fold up the cylinders making sure they are square and fold out the 2-to-1 arm bracket.

Construct the slidebars as shown in Fig. 33. Use plenty of solder whilst applying pressure to keep the laminations together. Clean off the front and rear faces and remove the rear section. The crosshead slot will need cleaning out so that the cross head is a good fit. This can be done with a thin file – haven't gone one? - then use a piece of emery paper over a scrap piece of brass etc. The appearance of the slidebars is much improved by carefully filing the top smooth.

Insert the slidebars in the cylinders and tack soldered in place. After checking all is square and parallel they are permanently attached. Attach the piston rod glands (part N4) and check that the crosshead slides properly. Solder the valve crosshead guides (parts B16 & B17) in place aligning them with a piece of 0.8mm wire passed through the valve rod holes.

Drill out the holes in the front cylinder covers (part N5 & N6) - marked on the inside - so that the relief valves (part B3) will pass through. Attach the front covers and fit the relief valves. Add part 29 as shown in Fig. 9.

Solder together the connecting rod laminations (part 23 & 24) and add the rod boss laminations (part 25) to the big end back and front. Drill the big end to fit the crankpins and the small end 1mm. Solder the crosshead arm (part 53) to a piece of 1mm wire as a pin. Fit the connecting rod to the crosshead, ensuring the crosshead arm is vertical, carefully solder the pin from the rear and file flush. Fit the connecting rods with a thin washer between the coupling rods and connecting rods and check the clearance of the connecting rod and the leading axle crankpin nut. You will probably have to reduce the thickness of the nut.

Solder the slide bar bracket laminations (part 30) together back to back. Attach the cylinders to the chassis with two 10 BA bolts and fit the slide bar bracket through the frame slots and solder to the slide bars.

All the valve gear joints, with the exception of the eccentric arm/eccentric rod, are made with wire pins soldered on the inside. This clearly runs the risk of soldering the joint solid. To minimise this:

- (i) ensure the pin is a tight fit in the hole.
- (ii) use oil or a proprietary solder mask.
- (iii) use plenty of flux, a small amount of solder, and be quick!

Bend up, in a vice, part 37 centring the bends on the etched slot. Solder part 38 in the slot in part 37 ensuring that the holes for the radius link pivot align horizontally and vertically. Solder the radius link brackets to part 39 as in Fig. 11 and check the assembly fits in the frame slots. Solder short pieces of 1mm wire to the brackets for the radius link pivots.

Drill out the holes in the radius link laminations (parts 34 & 36) to take the 0.3mm wire pins which align the laminations and represent the bolt heads. Solder the inner laminations together with four lengths of 0.3mm wire (Fig. 12). Check that the slot in the inner laminations is a sliding fit with the 0.7mm wire.

Place the radius rod (part 46) and radius rod rear lamination (part 47) over the radius link, align with a piece of 0.7mm wire, and solder the lamination to the rod. Solder the 0.7mm wire pin in place and clean off flush. The radius rod should now move smoothly in the link. Add the fork joint (part 48) to the front of the radius rod. Open out the holes in the radius link outer lamination (part 34) so that they are a good fit on the pivot wires on the radius link bracket. Solder the outer laminations in place and cut off the 0.3mm wire to represent the bolt heads. Gently spring the links in place in the brackets (insert washer part 40 as shown in Fig. 11) and check that the links pivot freely and are vertical.

Form the joggle in the combination levers (part 49) with the fold lines inside reinforcing the bends with solder. Assemble the rear valve rods (part 54) and union link (parts 50 & 51). Make the valve rods as long as possible so that they just go in past the slide bar bracket. Pin together the combination lever, union link, valve rod and radius rod.

Add the fork joint (part 33) to the eccentric rod (part 32). Reduce the diameter and thickness of the rivet heads so that they will fit in the recess in the back of part 106. Tap the crankpin hole in the eccentric crank (part 31) 14 BA. Oil the tap and use it to screw the eccentric arm and a crankpin nut together as shown in fig. 14. Now solder the nut to the arm. Remove the tap and file off flange of the nut. This gives an arm with a substantial thread which can be tightened on the crankpin. Fit the arms on the crankpin and tighten so that the offset of the end of the arm is 2.5mm (see Fig. 29). You may need to file some more off the nut so that it tightens in the correct position. Rivet the radius rod to the arm and add part 106.

Now pin the remaining two joints between the union link and crosshead arm and between the radius link and eccentric rod. Check that the motion works smoothly. Fit the reversing crank (parts 41 & 42) to the reversing cross shaft made from 1mm wire as in Fig. 11. Add the pins through the ends of the cranks and through the slots in the radius rods. By rotating the cross shaft you should now be able to reverse the motion!

Assemble the 2-to-1 lever (parts 56 & 57) and the front valve rods (part 55) as shown in Fig. 17. Pin the valve rods, 2-to-1 lever and equal lever (part 59) together. Solder a 1mm wire pin in place in the bracket attached to the cylinders. Make the pin just long enough so that the 2-to-1 arm can be sprung in place over the washer (part 58). Adjust the valve rods to length so that they do not interfere with the rear valve rods and check for free movement. Now link the valve rods together with hoops of 0.3mm wire (see Fig. 9) checking that you have equal backward and forward movement on the conjugated valve gear arms. This now means that the valve gear is permanently fixed to the cylinders but the complete unit can be removed by unscrewing the eccentric arms and cylinder bolts.

Form the cylinder wrappers (part 107) to shape and solder in place making sure the drain cock holes are on the bottom centre line. Attach the drain cock castings (part B2). Emboss the rivets on the drain cock linkage (part 108) and joggle the front lever as in Fig. 9, before soldering in place together with lengths of 0.45mm wire to represent the operating rods.

The axles are now retained by the springs > formed from a triple lamination of parts 11, 12 & 13. Assemble the brake hangers (parts 112 & 113) first embossing the rivet on each lamination. Attach the hangers to the pivot wires. Emboss the bolts in parts 109 & 110 and solder the cross shaft overlays to the top of part 109. Fix this assembly to the brake hangers. Complete the brake gear by fitting the front cross shaft, levers, pull-rods and brake cylinders (parts 111 & W14) as shown in Fig. 15.

Complete the chassis detailing by fitting sandboxes (part W13), sandpipes (0.45mm wire) and sand box filler pipes (1mm wire) as shown in Figs. 4 & 29.

Emboss the rivets on the valences (part 121) and fold up. Now emboss the rivets on the drag beam and buffer beam as appropriate and fold up. There are two fold lines below the drag beam and the fold should be made on the lower one. Curve the valence behind the drag beam as shown in Fig. 18. Fold up part 125 and solder in place behind the bufferbeam and between the valences so that it is flush with their upper edges. Carefully form the bends in the footplate by bending over a rod of suitable size and fold up the strengthening ribs either side of the body fixing nut. Now solder the footplate in place with the valences in the half-etched recess along each side and part 125 in the recess under the front edge. Add part 122 to the rear drag beam and a 10 BA nut over the middle hole at the rear. This now gives a sturdy platform upon which to construct the upperworks. The excess metal is not broken away until the boiler is fixed to the footplate.

Curve the outer edges of part 126 and locate in place over the lamp irons (See Fig. 20). Locate the frame extensions (part 80) and then solder up all the joints at the front end. Fit the smokebox saddle castings (part W22) between the frames aligning them with the half-etched lines on the inside of the frames. The front casting will need shortening the joint between the two pieces being hidden by the steampipes.

Locate the half-etched groove in the splasher fronts (parts 138, 139 & 140) on the footplate edge and solder in place in the centre of each opening. Curve the splashers (parts 141, 142 & 143) to shape by rolling underneath a suitable rod or dowel on a resilient surface (a piece of rubber sheet) emboss the rivets, and fold up the end brackets before soldering in place. Add part 144 as shown in Fig. 24. Fold up the valve cover boxes (part 130) and solder in place in the half-etched recesses in the footplate. Form part 132 and solder in place on part 131 before soldering part 131 in place.

The front end detail can now be completed by adding parts 124, B5, W3, 133, 127, 128 & 129 as appropriate. Add the sanding rods as shown in Fig. 24 and the lubricators as shown in Fig. 21. The lubricator linkage (part 61) is fixed to the chassis brackets and is probably best left until the body can be fixed to the chassis.

SECTION 15: FIREBOX

Do not remove the cusp around the edges of the firebox and boiler formers or they will be too small.

Pin together, using 0.45mm wire pins, parts 69,70,71 as shown in Fig.26 with the part 71 with the cut outs for the sanding and reversing rods on the left side. Fold this assembly along the fold lines and solder together with parts 68 and 72 to make the firebox cage. Open up the slots for the sanding and reversing rods and round the sloping front edge.

Solder parts 73 & 74 in place on the firebox wrapper (part 154) before forming the wrapper to shape. Centre the wrapper on the formers by using the small notches in the top of the formers (accuracy here is essential) before soldering the wrapper in place. Solder two short pieces of 0.7mm wire into the holes in the rear former to act as dowels to locate the firebox and cab. Alternatively, 12 BA screws could be used. Fix part 155 in place and the upper washout plugs/doors as appropriate. Solder handrail knobs in place and add the lower handrail from 0.45mm wire.

SECTION 16: BOILER AND SMOKEBOX

Form the coned boiler (part 158) by rolling and check for fit around the formers (parts 75 & 76). Bend the boiler band joining brackets on part 159 and fit through the small slots from inside the boiler. If the fit is good and the formers fit, then solder the wrapper ends together with part 159. Solder the formers in place so that they are almost flush with the ends with the etched notch at the top of the rear former aligned accurately with the notch in the wrapper. Solder two short pieces of 0.7mm wire into the holes in the rear former to act as dowels to locate the boiler and firebox. Alternatively, 12 BA screws could be used. Check the boiler/firebox fit. Represent the bolts in the joining brackets using 0.3mm wire and solder the handrail knobs in place.

If you are fitting the smoke deflectors, then drill appropriate holes as shown in Fig. 23. The drawing is full size and so may be used as a template. Emboss the rivets around the ejector exhaust pipe flange on the smokebox/parallel boiler wrapper (part 160). Roll the wrapper and check-fit it on the formers (parts 77 & 78). Solder the wrapper ends together using part 161 and solder in the formers flush with the back and front with the two handrail knob holes on the front spacer equally spaced from the adjacent holes on the wrapper. Drill out the handrail knob holes in part 79 and attach to the front of the smokebox aligning the handrail holes. Add the remaining handrail knobs.

Tap the hole in part 77 10 BA so that the smokebox and boiler can be screwed together. Now check-fit the boiler/smokebox to the firebox and saddle.

Form the ejector exhaust pipe from 1mm wire and attach using part 166 through the slots in the boiler. Leave it over length as it passes through the cab front the rear. Add the boiler handrail from 0.45mm wire.

SECTION 17: CAB

Fold up the cab floor support (part 170) and solder the cab floor (part 171) in place. Add the washout plugs from ,5mm square wire. Curve the rear edges of the cab sides (part 175 or 176) and solder part 177 or 178 inside the rear edge. Solder the cab doors (part 179) to the hinges and solder the cab handrails in place. Solder the inner cab window layer (part 180) in place (first file away the piece shown in Fig. 28) aligning the small holes for the cab side windscreens (part 184). Solder the sliding window frame (part 181) over part 180 before breaking off the rear piece along the half-etched line. The outer window layer (part 182) which retains the sliding window (part 183) cannot be fixed until painting and glazing are complete. Assemble the cab seats and fix in place.

Emboss the rivets on the cab front and solder the window frames (part 174) in place on the inside. Solder the cabsides and cab front to the cab floor. Fold down the tabs on the fallplate (part 172) which fit in the slots in the cab floor to give a hinge effect.

Fold up the back and front of part 185 which gives a solid base upon which to build the removable cab roof. Roll the cab roof to shape and solder in place with the cut-out for the ventilator as far forward as possible. Complete by adding the ventilator and rainstrips as shown in Figs. 19 & 22. Now using a Carborundum disc in a mini-drill cut through the unwanted part of the former and snap off the redundant parts along the half-etched lines. The edges of the formers will now need cleaning up.

SECTION 18: FINAL ASSEMBLY

Now permanently attach the cab/firebox/boiler/smokebox to the footplate by soldering the smokebox to the saddle and bolting the footplate to the cab. It may be possible to arrange a non-permanent fixing to the saddle to make painting the model easier, but care will be needed in handling the footplate once the redundant material is removed. Remove this unwanted material in the same way as for the cab roof.

Fold up part 97 (Fig. 6) removing the steps if appropriate. Attach the front steps (parts 98 & 99) and solder the complete assembly to the frames.

Attach all the remaining parts using the drawings and photographs as a guide to position.

Using the drawing of the cab interior the backplate can be assembled and the cab interior detailed. Use the copper wire for the pipes.

If you have any problem with the kit or any criticisms or suggestions please feel free to contact Brassmasters.

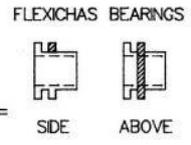
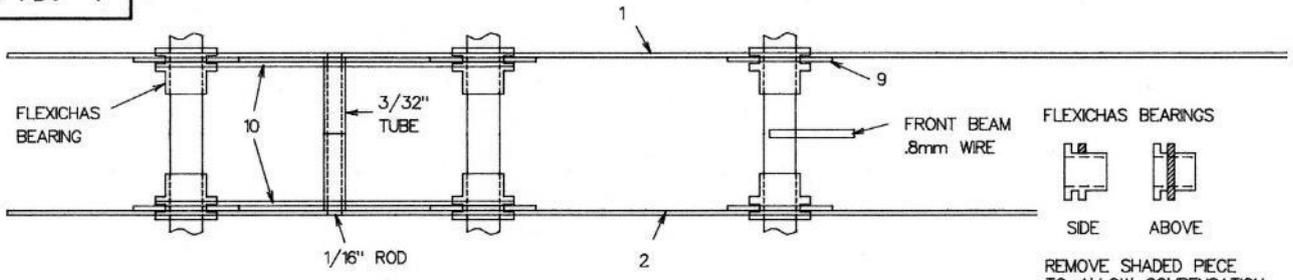
Finally, I must again thank Guy Williams for the original idea of a 'foreign' Pendon locomotive and for much of the pattern making.

Best wishes

Martin Finney May 1993

FIG. 1

FULLY COMPENSATED - ALL AXLES FREE TO MOVE



REMOVE SHADED PIECE TO ALLOW COMPENSATION BEAMS TO REST ON BEARING CLOSE TO FRAMES

A SIMPLER SYSTEM - REAR AXLE IN FIXED BEARINGS

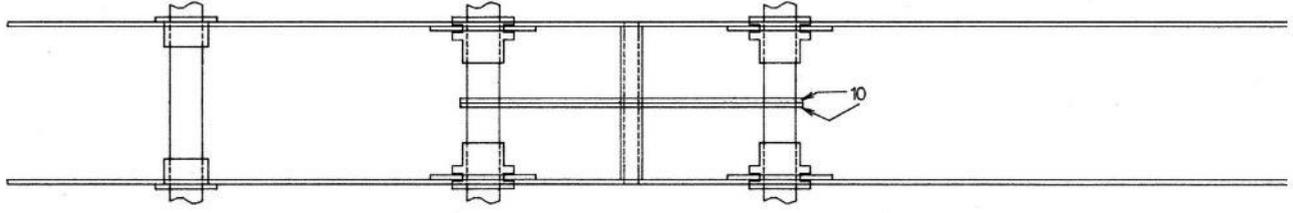


FIG. 2

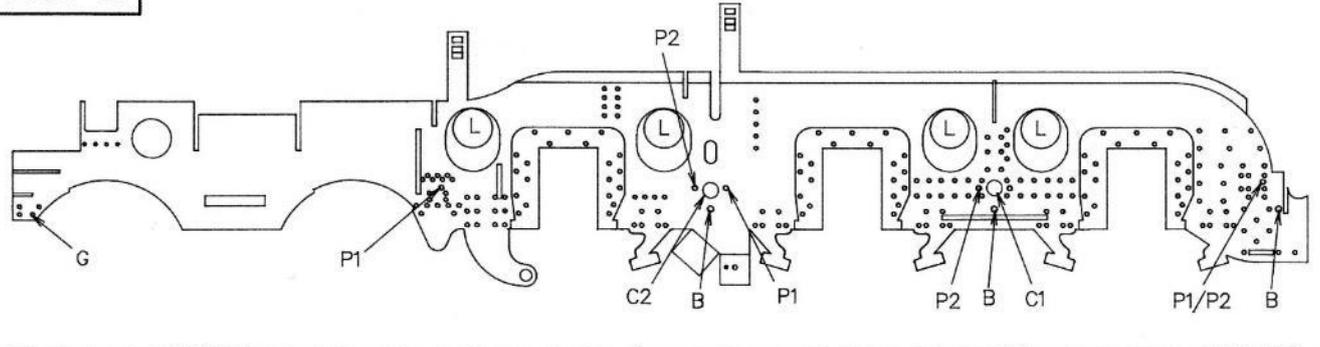


FIG. 3

CUT AWAY TO CLEAR LUBRICATOR LINKAGE BRACKET

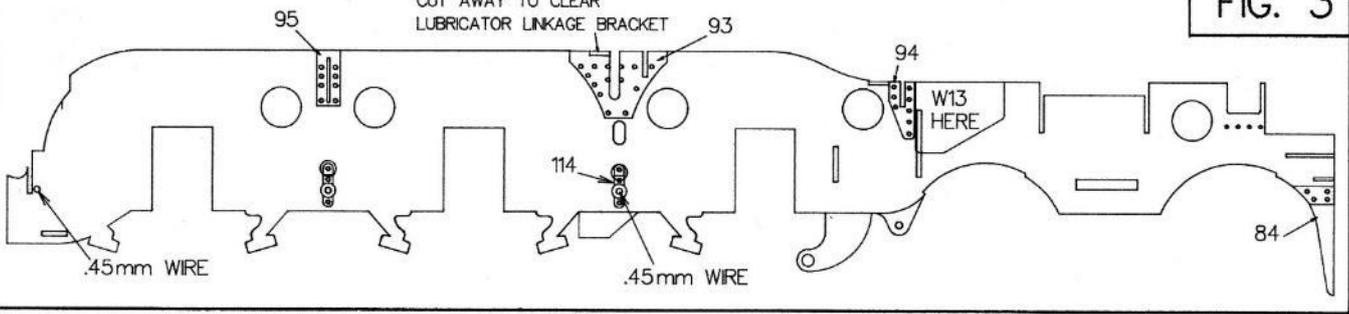


FIG. 4

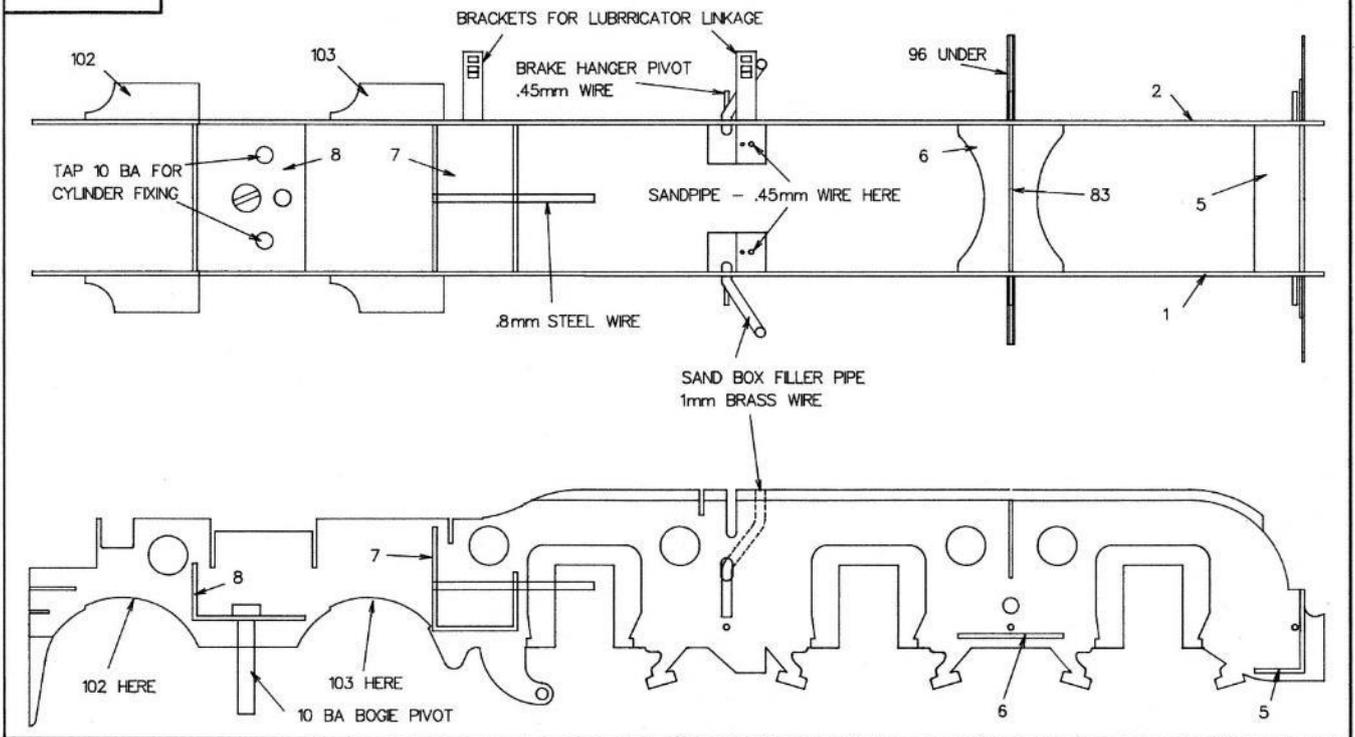


FIG. 5

1mm NICKEL SILVER WIRE

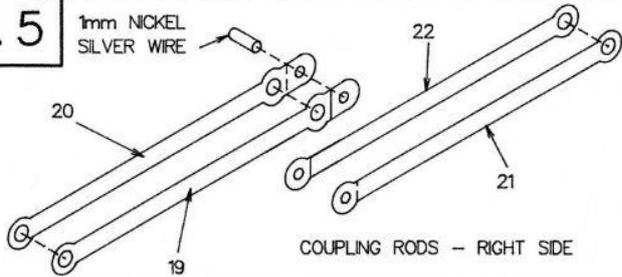
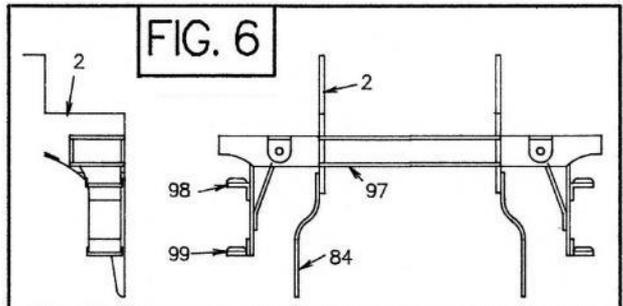


FIG. 6



DRAWBAR THROUGH THIS SLOT

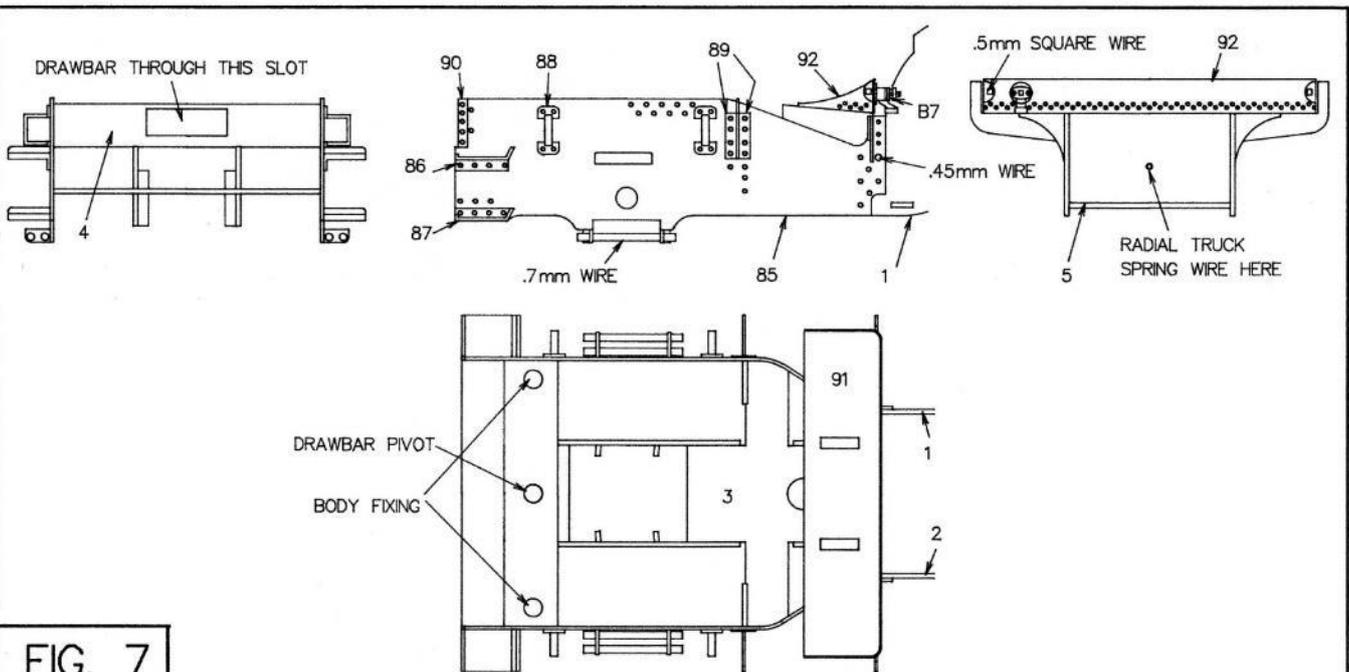


FIG. 7

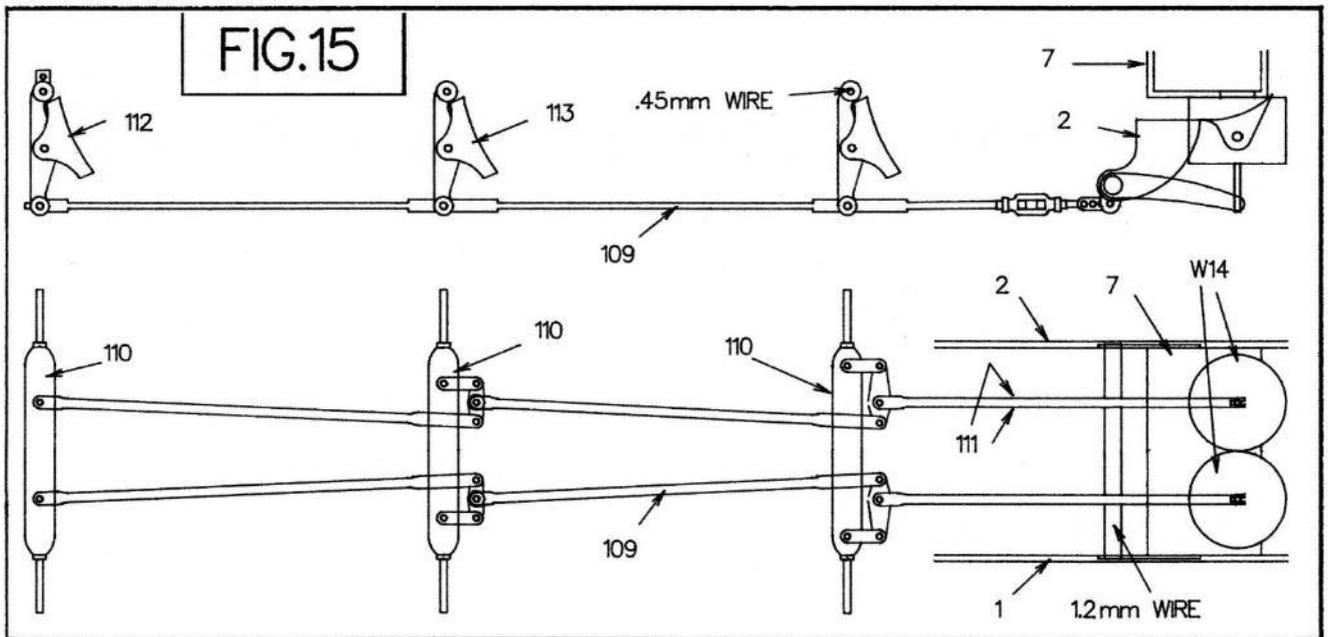
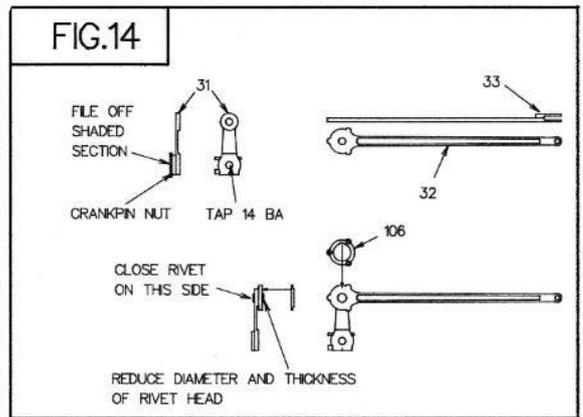
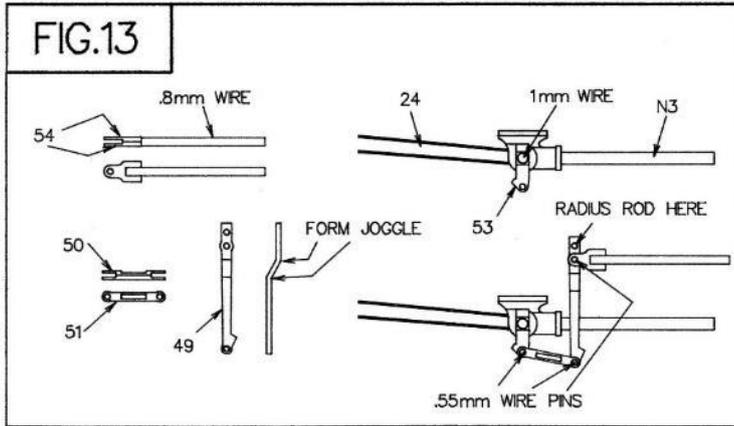
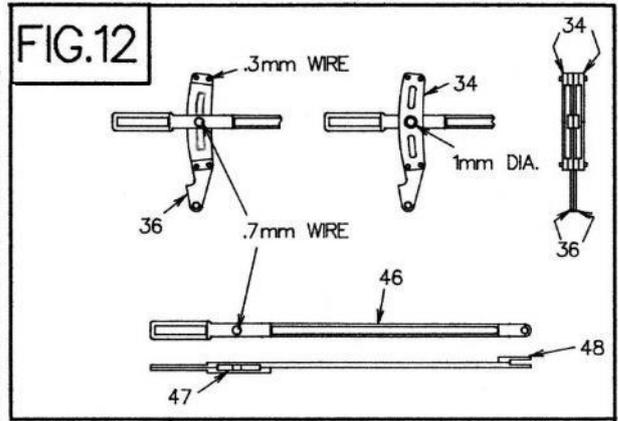
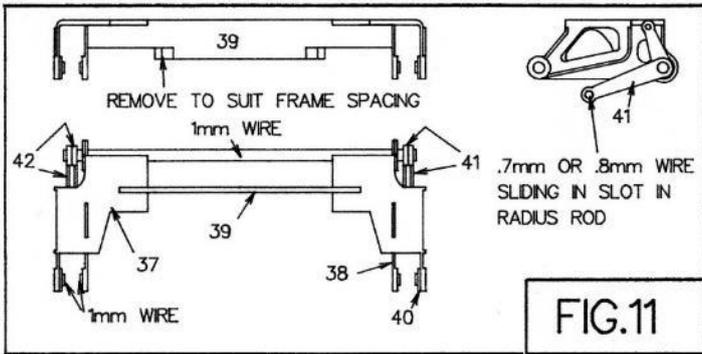


FIG.16

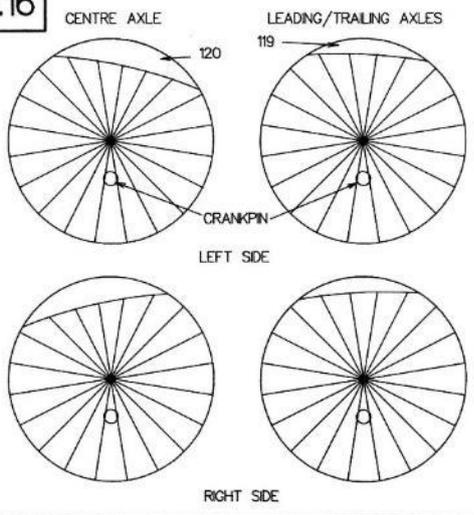


FIG.17

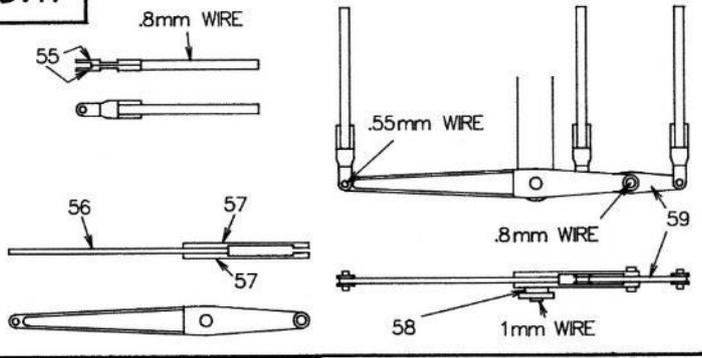


FIG.18

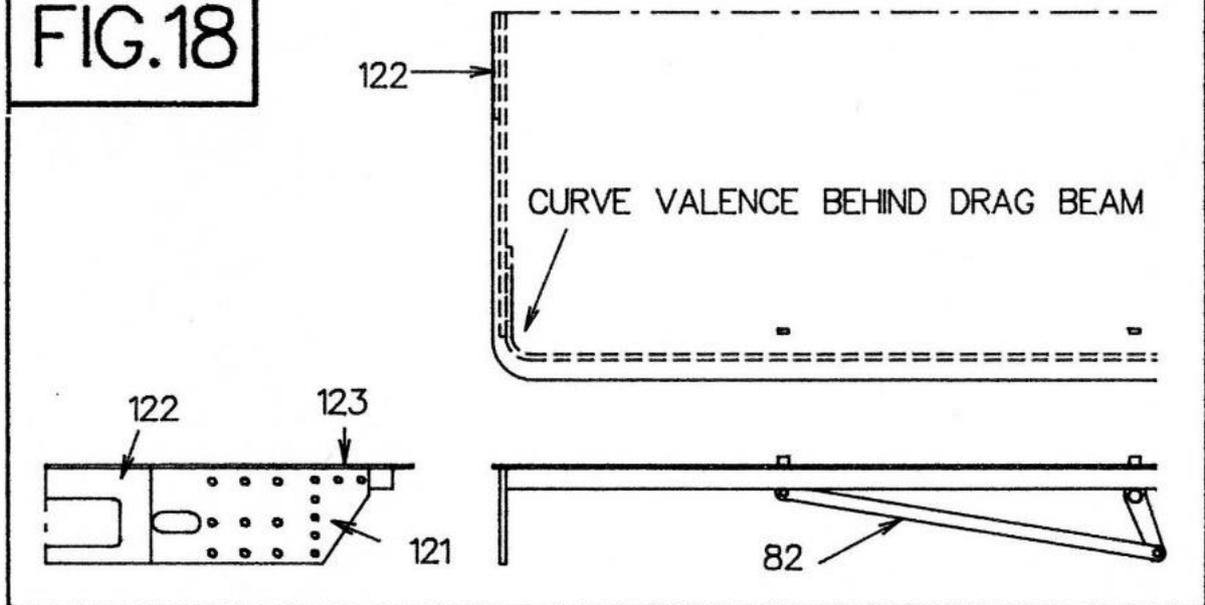
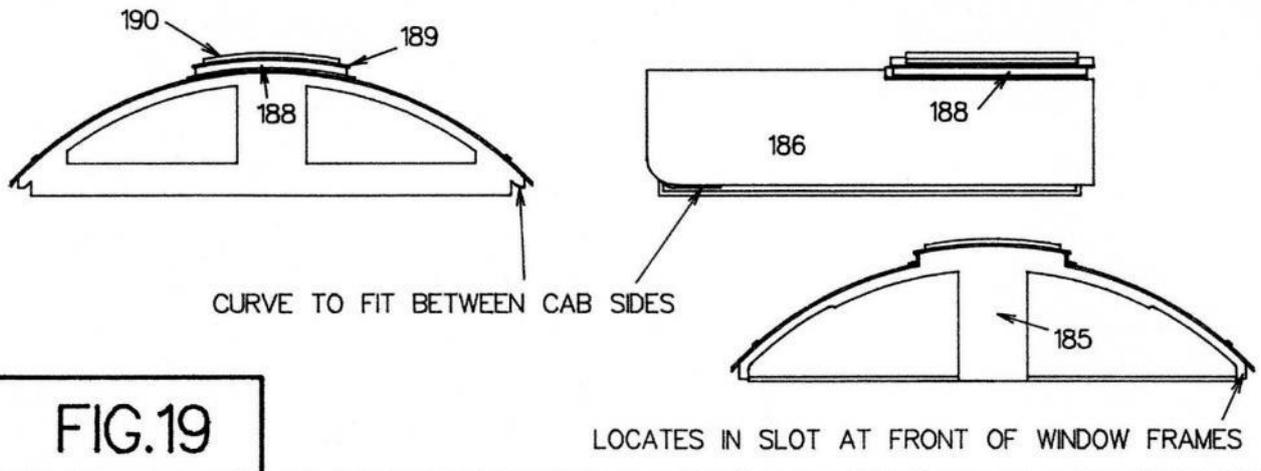
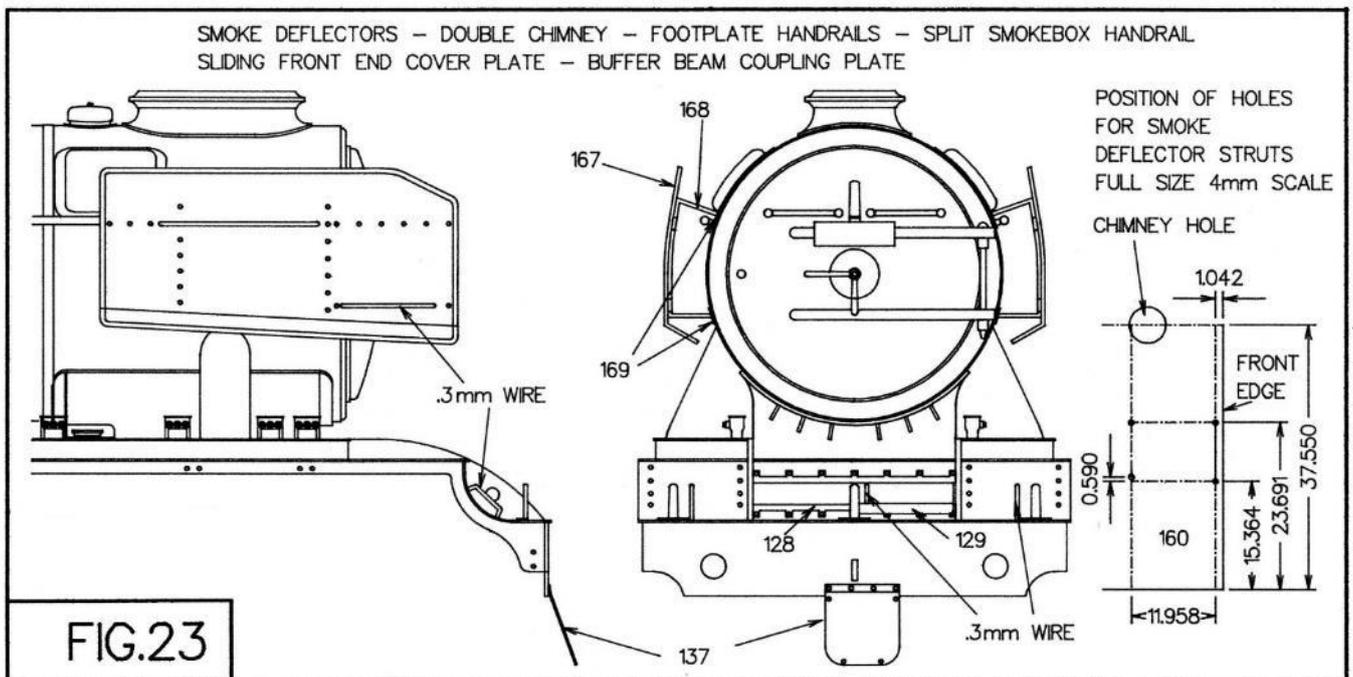
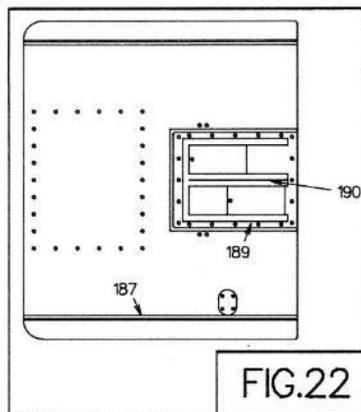
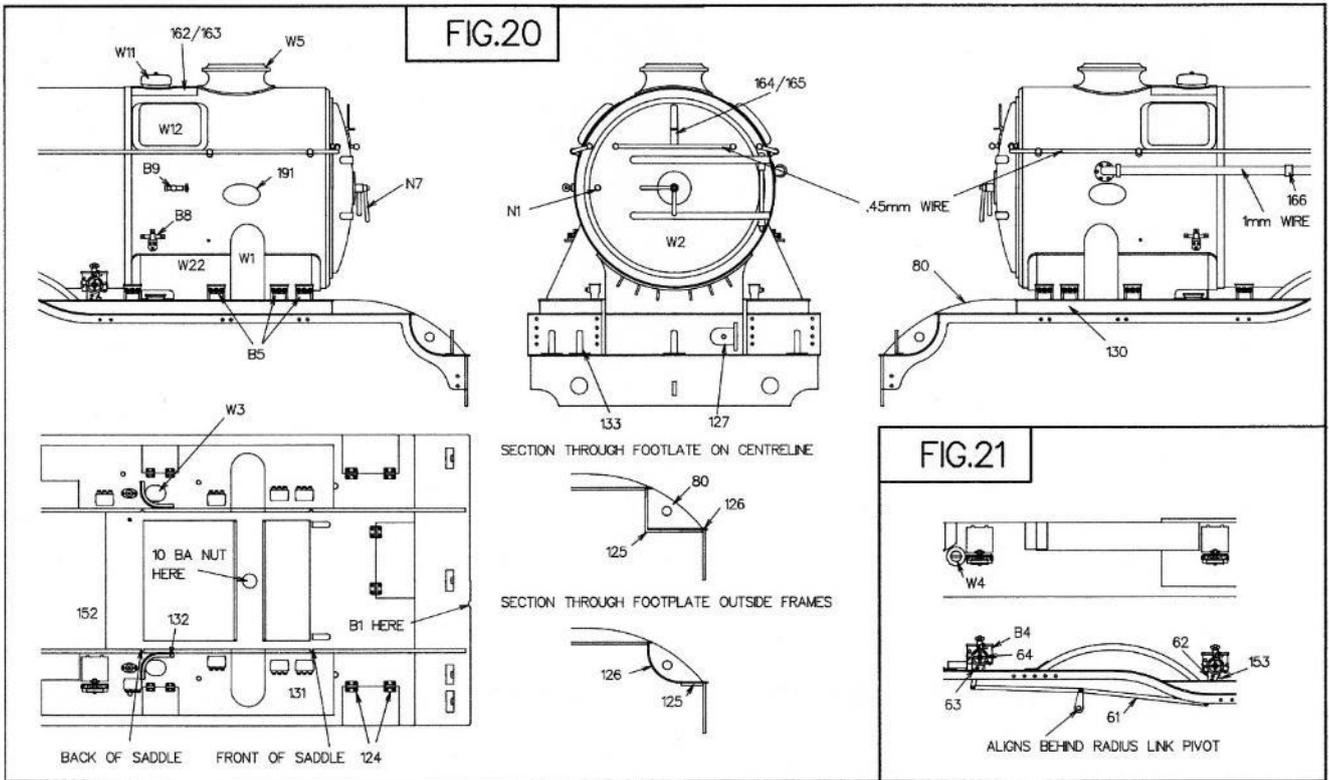


FIG.19





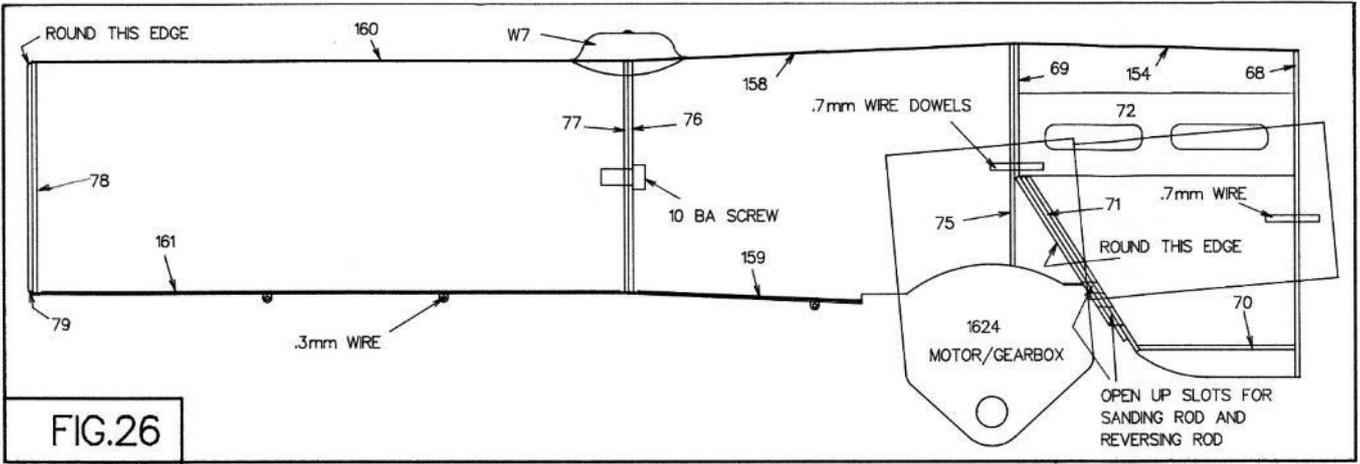
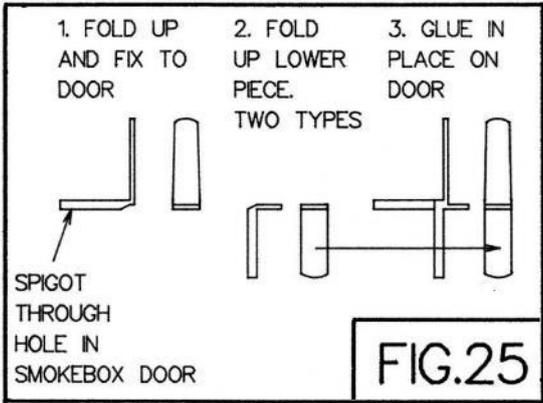
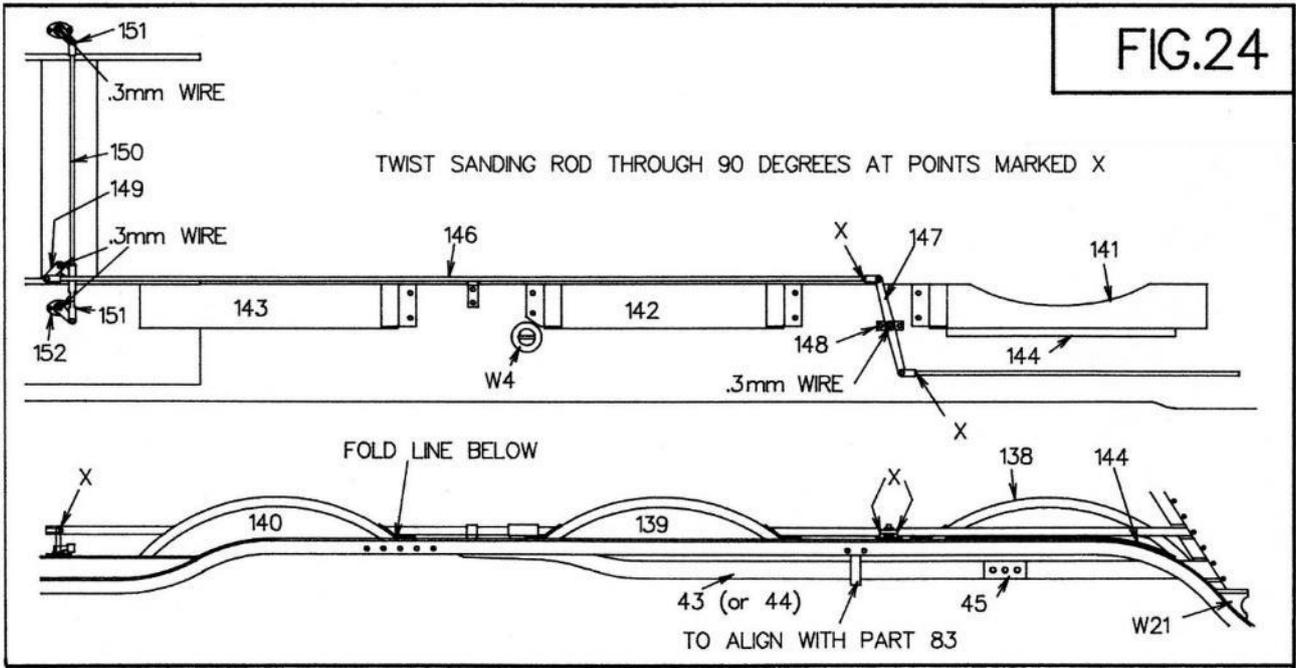


FIG.27

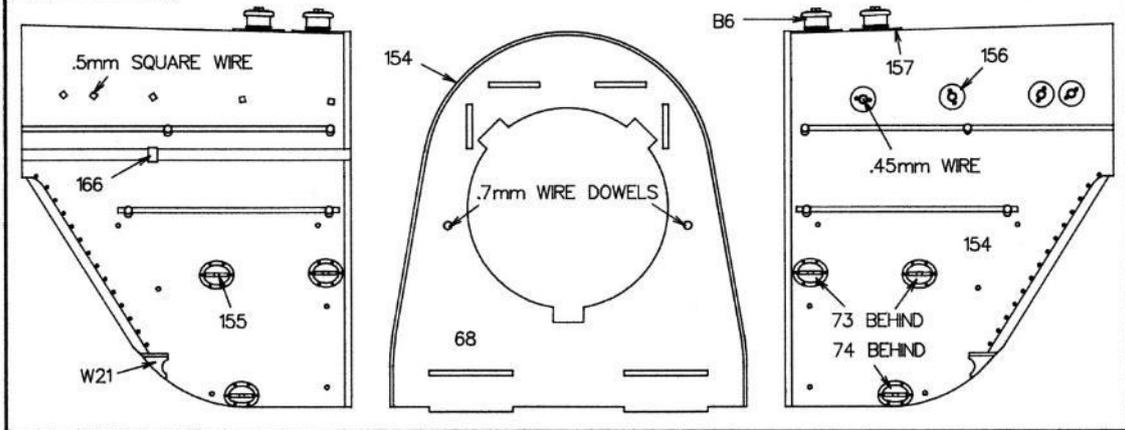


FIG.28

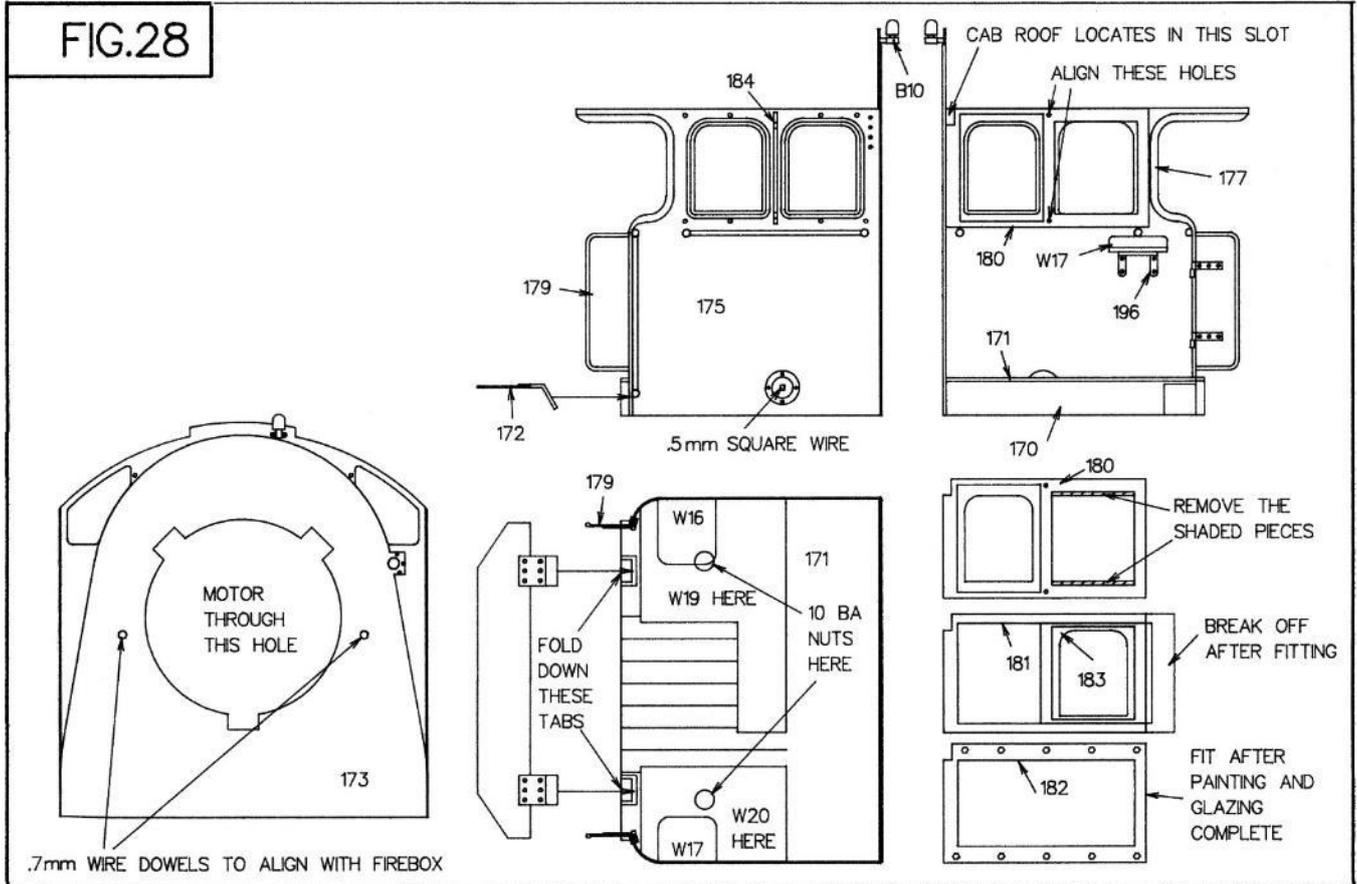


FIG.29

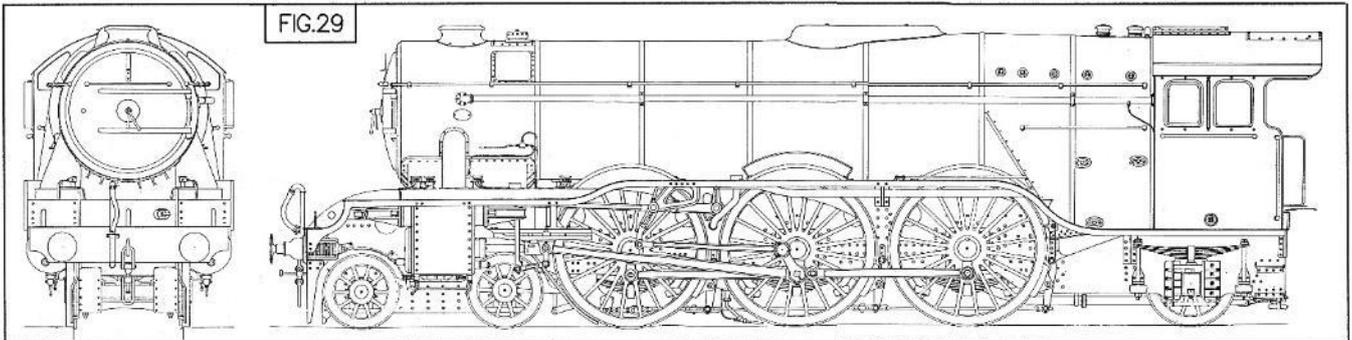
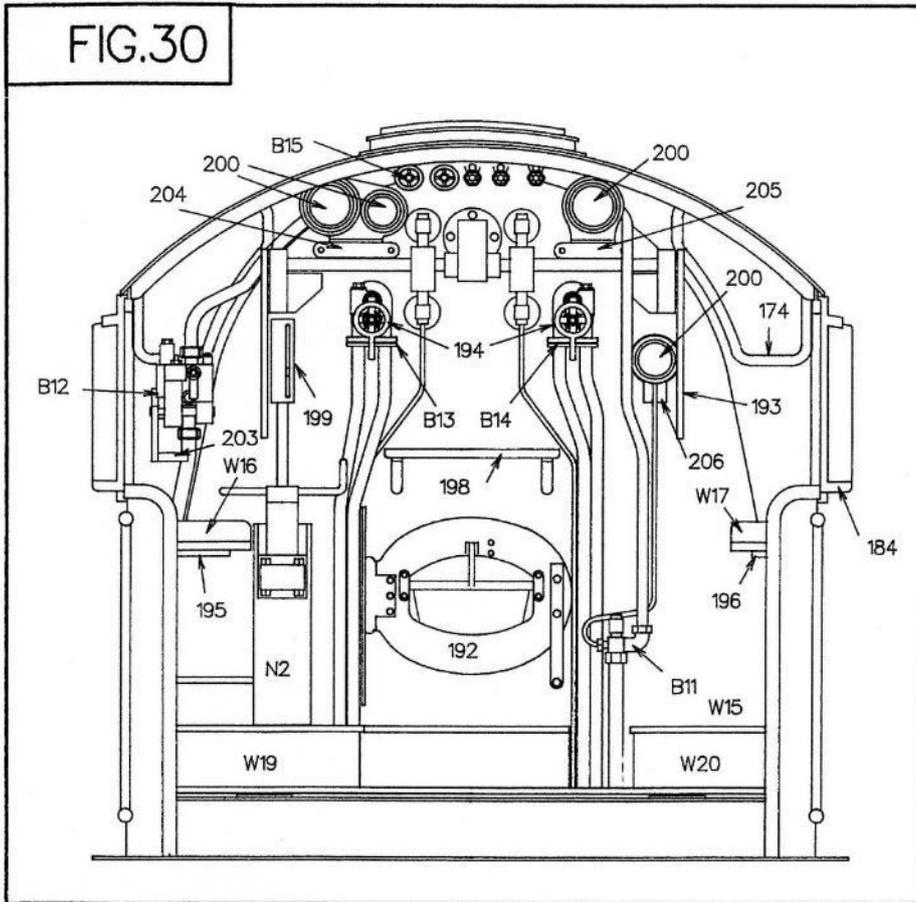


FIG.30



ASSEMBLY OF TYPICAL VALVE GEAR JOINT

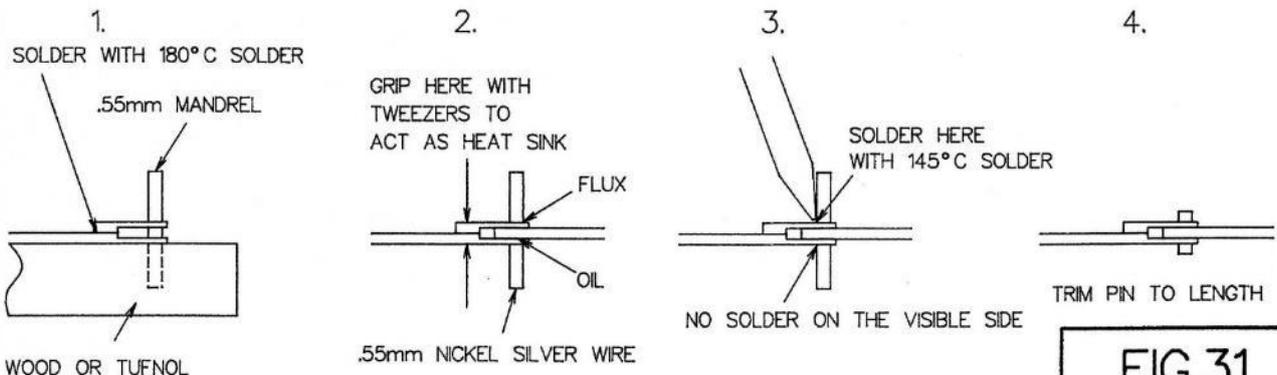


FIG.31

FIG.32

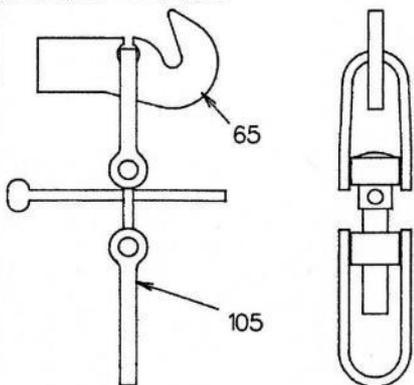
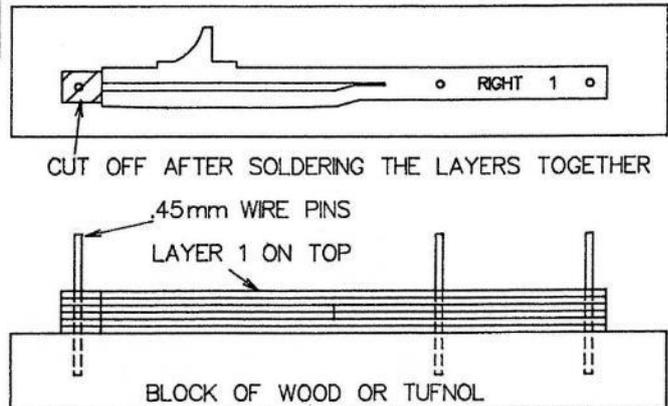
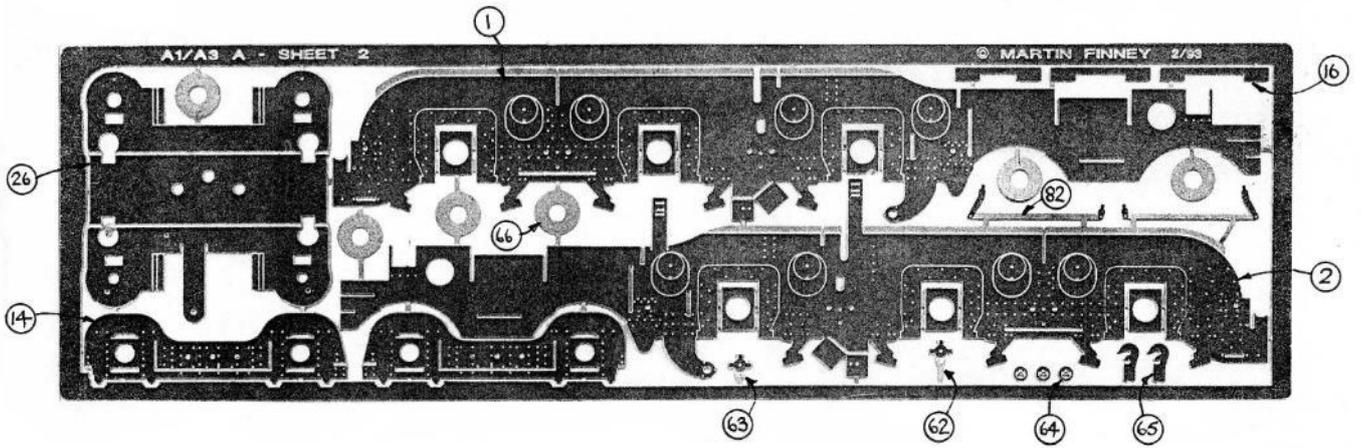
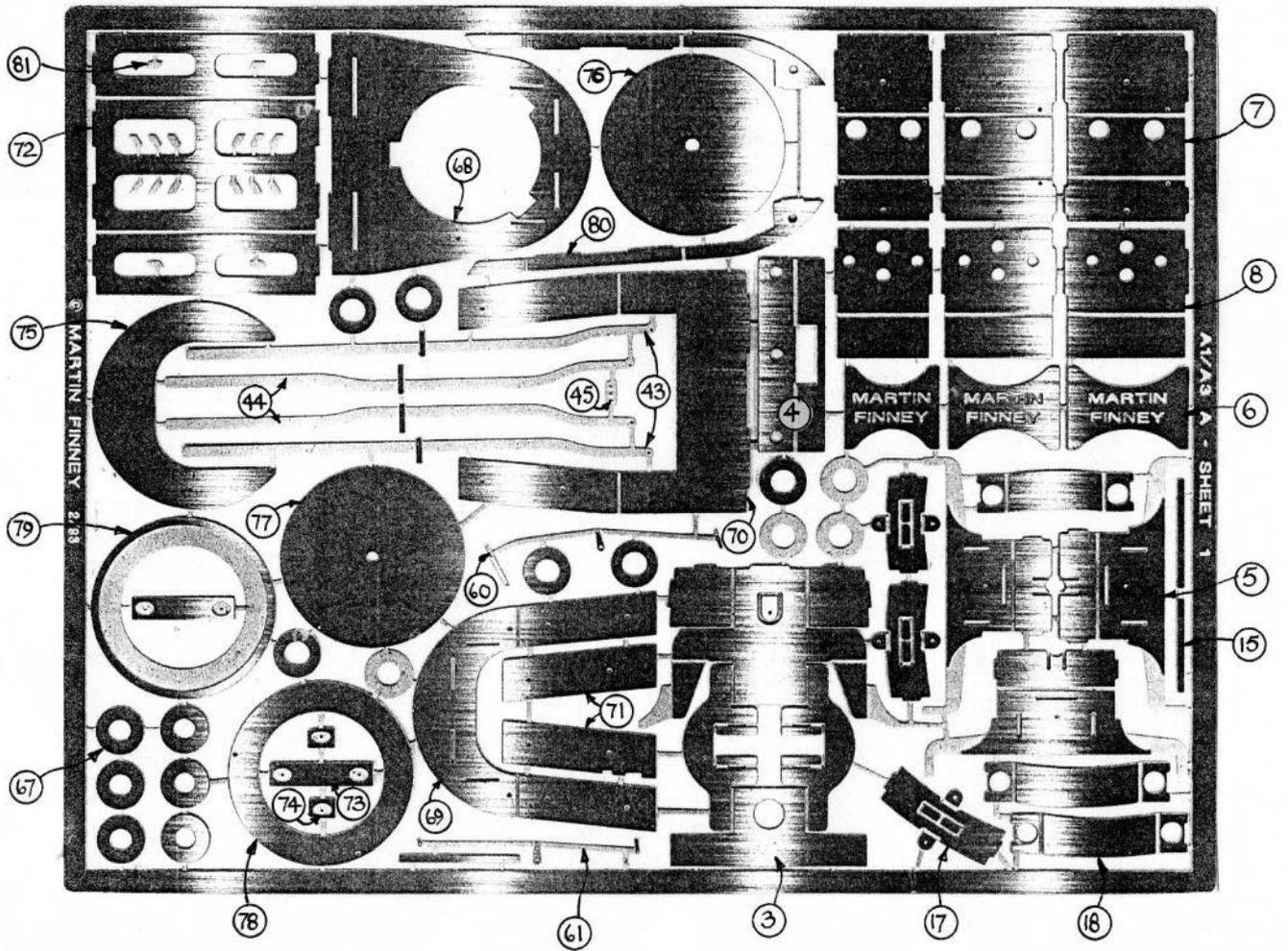
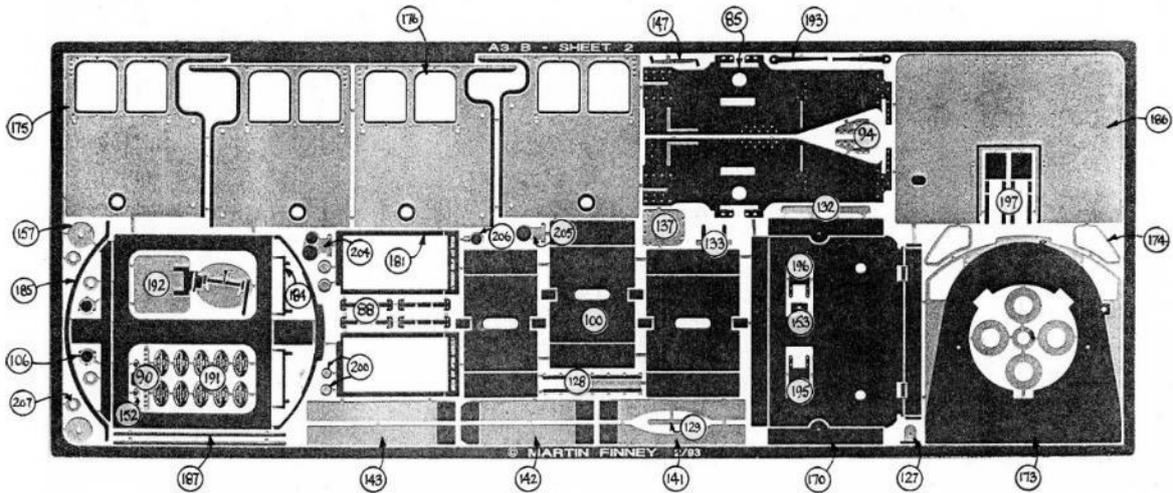
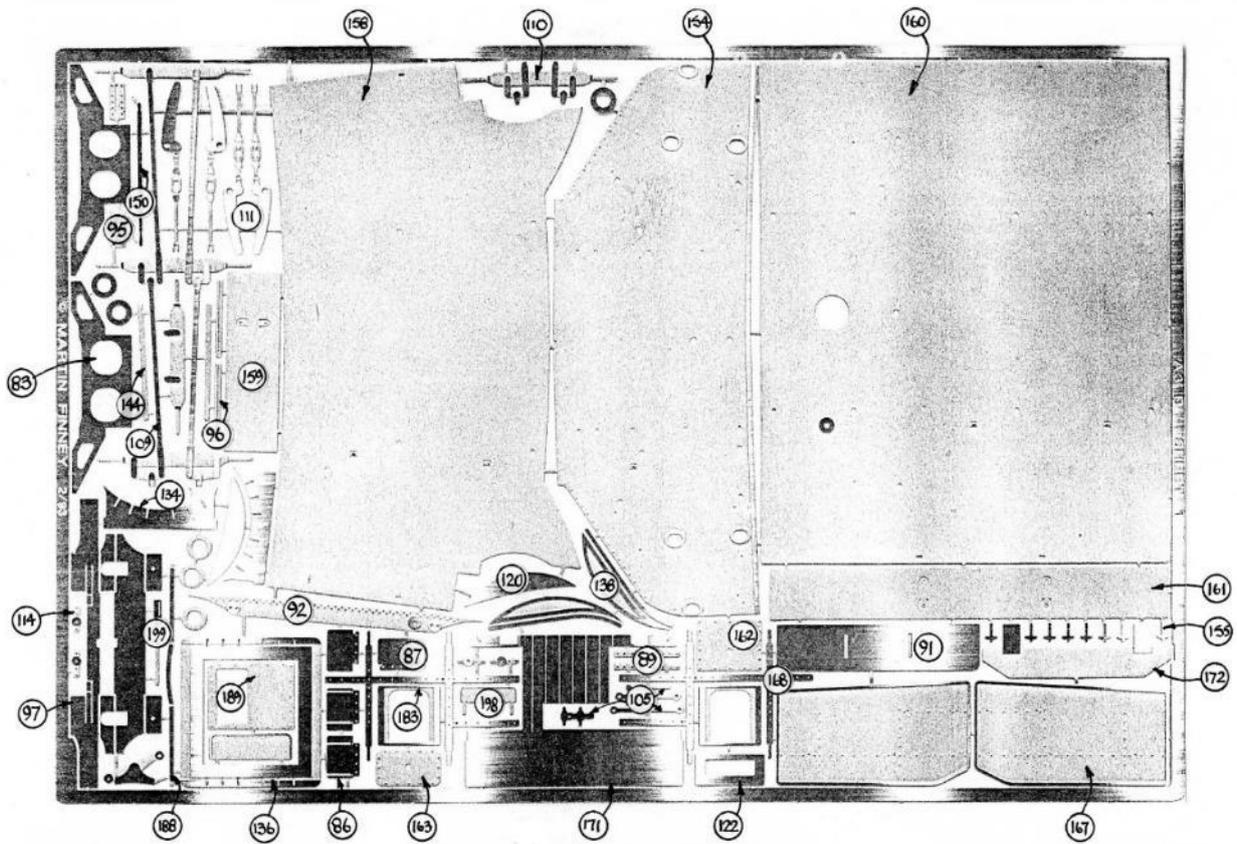
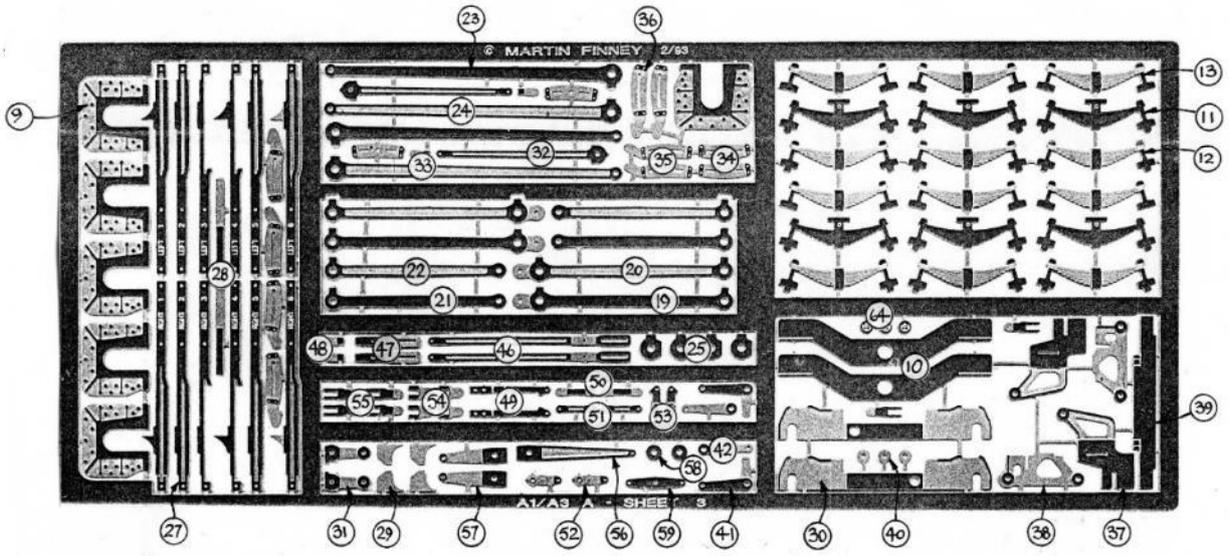
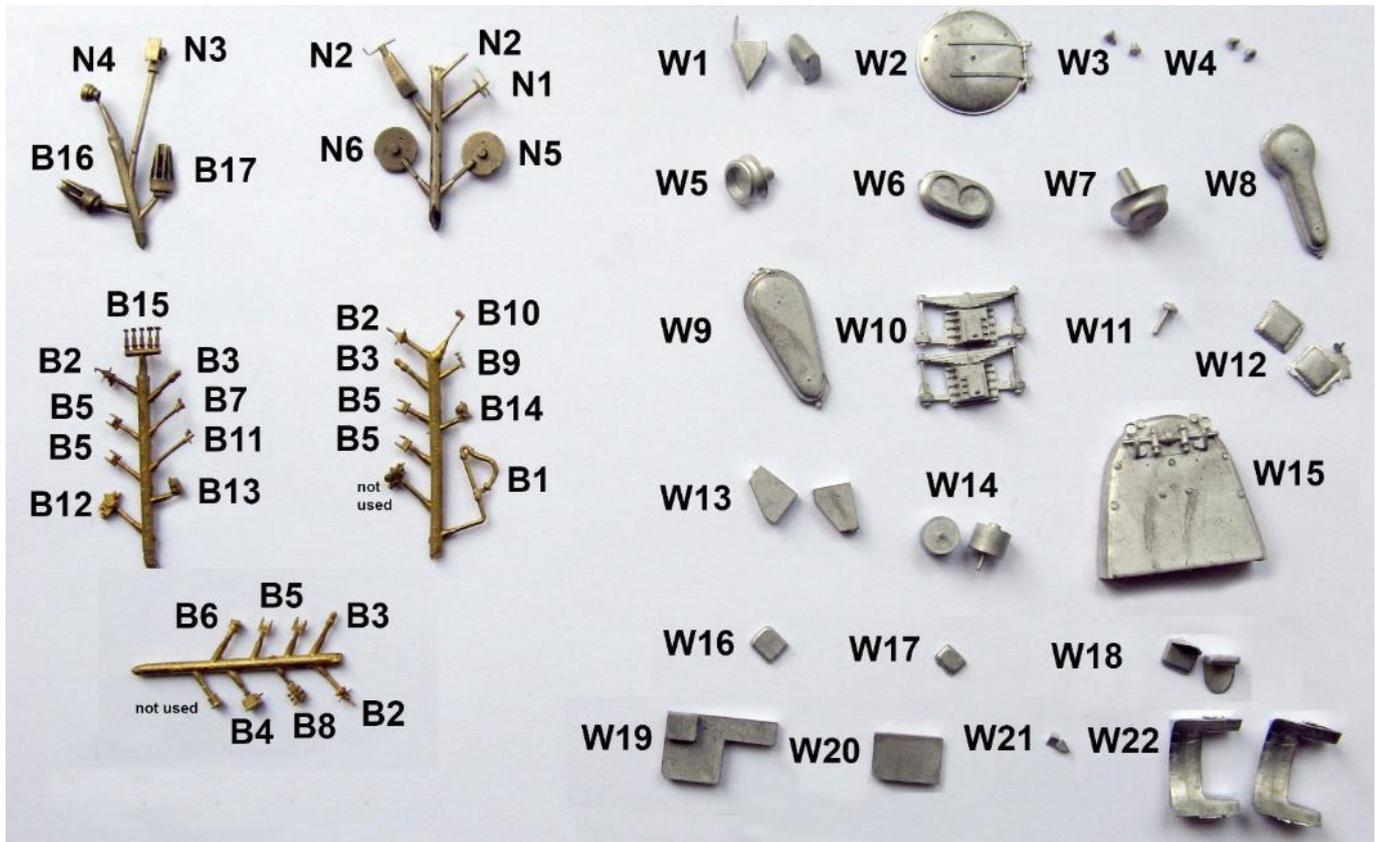
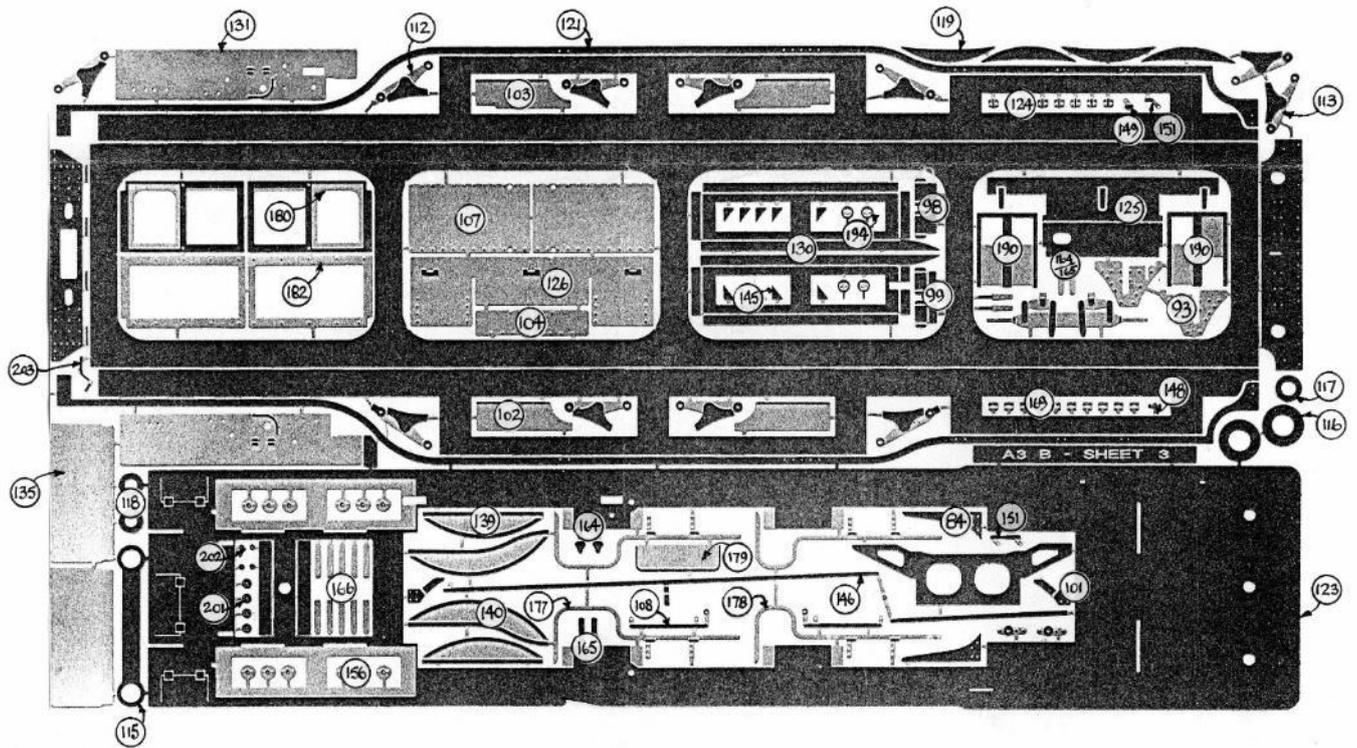


FIG.33









Etched components

1. Frame - left
2. Frame - right
3. Rear frame extension - inner
4. Rear frame spacer - body fixing
5. Frame stay - rear - firebox bracket
6. Frame stay - middle - horizontal
7. Frame stay - front - compensation beam mounting
8. Frame stay - front - cylinder mounting
9. Hornblock - (6)
10. Compensation beam - (2)
11. Spring - centre lamination - (6)
12. Spring - outer lamination - (6)
13. Spring - inner lamination - (6)
14. Bogie - frame - (2)
15. Bogie frame stay - rear
16. Bogie frame stay - front
17. Radial truck - top plate
18. Radial truck - bottom & ends
19. Coupling rod - front - inner lamination - (2)
20. Coupling rod - front - outer lamination - (2)
21. Coupling rod - rear - inner lamination - (2)
22. Coupling rod - rear - outer lamination - (2)
23. Connecting rod - inner lamination - (2)
24. Connecting rod - outer lamination - (2)
25. Connecting rod boss lamination - (4)
26. Cylinders
27. Slide bar lamination - (12)
28. Slide bar - rear packing piece - (2)
29. Slide bar - front flange plate - (4)
30. Slide bar bracket lamination - (2)
31. Eccentric crank - (2)
32. Eccentric rod - (2)
33. Eccentric rod - fork joint - (2)
34. Radius link outer lamination - (4)
35. Radius link inner lamination - STV - (4)
36. Radius link inner lamination - LTV - (4)
37. Radius link bracket - (2)
38. Radius link bracket - inner - (2)
39. Radius link bracket - stretcher
40. Radius link bracket - washer - (2)
41. Reversing crank lamination - reversing rod side— (2)
42. Reversing crank lamination - not reversing rod side - (2)
43. Reversing rod - Doncaster - (2)
44. Reversing rod - North British - (2)
45. Reversing rod joint - overlay
46. Radius rod - (2)
47. Radius rod - rear lamination - (2)
48. Radius rod - fork joint - (2)
49. Combination lever - (2)
50. Union link - inner lamination - (2)
51. Union link - outer lamination - (2)
52. Crosshead arm - STV - (2)
53. Crosshead arm - LTV - (2)
54. Valve connecting link lamination - rear - (4)
55. Valve connecting link lamination - front - (6)
56. 2 to 1 arm
57. 2 to 1 arm - lamination - (2)
58. 2 to 1 arm packing washer
59. Equal arm
60. Mechanical lubricator linkage - early type
61. Mechanical lubricator linkage - later type
62. Mechanical lubricator arm - front - (2)
63. Mechanical lubricator arm - rear - (2)
64. Mechanical lubricator handwheel - (2)
65. Coupling hook
66. Washer 1/8" - 4mm
67. Washer 3/16" - 7mm
68. Firebox rear former
69. Firebox front former
70. Firebox front former lower extension
71. Firebox front former lower extension - packing piece
72. Firebox former spacer
73. Firebox mudhole doors - upper - (2)
74. Firebox mudhole door - lower - (2)
75. Coned boiler rear former
76. Coned boiler front former
77. Parallel boiler rear former
78. Smokebox front former
79. Smokebox front overlay
80. Front frame extension - (2)
81. Smokebox saddle - fillet - (12)
82. Damper operating rod - (2)
83. Frame stay - middle - reversing rod bracket
84. Frame - guard iron - (2)
85. Rear frame extension - outer - (2)
86. Rear steps - upper - (2)
87. Rear steps - lower - (2)
88. Rear spring retaining bracket - (4)
89. Rear frame - footplate bracket overlay - (4)
90. Rear frame - drag beam bracket overlay - (2)
91. Fire box below footplate - former
92. Fire box below footplate - wrapper
93. Radius link bracket frame overlay - (2)
94. Slide bar bracket frame overlay - (2)
95. Reversing lever bracket overlay - (2)
96. Reversing lever bracket rib - (2)
97. Frame stay - behind buffer beam
98. Front step - upper - (2)
99. Front step - lower - (2)
100. Bogie frame stay - centre
101. Bogie - guard iron - (2)
102. Bogie wheel - splasher - front - (2)
103. Bogie wheel - splasher - rear - (2)
104. Bogie - dust shield - (2)

Etched components (continued)

105. Screw coupling
106. Eccentric rod bearing overlay - (2)
107. Cylinder wrapper.- (2)
108. Drain cock linkage - (2)
109. Brake pull rods/cross shafts
110. Brake cross shaft overlay - (3)
111. Brake pull rod lamination - front - (4)
112. Brake hanger lamination - rear - (4)
113. Brake hanger lamination - middle/front - (8)
114. Brake hanger pivot overlay - (4)
115. Draw bar
116. Washer 1/8"
117. Washer 2mm
118. Washer 10BA
119. Balance weight - leading/trailing axle - (4)
120. Balance weight - centre axle - (2)
121. Valence/bufferbeam/dragbeam assembly
122. Dragbeam overlay
123. Footplate
124. Footplate access door hinges - (6)
125. Front drop plate
126. Footplate overlay - front drop plate
127. Front end cover plate - original type
128. Front end cover plate - later type
129. Front end cover plate - later type - overlay
130. Footplate valve cover box - (2)
131. Footplate valve cover box - top - (2)
132. Footplate valve cover box - sand filler rim - (2)
133. Extra footplate lamp iron
134. Smokebox saddle - front/back - (2)
135. Smokebox saddle - sides - (2)
136. Smokebox saddle - saddle plate
137. Bufferbeam coupling plate
138. Splasher front - rear - (2)
139. Splasher front - middle - (2)
140. Splasher front - leading - (2)
141. Splasher top - rear - (2)
142. Splasher top - middle - (2)
143. Splasher top - leading - (2)
144. Footplate overlay - rear splasher ~ (2)
145. Name plate bracket - (8)
146. Sanding rod
147. Sanding rod - crank overlay
148. Sanding rod - crank bracket overlay
149. Sanding rod - front crank overlay
150. Sanding rod - transverse
151. Sanding rod - transverse - overlay - (2)
152. Sandbox spindle bearing - (2)
153. Mechanical lubricator foot
154. Firebox wrapper
155. Firebox mudhole door bracket - (6)
156. Firebox washout door cover - (9)
157. Safety valve plate - (2)
158. Coned boiler wrapper
159. Cone boiler joining strip
160. Smokebox/parallel boiler wrapper
161. Smokebox/parallel boiler joining strip
162. Anti-vacuum valve plate - early
163. Anti-vacuum valve plate - later
164. Lamp iron - smokebox - early type
165. Lamp iron - smokebox - later type
166. Ejector exhaust pipe bracket - (5)
167. Smoke deflector - (2)
168. Smoke deflector bracket - (2)
169. Smoke deflector bracket - base plate - (8)
170. Cab floor support
171. Cab floor
172. Fall plate
173. Cab front
174. Cab window frames - (2)
175. Cabside - low cut-out - (2)
176. Cabside - high cut-out - (2)
177. Cabside rear inner beading - low **cut-out - (2)**
178. Cabside rear inner beading - high **cut-out - (2)**
179. Cab door - (2)
180. Cab window - inner layer - (2)
181. Cab window - middle layer - (2)
182. Cab window - outer layer - (2)
183. Cab window - sliding frame - (2)
184. Cabside windscreen - (2)
185. Cab roof former assembly
186. Cab roof
187. Cab roof rainstrip - (2)
188. Cab roof ventilator - sides/back
189. Cab roof ventilator - top
190. Cab roof ventilator - shutters - two positions
191. Worksplate
192. Firehole door and fire screen
193. Regulator lever - (2)
194. Injector handwheel - (2)
195. Cab seat bracket - early - driver
196. Cab seat bracket - early - fireman
197. Cab seat bracket - bucket - (2)
198. Backplate shelf
199. Cut off indicator
200. Cab gauges - (4)
201. Steam distribution box handwheel - large - (2)
202. Steam distribution box handwheel - small - (2)
203. Vacuum ejector handle
204. Bracket - vacuum/steam chest pressure gauges
205. Bracket - boiler pressure gauge
206. Bracket - heater gauge
207. Crankpin washer - (4)

WHITEMETAL CASTINGS

- W1. Steam pipe - STV - (2)
- W2. Steam pipe - LTV - (2)
- W3. Smokebox door
- W4. Front sandbox lid - (2)
- W5. Rear sandbox lid - (2)
- W6. Chimney - original pattern - A1
- W7. Chimney - later pattern - A1/A3
- W8. Dome - original pattern - A1
- W9. Dome - later pattern - A3
- W10. Banjo dome - early - A3
- W11. Banjo dome - later - A3
- W12. Smokebox superheater cover - A3 - (2)
- W13. Cartazzi axlebox/spring - (2)
- W14. Snifting valve
- W15. Front sandbox - (2)
- W16. Brake cylinder - (2)
- W17. Back plate
- W18. Seat early - driver
- W19. Seat early - fireman
- W20. Seat later - (2)
- W21. Cab footplate platform - left
- W22. Cab footplate platform - right
- W23. Footplate step - (2)
- W24. Smokebox saddle - (2)

OTHER COMPONENTS FOR CHASSIS

- 1/8" Flexichas bearing - (6)
- 2mm top hat bearing - (6)
- Nickel silver wire - 1mm - for coupling rod pins, crosshead pins, radius link pivots and 2-to-1 lever pivot
- Brass 10BA C.H. screw - (8)
- Brass 10BA nut - (5)
- Nickel silver wire - 0.55mm - for valve gear pins
- Nickel silver wire - 0.7mm - for Cartazzi axlebox ties & radius rods
- Steel wire - 1/32" - front compensation beam
- Brass wire - 1/16" - for compensation beam pivots & exhaust steam injector pipe
- Brass tube - 3/32" outside diameter - for compensation beams
- Brass wire - 0.45mm - for brake hanger pivots & sandpipes
- Brass wire - 0.8mm - for valve rods
- Brass wire - 1mm - for sandbox pipes & reversing cross shaft
- Brass wire - 1.2mm - for brake cross shaft
- Valve gear rivet - (2)
- Spring wire for rear truck & bogie side control

BRASS and NICKEL SILVER CASTINGS

- B1. Vacuum pipe
- B2. Drain cock - (4)
- B3. Cylinder relief valve - (4)
- B4. Mechanical lubricator - (2)
- B5. Pot lubricator - (8)
- B6. Safety valve - original pattern - (2)
- B7. Safety valve - later pattern - (2)
- B8. Blowdown tap
- B9. Anti carboniser - (2)
- B10. Anti carboniser valve
- B11. Whistle
- B12. Mason reducing valve
- B13. Vacuum ejector
- B14. Injector valve - left
- B15. Injector valve - right
- B16. Steam collector
- B17. Valve crosshead guide - front - (2)
- B18. Valve crosshead guide - rear - (2)
- N1. Smokebox door knob
- N2. Reverser
- N3. Crosshead/piston rod - (2)
- N4. Piston rod gland - (2)
- N5. Cylinder front cover - left
- N6. Cylinder front cover - right
- N7. Smokebox door handles

OTHER COMPONENTS FOR BODY

- Nickel silver wire - 0.45mm - for handrails
- Brass wire - 1mm - for vacuum ejector exhaust pipe
- Brass wire - 0.3mm - sand rod pivots and front & smoke deflector handrails
- Brass wire - 0.5mm square - for washout plugs
- Brass wire - .2mm - for lubricator pipes
- Handrail knob - (32)
- Buffer - (2)
- Copper wire for back plate pipes

Components not provided

- Wheels (Ultrascale, Alan Gibson or Markits)
 - Driving: 6' 8" - 20 spoke, 13" throw c.b.s
 - Bogie: 3' 2" - 10 spoke; Trailing 3' 8" - 12 spoke
- Portescap 1624 motor or equivalent
- Suitable pickups
- Number and nameplates
- Couplings, paint and transfers