

Brassmasters

Scale Models

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LONDON & NORTH EASTERN RAILWAY

A4 4-6-2

LOCOMOTIVE KIT

Designed by Martin Finney

4MM SCALE

OO - EM - P4

**INSTRUCTIONS
AND PROTOTYPE NOTES**

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SECTION 1: BRIEF HISTORICAL DETAILS

In 1935, Nigel Gresley convinced the LNER directors that, with steam, he could produce a far better commercial return than by following the German example of switching to diesel propulsion for high speed trains. The resulting A4 class were a significant step forward from his previous A3 class, which were themselves a development of his original A1 class Pacifics for the Great Northern Railway first introduced in 1922. The new locomotives made an immediate impact both through their looks and their performances on the new high speed services.

The engines were built under six Engine Orders as follows:

| E.O. | Original Nos. | To traffic | Original chimney | Original tender |
|------|---------------|-----------------|------------------|---------------------|
| 338 | 2509-12 | 9/1935-12/1935 | Single | Streamlined Cor. |
| 340 | 4482-90 | 12/1936-6/1937 | Single | 1928 Corridor |
| | 4491 | 6/1937 | Single | Streamlined Cor. |
| 341 | 4492-97 | 6/1937-10/1937 | Single | Streamlined Cor. |
| | 4498 | 10/1937 | Single | 1928 Corridor |
| 341A | 4462-64 | 12/1937-12/1937 | Single | Streamlined Non-Cor |
| 342 | 4465-67 | 1/1938-2/1938 | Single | Streamlined Non-Cor |
| | 4468 | 3/1938 | Double | Streamlined Non-Cor |
| | 4469,4499 | 3/1938,4/1938 | Single | Streamlined Non-Cor |
| | 4500,4900 | 4/1938,5/1938 | Single | Streamlined Non-Cor |
| | 4901,4902 | 6/1938,6/1938 | Double | Streamlined Non-Cor |
| 343 | 4903 | 7/1938 | Double | Streamlined Non-Cor |

For a detailed history of this 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:

Isinglass Drawings. Drg. No. 315 & Drg. No. 316.

Locomotives Illustrated 38 - Ian Allan

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

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

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

The A4 Pacifics - P.N.Townend - Ian Allan

The Power of the A4's - Brian Morrison - Oxford Publishing Co.

Variations/Modifications incorporated into the kit

Chimney: single and double chimneys. Double chimneys were fitted to all of the single chimney fitted locomotives between 5/1957 and 11/1958.

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 some rivets with a visible head as frames were repaired.

Extra roof vents: Fitted from 3/37

Casing access doors: Two types; originally with a press clip fastener replaced, from 11/37, with the locking handle type.

Extra casing access doors each side of the smokebox: From 4/38 engines 2509-11, 4488/90/91/99, 4500 & 4901-3 were fitted with these doors which had two hinges on their top edge.

From 1939 these '2 hinge' doors were replaced by a longer '3 hinge' door; all 35 engines receiving them.

Lamp bracket - smoke box door: From March 1941, the top lamp bracket was moved 9" down the door.

Side skirting: between 6/41 and 10/42 the skirting both in front of and behind the cylinders was removed from all the locos. This revealed that some of the locomotives had the G.N.R. pattern valve guides ahead of the cylinders which are provided.

Bogie dust shields: At first two small dust shields were fitted to the front of the bogie. From about 1941 these were replaced with a continuous one. Until this time the pipes from the middle cylinder drain cocks were not visible, but when the continuous dust shield was fitted these pipes were brought to the outside, one emerging either side beneath each outside cylinder to be clipped to the pair already there, thus making three pipes on each side from this time onwards.

Frame guard irons: Between 12/52 and 6/54 the large guard irons were removed and consequently the cylinder drain pipes cut back to a point level with the centre of the leading bogie wheels.

Tenders

As can be seen from the table on the previous page, the locomotives were fitted with three types of tender as follows:

1928 Corridor tender - 10 tenders modified from the tenders originally fitted to the A1 and A3 unstreamlined Pacifics. Easily recognisable because they retained their external beading.

Streamlined Corridor tender - 11 tenders built new for the A4's. They had no external beading.

Streamlined Non-Corridor tender - 14 new tenders. Easily recognisable because of their lack of a corridor and their narrower width over the tank. They too have no external beading.

Tender changes were not uncommon so a dated photograph is needed to show the type of tender at a given time.

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:

- Gauge 00, EM or P4.
- Suspension Rigid, sprung, compensated.
- Pickups

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

- Scrapers attached to printed circuit board fixed between the frames.
- Plunger - drill out three 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 manufacturers' 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 beams. Solder the rear hornblocks to the inside of the frames aligning them with the half-etched line and with the bottom of the frames. Modify the Flexichas bearings on the centre and rear axles as shown in Fig.1.

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. Emboss the frame rivets as appropriate. Fold up the centre sandboxes as shown in Fig.3. Solder in place parts 74, 83 & 84 and the brake hanger pivots, from 0.45mm wire (Fig.3).

SECTION 4: FRAME STAYS AND ASSEMBLING THE CHASSIS

Remove the frame stays, parts 5, 6, 7 & 8 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 screws through the hole in part 8, for the bogie pivot.

Now assemble the frames and stays. 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. Attach the bogie splashers (parts 88 & 89) 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 undersize for the crankpins and the fork joint holes 1.0mm so that the 1.0mm 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 1.0mm 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 1/32" steel 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. 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. The height of the top of the frames above rail level, between the coupled wheels, should be 25.2mm. Retain the beam pivot by fitting part 105 over the brake hanger pivots as shown in Fig.3.

SECTION 8: REAR FRAMES AND 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 75) 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 76, 77, 78, 80 & 81 together with the Cartazzi axlebox ties from 0.7mm wire.

Fold up part 82. Add the washout plugs at the corners from 0.5mm square wire, the blowdown tap (part B5) and the mudhole door clamps (part 131), before soldering in place on top of part 3. Add part 67 as shown in Fig.7.

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 109) 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 87) and solder in place on the inside of the frames. Fold up the frame stay (part 86) 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 90 or 91) to shape and solder in place.

Using appropriate washers (part 109) 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

Slide part 70 in place in its slots in the frames. This stay acts to support the Portescap motor and is not soldered in place until the mechanical lubricators have been attached.

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. 17. 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.

SECTION 11: CYLINDER ASSEMBLY

Check all the holes in the cylinders (part 26) against the appropriate components and open up the holes if necessary. Reduce the width of the inside cylinder faces to the etched lines provided as appropriate, 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. 28. 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 crosshead 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 solder in place. After checking all is square and parallel they are permanently attached. Attach the piston rod glands (part N2) and check that the crosshead slides properly. Solder the valve crosshead guides (parts B14 or N8 -front & B15 - rear) in place aligning them with a piece of 0.8mm wire passed through the valve rod holes. Attach the front cylinder covers (parts N3 & N4) and fit the relief valves (part B2). 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 1.0mm. Solder the crosshead arm (part 50) to a piece of 1.0mm 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 possibly have to reduce the thickness of the nut.

Tap the hole in the bracket on the rear slide bar bracket lamination (part 31) 10 BA. Fold out the bracket and solder to the front lamination (part 30). 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 slidebars.

Attach the drain cock castings (part B1) to part 8. Emboss the rivets on the drain cock linkage (part 94) and fold over the end bracket at the rear as shown in Fig.3, before soldering in place together with a length of 0.3mm wire to represent the operating rod. Add part 95. Make the drain pipes from the copper wire provided adding the brackets (parts 96 & 97 as shown in Fig. 3. The joggle in the pipes to clear the bogie wheels is immediately behind the guard iron.

SECTION 12: VALVE GEAR

All the valve gear and mechanical lubricator linkage joints, with the exception of the eccentric arms/eccentric rods, are made with wire pins soldered on the inside (back). 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. Fold out the bracket on part 39 before soldering the radius link brackets in place as shown in Fig.11. Check the assembly fits in the frame slots. Solder short pieces of 1.0mm wire to the brackets for the radius link pivots.

Drill out the holes in the radius link laminations (parts 35 & 36) to take the 0.3mm wire pins which align the laminations and represent the bolt heads. Solder the inner laminations together with 4 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 44) and radius rod rear lamination (part 45) 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 46) to the front of the radius rod. Open out the holes in the radius link outer lamination (part 35) 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 47) with the fold lines inside reinforcing the bends with solder. Assemble the rear valve rods (part 54) and union link (parts 48 & 49). 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 34) to the eccentric rod (part 33). Reduce the diameter and thickness of the rivet heads so that they will fit in the recess in the back of part 93. Tap the crankpin hole in the eccentric crank (part 32) 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 that 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.24). 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 93.

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. The radius link bracket and slide bar bracket are joined by a 10 BA screw. By rotating the cross shaft you should now be able to reverse the motion!

Assemble the 2-to-1 lever (parts 53 & 54) and the front valve rods (part 52) as shown in Fig.18. Pin the valve rods, 2-to-1 lever and equal arm (part 56) together. Solder a 1.0mm 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 55). 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 links of 0.45mm 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, cylinder screws and the screw joining the radius link bracket to the slide bar bracket.

SECTION 13: FINISHING THE CHASSIS

The axles are now retained by the springs, formed from a triple lamination of parts 11, 12 & 13. Assemble the brake hangers (parts 103 & 104) first embossing the rivets. Attach the hangers to the pivot wires. Emboss the bolts in parts 98 & 99 and solder the cross shaft overlays to the top of part 98. Fix this assembly to the brake hangers. Complete the brake gear by fitting the front and rear cross shafts, levers, pull rods and brake cylinders (parts 100, 101, 102 & W6) as shown in Fig.15.

Now assemble the mechanical lubricators and drive as shown in Fig. 4. The 'working' drive linkage is very fiddly and not for the faint hearted! It is very important to make all the pivoted joints as tight as possible - once the locomotive has run in the joints will quickly free up. I have provided duplicates of all the small components as well as a fixed linkage for the most complex part.

For a fully working linkage first solder part 61 to a piece of 0.45mm wire. Now shorten the wire on one side so that 0.5mm protrudes. Slide the longer end through the inner hole in part 73 and fold up the bracket so that the outer hole fits over the short end of the wire. Solder part 60 to the inner projection of the wire. Solder part B3 in place and fit part 64 over the spindles retaining them with the handwheels (part 65). Assemble the small links (parts 62 & 63) and then pin them in place using 0.3mm wire.

For a non-working linkage use one of the pins to pivot part 60 to part 73. Use part 66 to replace parts 61, 62, 63 & 64.

Solder the completed assembly to part 70, thread through the slot in part 71, and solder in place in the frames. Trim part 72 to length and add to the lower edge of part 70. Similarly, fit parts 71 & 72 to the reversing rod side.

Complete the mechanical lubricator drive as shown in Fig.4. The wheel crankpin, wheel centre and pivot between parts 57 & 58 are in line.

Drill the holes in the buffer beam (part 85) 1.5mm to fit part W11. Fold up part 85 (Fig. 6) inserting part W11 at the same time before soldering the complete assembly to the frames.

Add the reversing rod (part 43) as shown in Figs.7 & 43. The rod is soldered to the bracket from the middle frame stay (part 70).

Complete the chassis detailing by fitting sandboxes (part W5), sand pipes (0.45mm wire) and sand box filler pipes (1.0mm wire) as shown in Figs.3 & 24.

SECTION 14: CAB

Fold up the cab floor support (part 133) and solder the cab floor (part 134) in place. Add the washout plugs from 0.5mm square wire.

Form the bend between the cab sides and the cab front (part 136). To do this, first scribe, with a sharp point, the fold lines (make them quite deep) on the inside. The lines run from the slots in the projections at the top and bottom. File off the marking projections when satisfied and make the folds between the sides and front to match the cab floor. Solder the inner cab window layer (part 141) in place aligning the small holes for the cab side windscreens (part 145). Solder the sliding window frame (part 142) over part 141 before breaking off the rear piece along the half-etched line. The outer window layer (part 143) which retains the sliding window (part 144) cannot be fixed until painting and glazing are complete.

Solder part 139 inside the rear edge of the cab sides and solder the cab handrails in place. Assemble the cab seats and fix in place. Solder the spectacle window frames (part 138) in place on the inside. Form the bend in the cab front and solder the cab sides and cab front to the cab floor. Fold down the tabs on the fallplate (part 135) which fit in the slots in the cab floor to give a hinge effect. Form part 137 to shape and solder in place in the slots in the cab front. Solder the safety valves (part B4) in place in the holes in part 137.

Anneal the hinges on the cab doors (part 140), by heating in a flame and bend to shape around a 0.45mm piece of wire. The hinge pins have been made too long so that they can be bent over to stop the doors falling off!

Fold up the back, front and central roof rib of part 146 which gives a solid base upon which to build the removable cab roof. Roll the cab roof, interior detail, and ventilator parts (parts 147, 148, 150, 151, 152, 153 & 154) to shape. The side ventilators were fitted from March 1937 onwards. Solder part 148 in place as shown in Fig.22 before soldering the roof in place on the former assembly. Complete by adding the ventilator parts and rainstrips (part 149). 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 15: STREAMLINED CASING AND FOOTPLATE

Before starting work on the resin casting for the streamlined casing please bear in mind the following:

- The casting should require very little finishing apart from cleaning up the lower faces. It is best wet sanded, ideally using fine-grade wet and dry paper.
- The dust should not be inhaled and hands should be washed after work.
- Bonding is best done with epoxy or one of the cyanoacrylates.
- Wash the casing in warm water with a mild soap/washing-up liquid, and rinse well before painting.
- Painting may be carried out with enamels, cellulose or acrylics. Of the latter two, acrylic plastic primer (Hycote brand available from car accessory shops or Halfords own brand - used for priming car plastic parts - bumpers etc.) is easier to apply than cellulose and 'keys' well.

Clean up the lower faces of the casing and drill holes as follows:

| | |
|-------------------------------|--------|
| Handrail knobs | 0.8mm |
| Buffer clearance | 1.0mm |
| Anti carboniser valve | 0.8mm |
| Anti carboniser valve pipe | 0.25mm |
| Lamp brackets | 0.7mm |
| Ejector exhaust pipe elbow | 1.0mm |
| Ejector exhaust pipe brackets | 0.5mm |

If you are not fitting part 120 then fill in the recesses on either side of the smokebox with a suitable filler (Milliput) and sand flush. If you are fitting part 119 then only the front third of the recess must be filled.

Emboss the rivets on the drag beam (part 121) and fold up. Fold up the cab floor support (Fig.21) and the bend across the footplate under the cab using Fig.19 as a guide. Fold up the strengthening ribs either side of the front body fixing bracket and strengthen with solder. Solder two 10 BA nuts in place over the holes in the bracket (Fig. 21).

Drill 1.1mm holes for the nine self-tapping screws which attach the footplate to the casing. Screw the footplate in place, using the longer screws, and check that it is central and as far forward as possible. Now permanently glue the footplate to the casing. Cut through the three bracing strips which cross the footplate and snap off the unwanted pieces along the half-etched lines. The screw opposite the lubricator compartment should be removed as its head will foul part 70. Some of the other screws can also be removed if you are concerned about the appearance of the model when it is viewed from a low angle.

Make the bend under the cab on part 123 to correspond to that in the footplate. Solder a 10 BA nut in position over the central hole which will be under the cab. Form part 124 to shape and solder in place as shown in Fig.21. Test the fit of part 123 - some fitting will be found necessary especially around the firebox.

Drill the holes for the short self-tapping screws which secure the cab to the rear of the casing. Be very careful not to drill too deep and break through the side of the firebox casing. I wrapped a piece of tape around the drill at the correct depth to use as a guide. Check the fit of the cab at this stage by screwing in place with the self-tapping screws and 10 BA screws from below. The top of the cab front should be level with the top of the casing.

When satisfied solder parts 121 and 123 together. Apply the solder from the edges only, clamping the two pieces together with two small blocks of wood or Tufnol.

Emboss the rivets on the valences (part 126 or 128) before curving to shape at the rear to fit inside the drag beam and at the front to match the shape of the footplate. Now solder the valences in place under part 123 and outside part 121. Curve the lower edges of part 127 or 129 to match the shape of the cylinders before soldering in place over the valences. Add part 122 to the rear drag beam. The body is fitted to the chassis by sliding the body over the chassis from the front with the rear raised - you will probably have to spring the front guard irons inward slightly. To remove, raise the rear of the body to so that the dragbeam clears the rear frame and slide forward until the skirts/cylinder covers clear the cylinders.

SECTION 16: FINAL ASSEMBLY AND DETAILING

Form the ejector exhaust pipe from 1.0mm wire and part B10 and attach it using part 132 through the slots in the boiler. Leave it over length as it passes through the cab front at the rear.

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

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

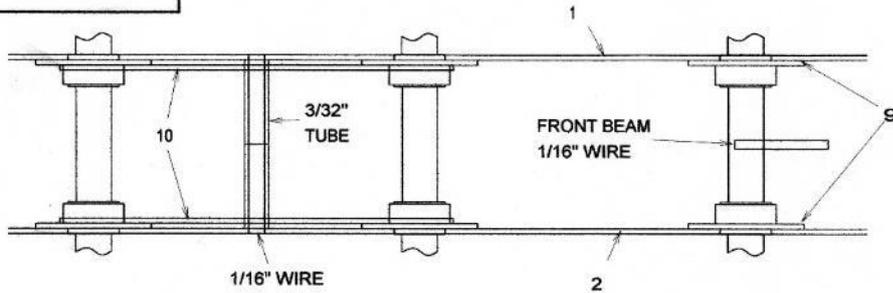
If you have any problem with the kit or any criticisms or suggestions please contact Brassmasters.

Best wishes

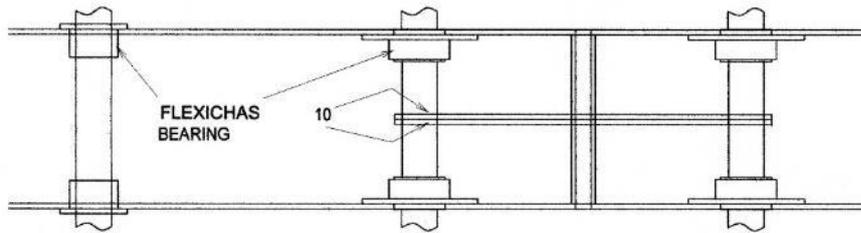
Martin Finney
January 1998

FIG. 1

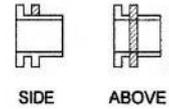
FULLY COMPENSATED - ALL AXLES FREE TO MOVE



A SIMPLER SYSTEM - REAR AXLE IN FIXED BEARINGS



FLEXICHAS BEARINGS



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

FIG. 2

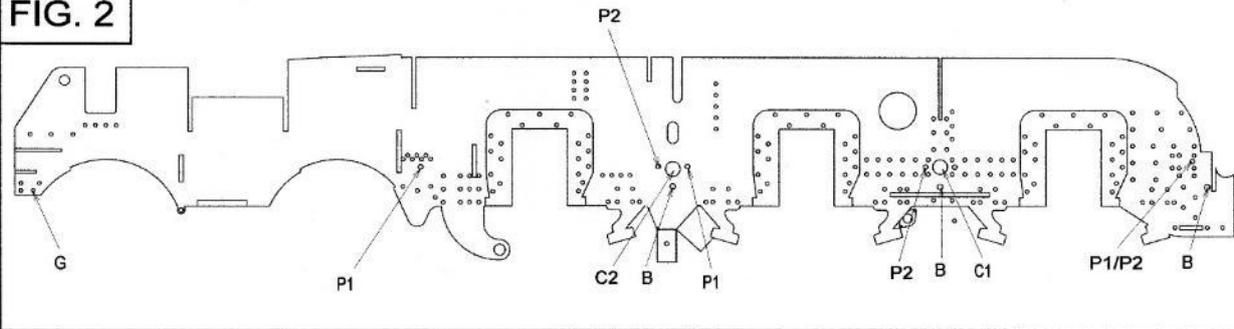


FIG. 3

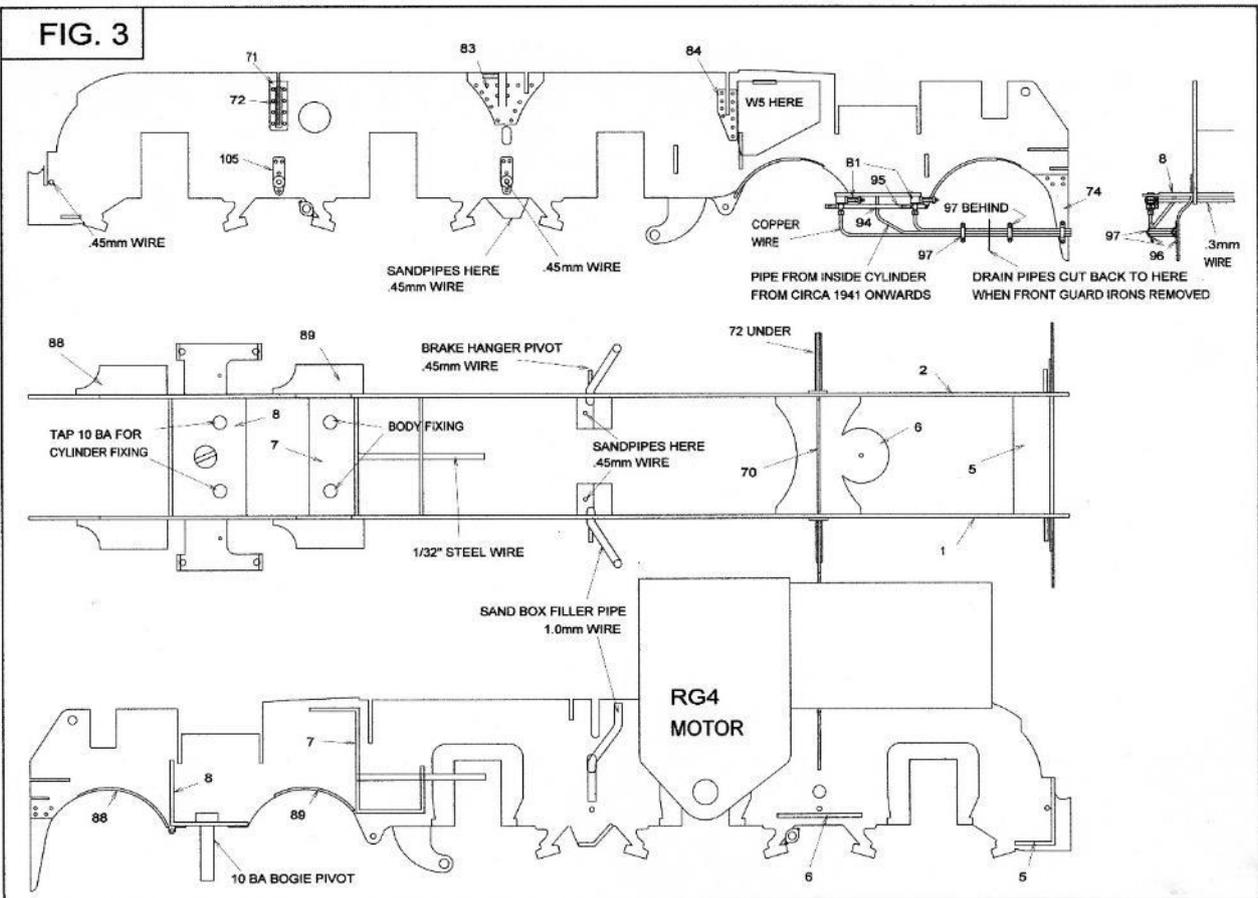


FIG. 4

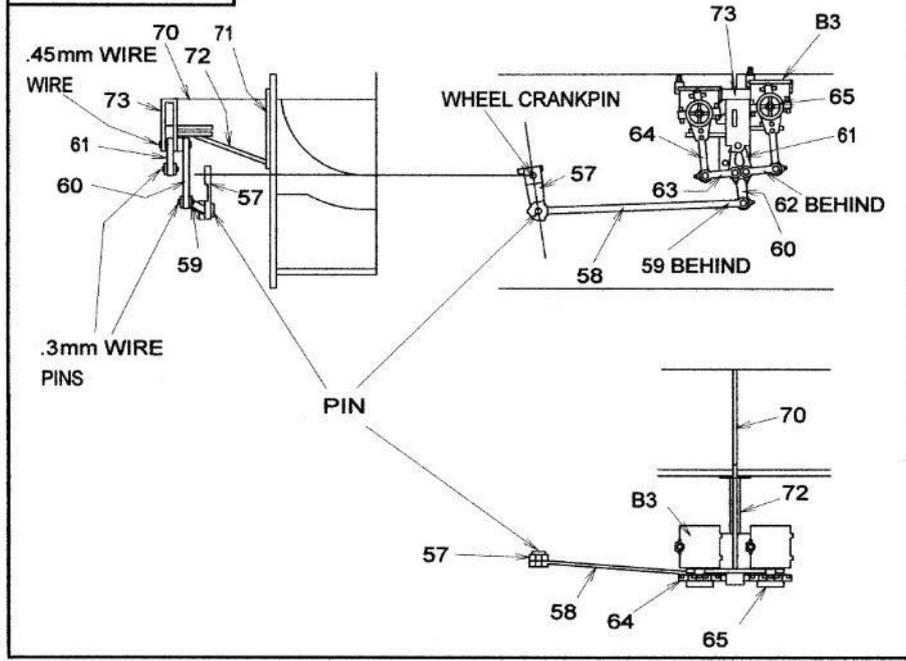


FIG. 5

COUPLING RODS - RIGHT SIDE

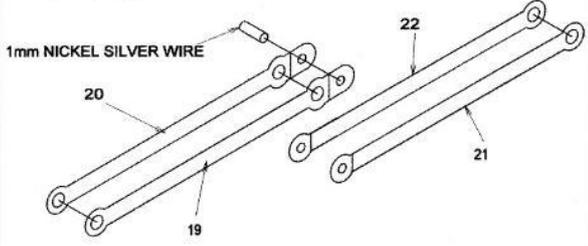
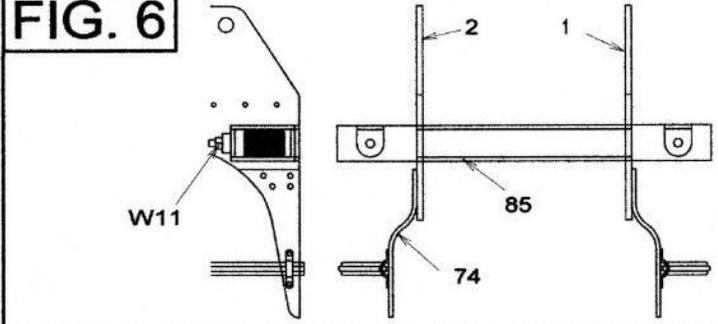


FIG. 6



DRAWBAR THROUGH THIS SLOT

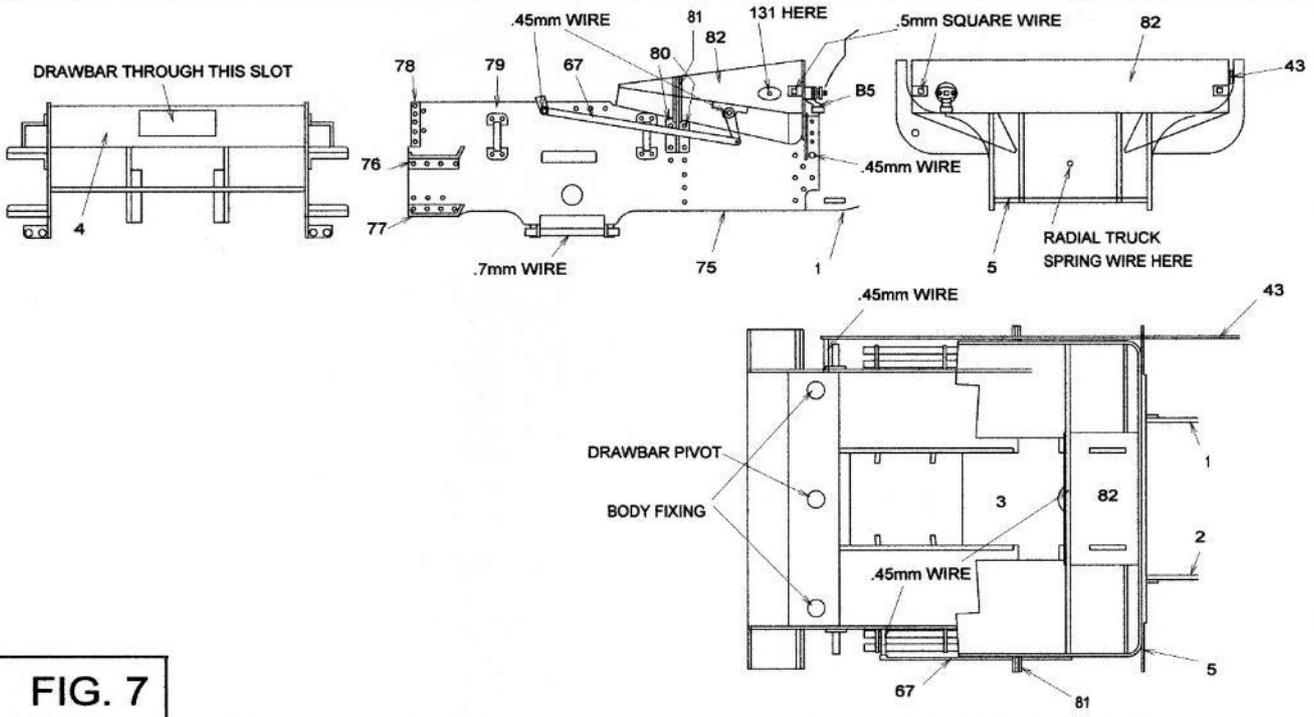
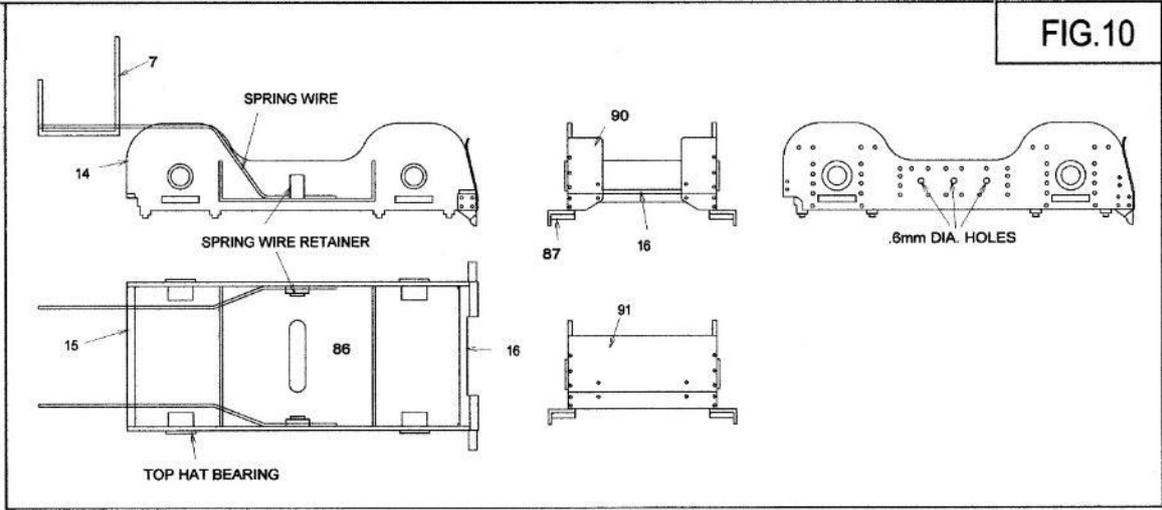
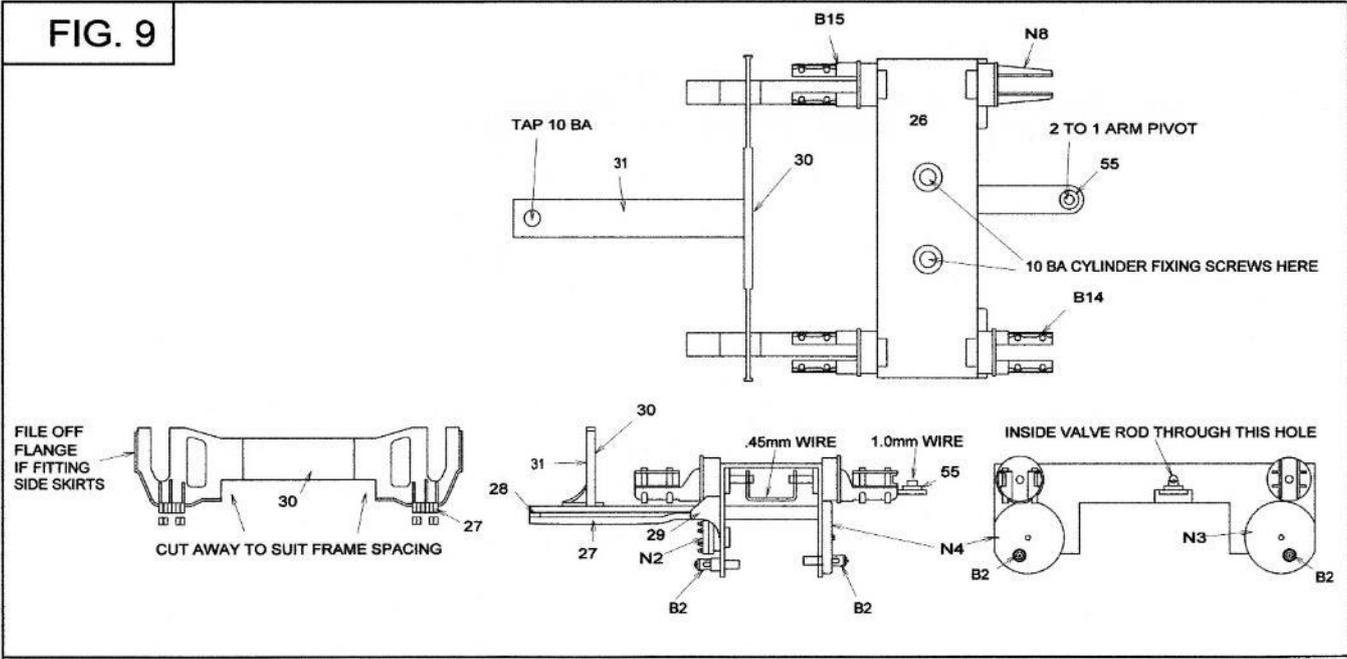
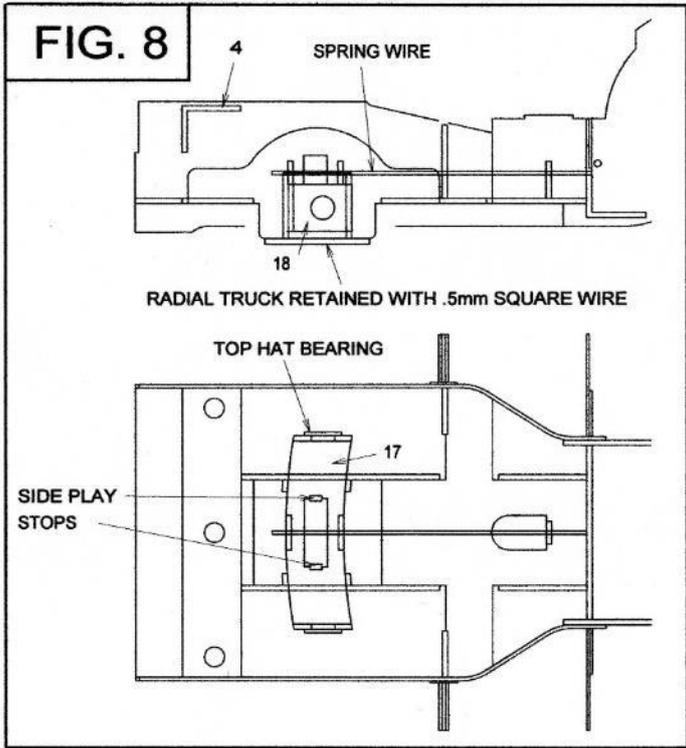
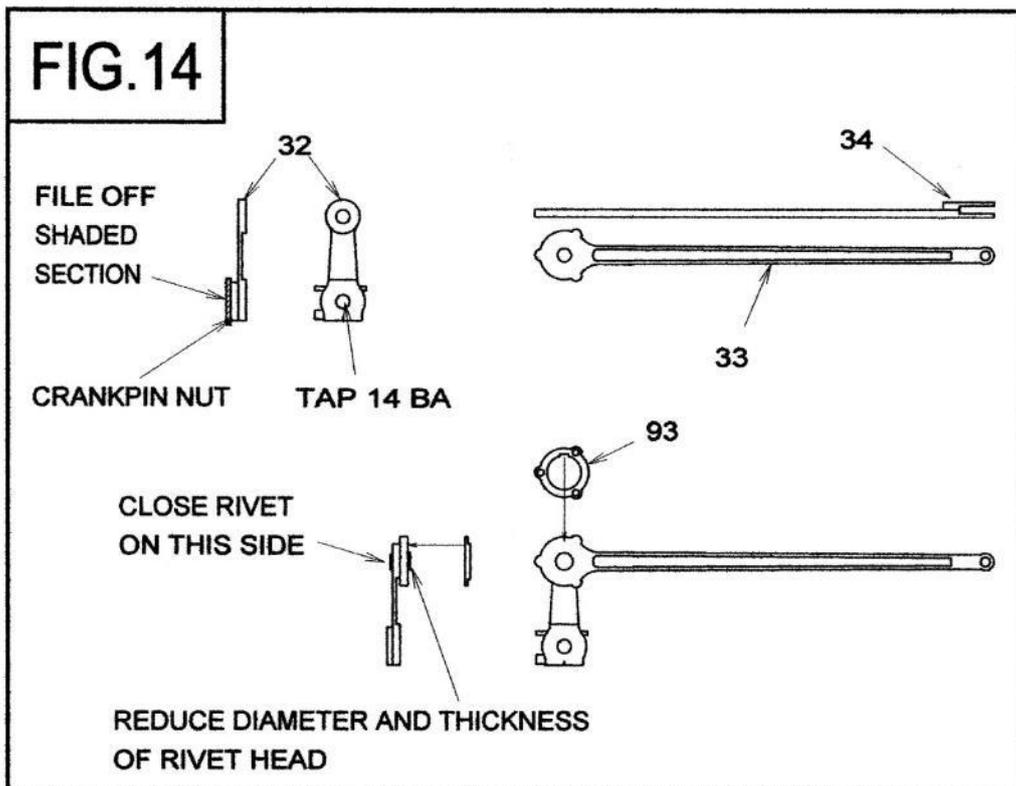
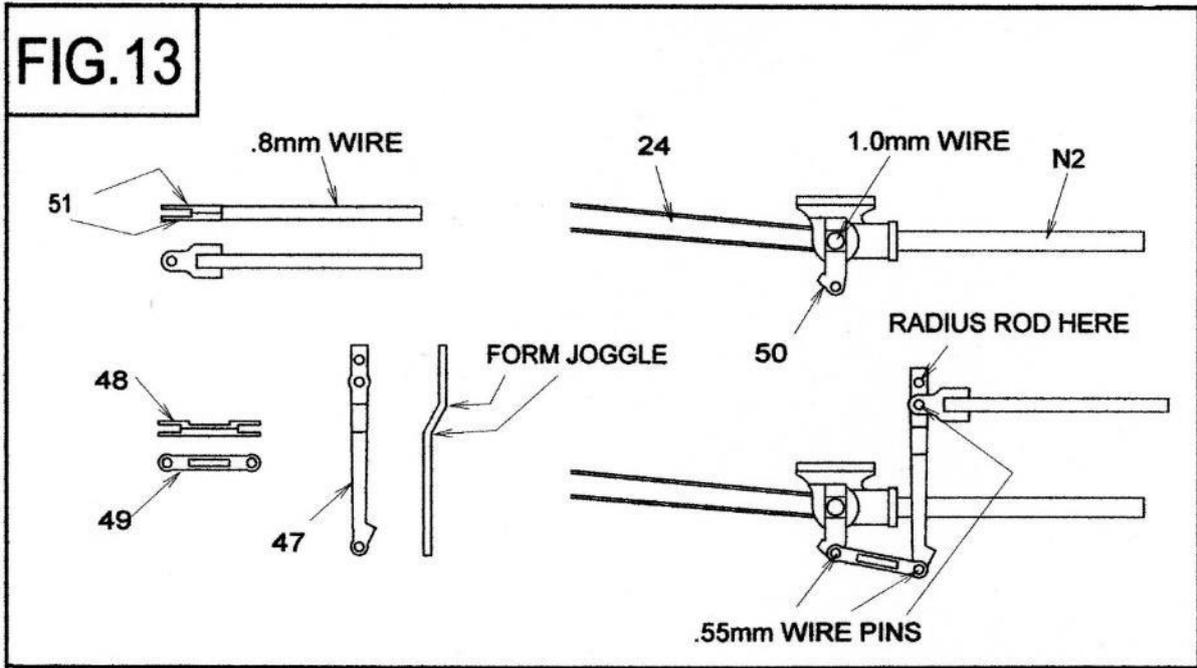
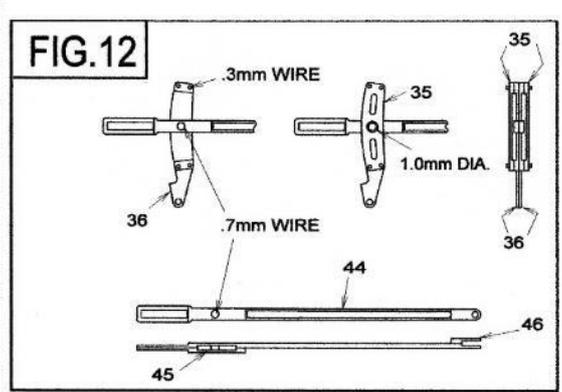
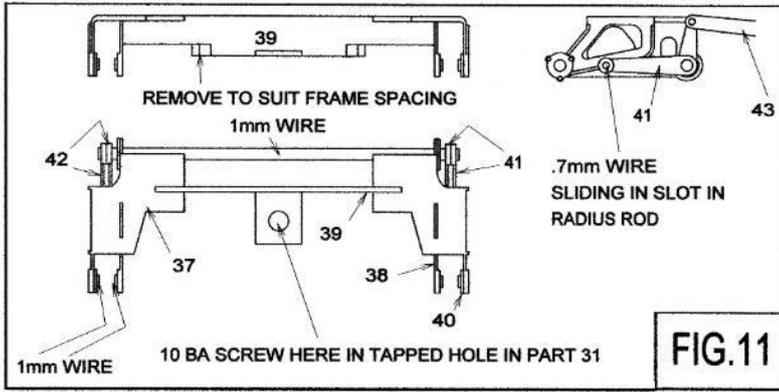


FIG. 7





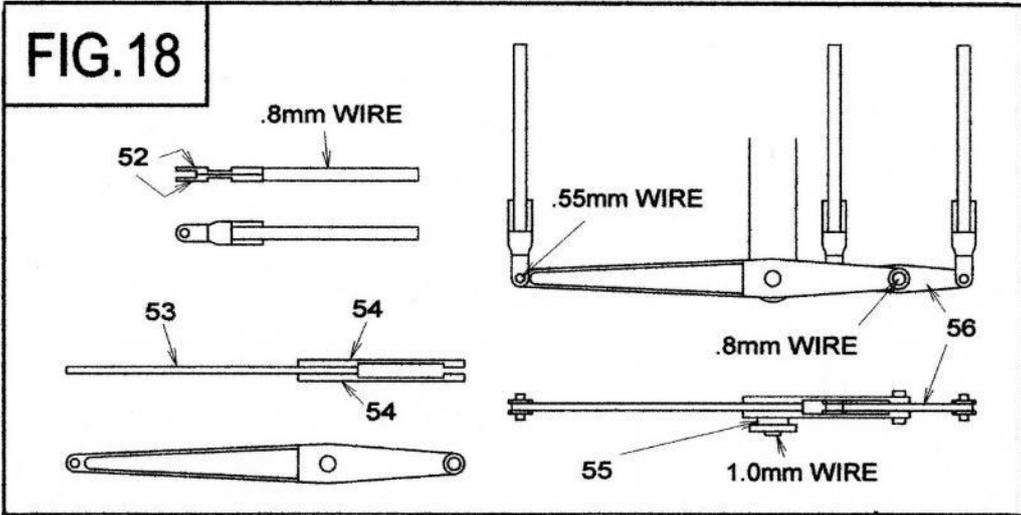
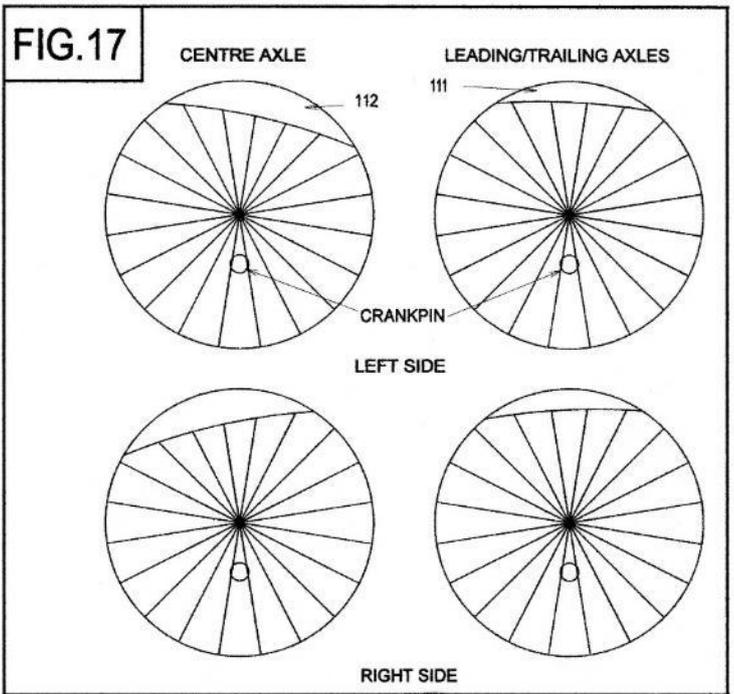
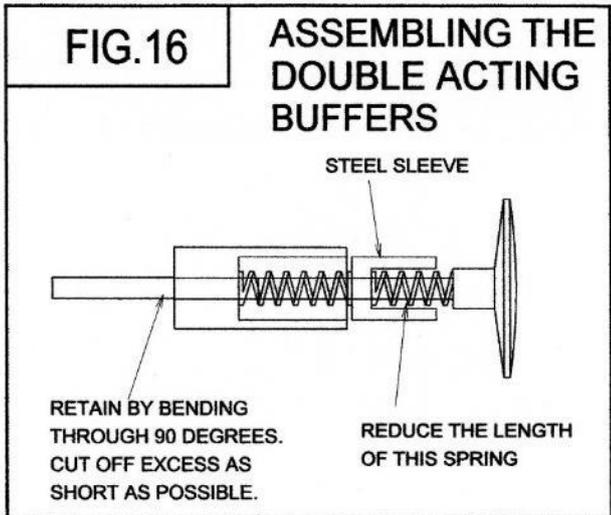
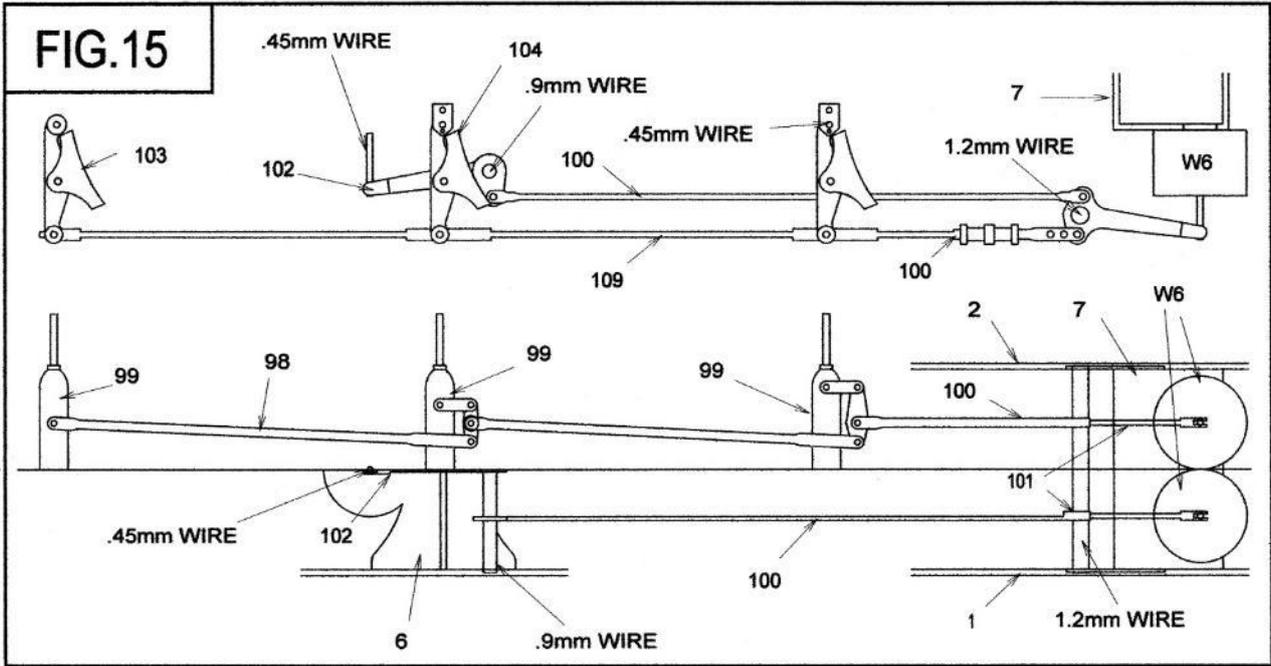


FIG.19

RHS - ORIGINAL CONDITION - FULL SIDE SKIRTS - SINGLE CHIMNEY
EARLY PATTERN OF ACCESS DOOR - UPPER LAMP IRON IN ORIGINAL POSITION

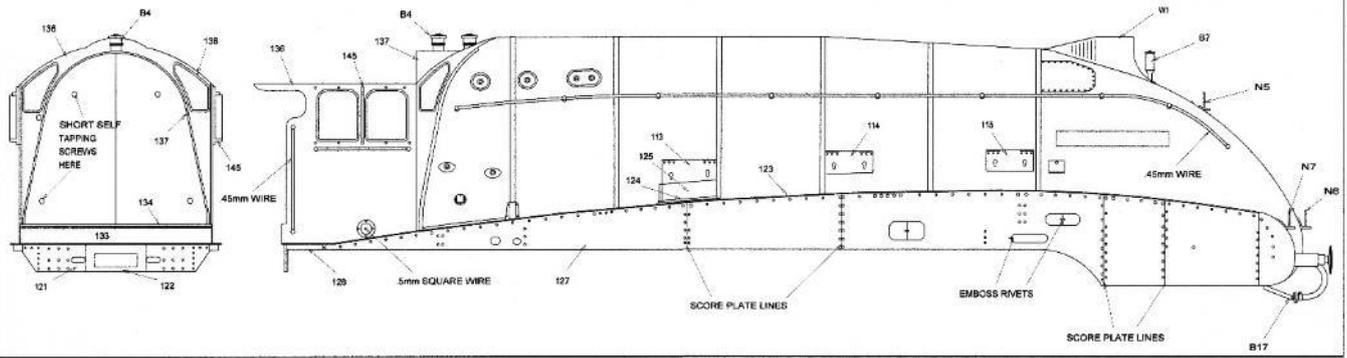


FIG.20

LHS - POST WAR CONDITION - SKIRTS REMOVED - DOUBLE CHIMNEY
LATER PATTERN ACCESS DOOR - EXTRA DOOR ON SMOKEBOX SIDE - LAMP IRON LOWER

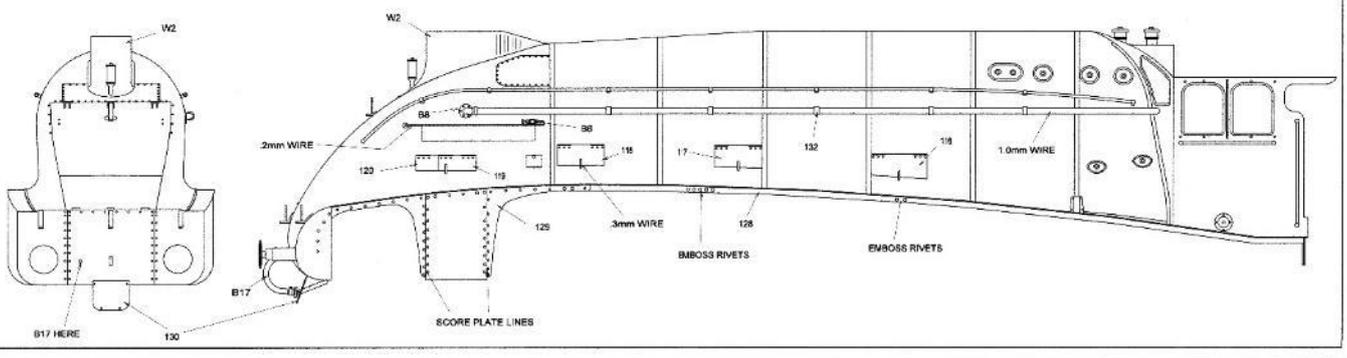


FIG.21

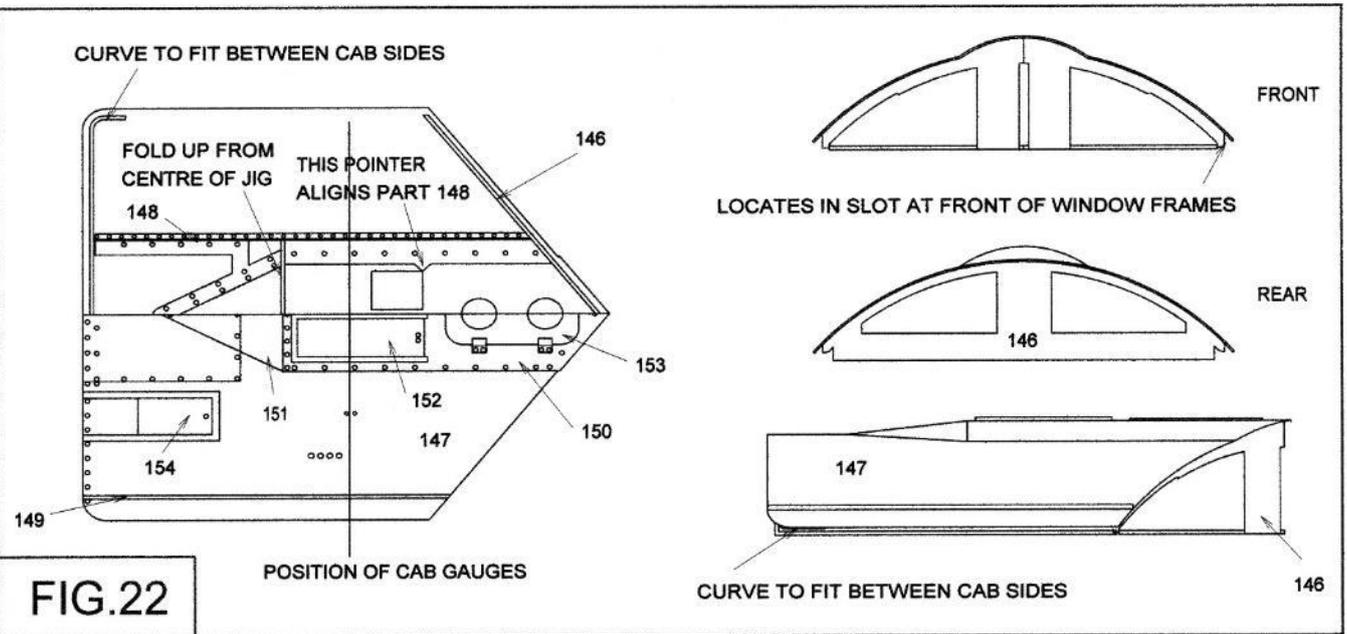
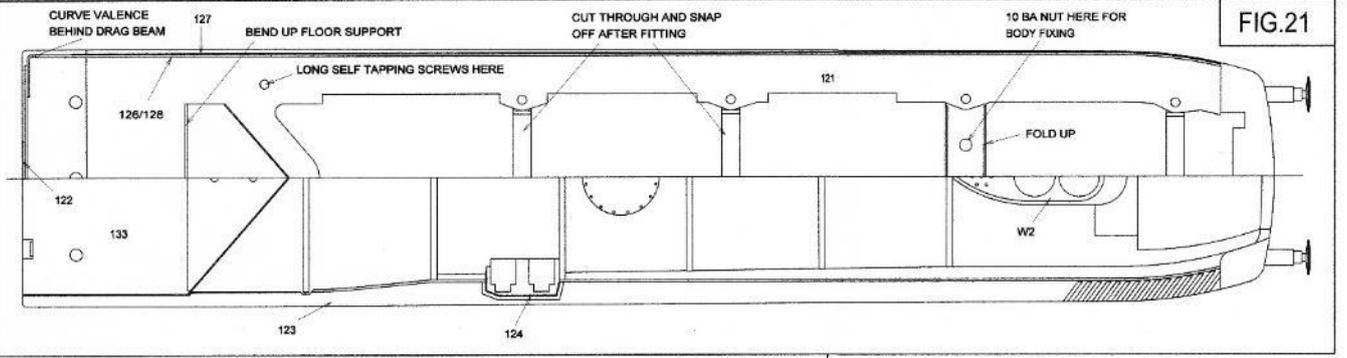


FIG.22

ASSEMBLY OF TYPICAL VALVE GEAR JOINT

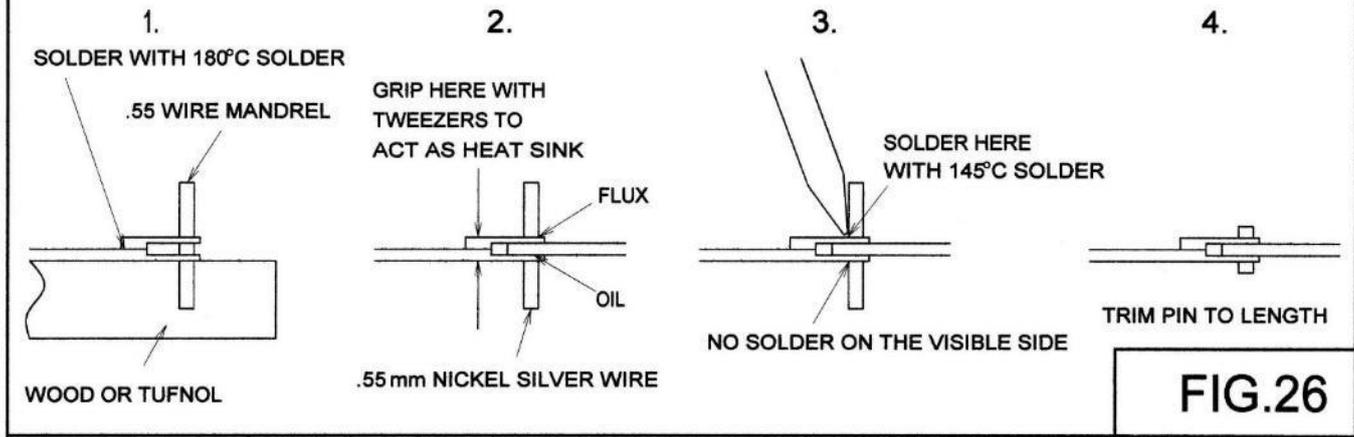
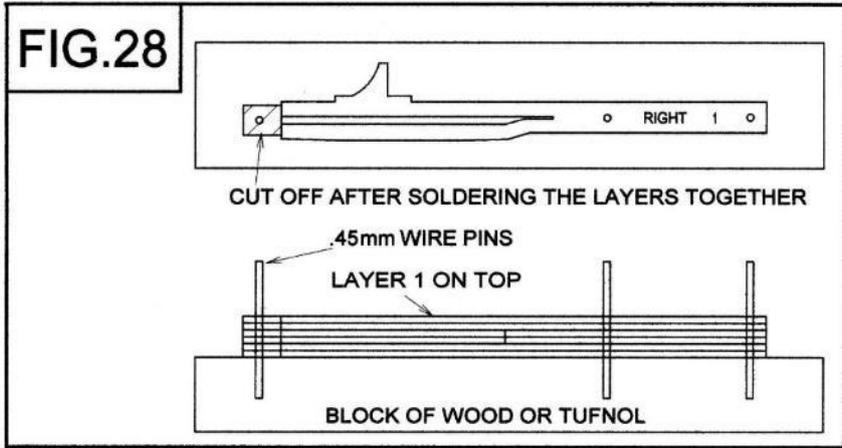
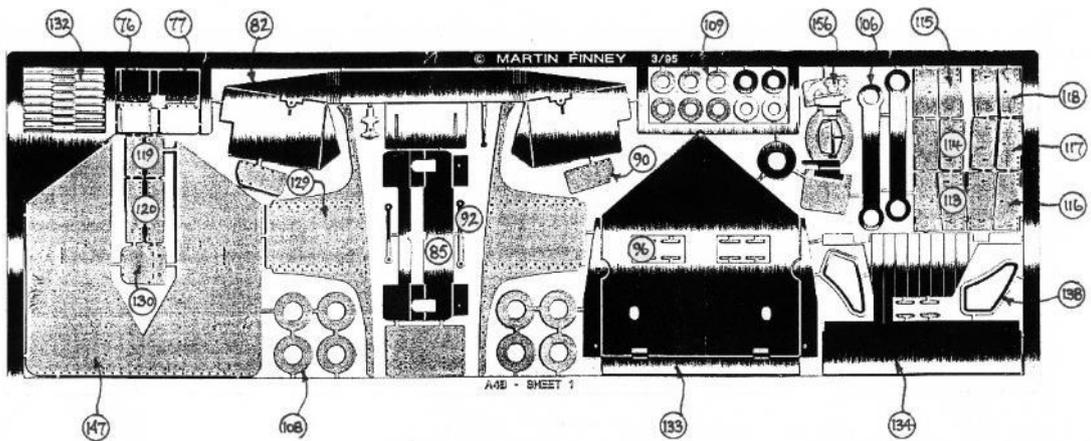
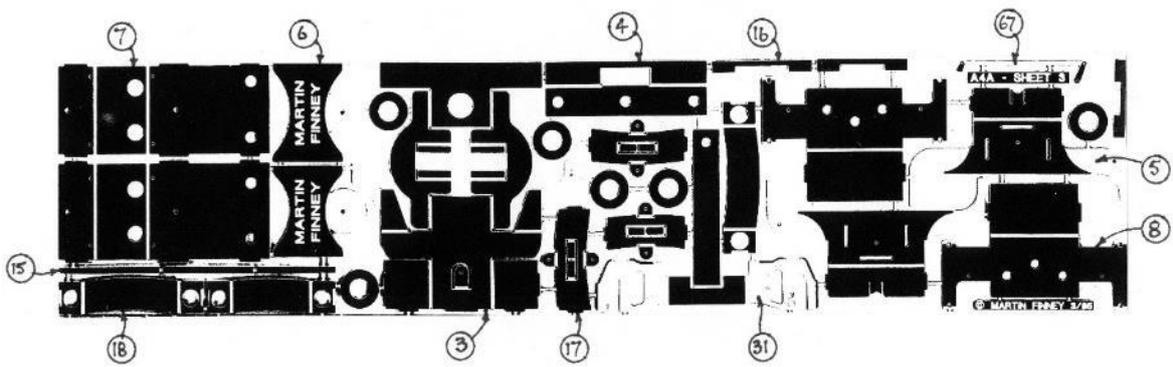
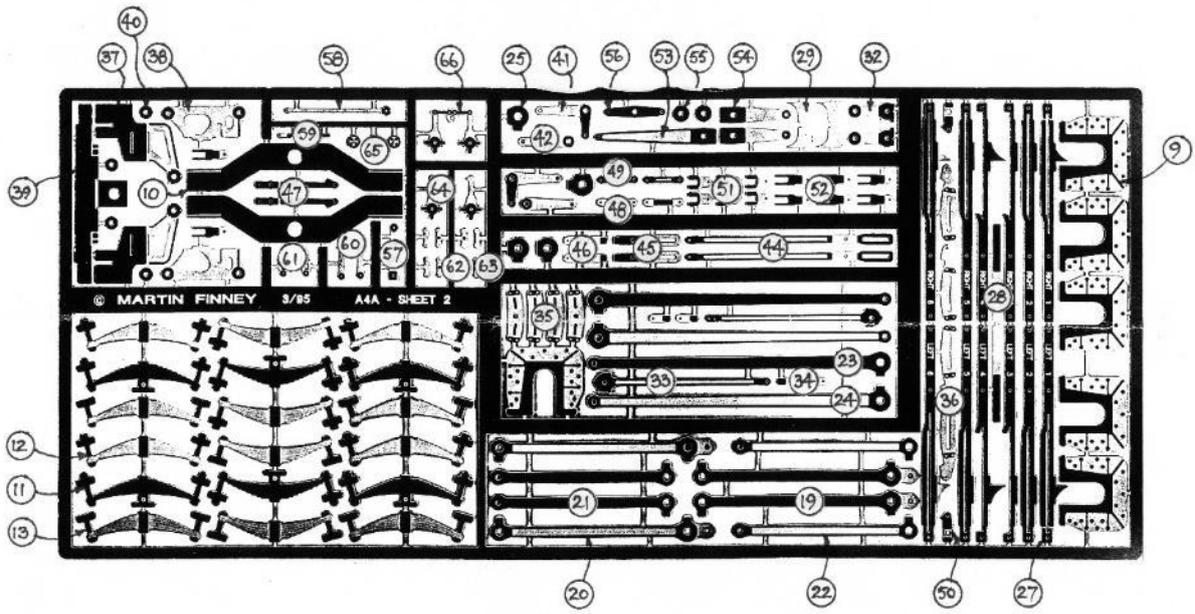
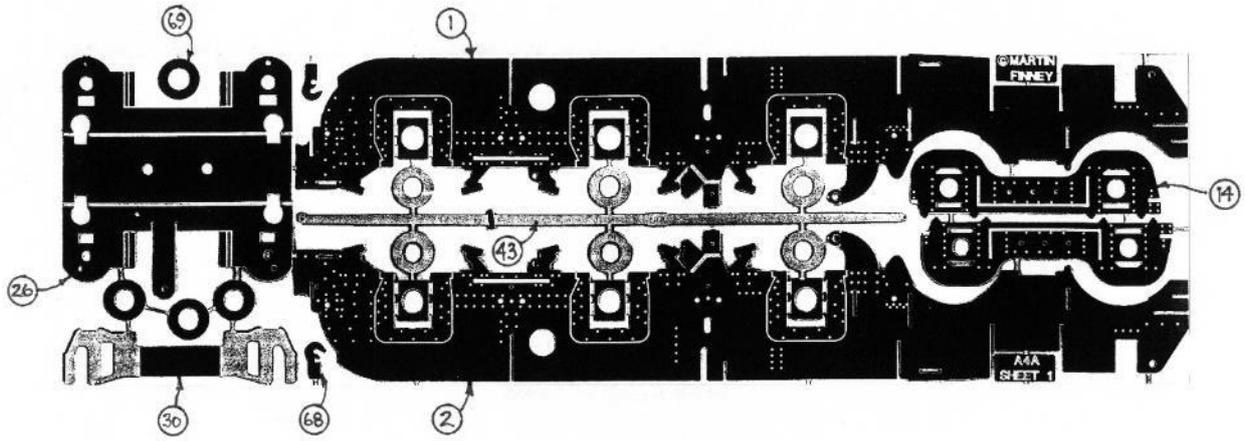
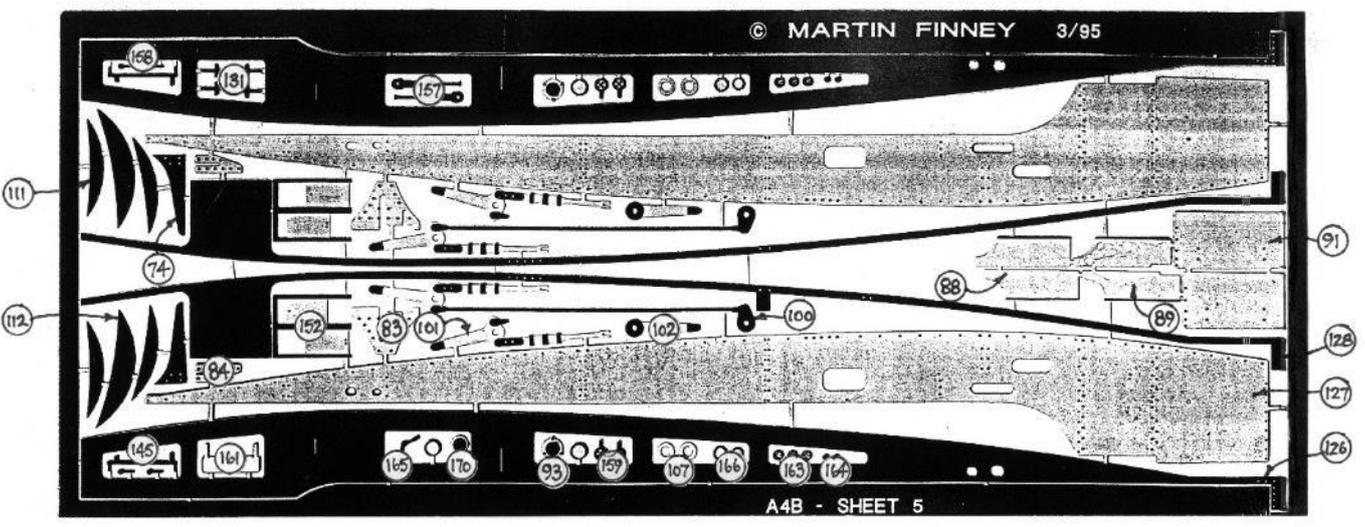
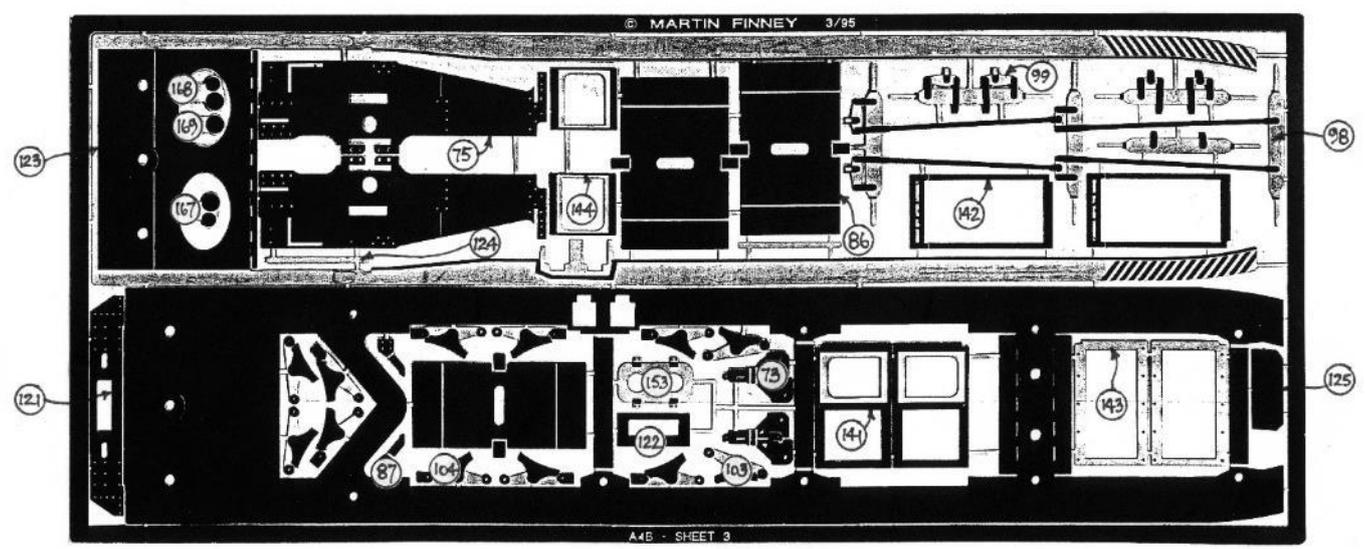
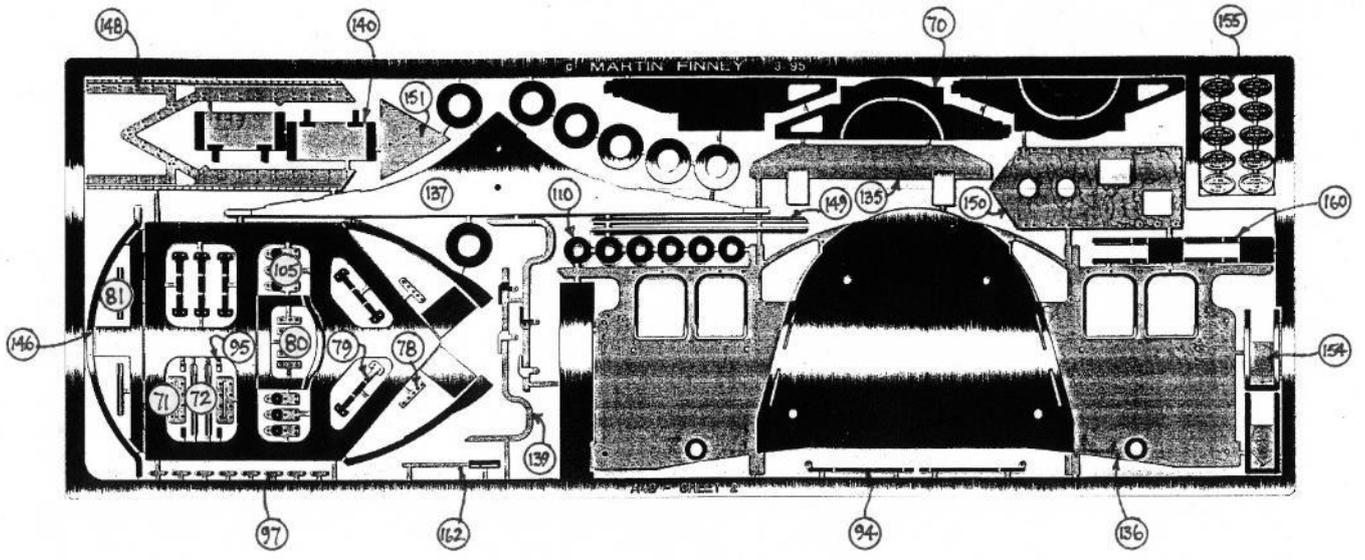


FIG.28







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 - front
31. Slide bar bracket lamination - rear
32. Eccentric crank - (2)
33. Eccentric rod - (2)
34. Eccentric rod - fork joint - (2)
35. Radius link outer lamination - (4)
36. Radius link inner lamination - (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 - left side - (2)
42. Reversing crank lamination - right side - (2)
43. Reversing rod
44. Radius rod - (2)
45. Radius rod - rear lamination - (2)
46. Radius rod - fork joint - (2)
47. Combination lever - (2)
48. Union link - inner lamination - (2)
49. Union link - outer lamination - (2)
50. Crosshead arm - (2)
51. Valve connecting link lamination - rear - (4)
52. Valve connecting link lamination - front - (6)
53. 2 to 1 arm
54. 2 to 1 arm - lamination - (2)
55. 2 to 1 arm packing washer
56. Equal arm
57. Mechanical lubricator drive eccentric crank
58. Mechanical lubricator drive eccentric rod
59. Mechanical lubricator drive eccentric rod - fork joint
60. Mechanical lubricator drive lever - inner
61. Mechanical lubricator drive lever - outer
62. Mechanical lubricator drive link - inner lamination - (2)
63. Mechanical lubricator drive link - outer lamination - (2)
64. Mechanical lubricator arm - (2)
65. Mechanical lubricator handwheel - (2)
66. Mechanical lubricator linkages - non working
67. Damper operating rod
68. Coupling hook
69. Washer - coupled axle
70. Frame stay - middle - reversing rod bracket
71. Reversing rod bracket frame overlay - (2)
72. Reversing rod bracket rib - (2)
73. Mechanical lubricator mounting bracket
74. Frame - guard iron - (2)
75. Rear frame extension - outer - (2)
76. Rear steps - upper - (2)
77. Rear steps - lower - (2)
78. Rear frame - drag beam bracket overlay - (2)
79. Rear spring safety bracket - (4)
80. Rear frame - footplate bracket overlay - (4)
81. Rear frame - footplate bracket rib - (2)
82. Fire box below footplate
83. Radius link bracket frame overlay - (2)
84. Slide bar bracket frame overlay - (2)
85. Buffer beam
86. Bogie frame stay - centre
87. Bogie - guard iron - (2)
88. Bogie wheel - splasher - front - (2)
89. Bogie wheel - splasher - rear - (2)
90. Bogie dust shield - original - (2)
91. Bogie dust shield - full width
92. Screw coupling

ETCHED COMPONENTS (continued)

- 93. Eccentric rod bearing overlay - (2)
- 94. Drain cock linkage - (2)
- 95. Drain cock linkage - front cock bracket - (2)
- 96. Drain pipe bracket - guard iron - (2)
- 97. Drain pipe bracket - around pipes - (4)
- 98. Brake pull rods/cross shafts
- 99. Brake cross shaft overlay - (3)
- 100. Brake pull rod lamination - front & rear cylinder - (2)
- 101. Brake pull rod lamination - front cylinder - (2)
- 102. Rear brake cylinder lever lamination - (2)
- 103. Brake hanger/shoe lamination - rear - (4)
- 104. Brake hanger/shoe lamination - middle/front - (8)
- 105. Brake hanger pivot overlay - (4)
- 106. Draw bar
- 107. Crankpin washer - (4)
- 108. Washer - coupled wheel axle
- 109. Washer - bogie wheel axle
- 110. Washer - fixing bolts
- 111. Balance weight - leading/trailing axle - (4)
- 112. Balance weight - centre axle - (2)
- 113. Access door rear - early pattern - (2)
- 114. Access door middle - early pattern - (2)
- 115. Access door front - early pattern - (2)
- 116. Access door rear - later pattern - (2)
- 117. Access door middle - later pattern - (2)
- 118. Access door front - later pattern - (2)
- 119. Extra front access door front - two hinge - (2)
- 120. Extra front access door front - three hinge - (2)
- 121. Footplate/dragbeam
- 122. Dragbeam overlay
- 123. Footplate overlay
- 124. Angle round lubricator compartment
- 125. Inner wall of lubricator compartment
- 126. Valence/skirt inner lamination - full skirt -(2)
- 127. Skirt outer lamination - full skirt - (2)
- 128. Valence - skirts removed -(2)
- 129. Cylinder cover - skirts removed - (2)
- 130. Bufferbeam coupling plate
- 131. Firebox mudhole door bracket - (2)
- 132. Ejector exhaust pipe bracket - (5)
- 133. Cab floor support
- 134. Cab floor
- 135. Fall plate
- 136. Cabsides/front
- 137. Firebox - inside cab
- 138. Cab spectacle window frame - (2)
- 139. Cabside inner beading - (2)
- 140. Cab door - (2)
- 141. Cab window - inner layer - (2)
- 142. Cab window - middle layer - (2)
- 143. Cab window - outer layer - (2)
- 144. Cab window - sliding frame - (2)
- 145. Cabside windscreen frame - (2)
- 146. Cab roof former assembly
- 147. Cab roof
- 148. Cab roof interior detail
- 149. Cab roof rainstrip - (2)
- 150. Central cab roof ventilator - front section
- 151. Central cab roof ventilator - rear section
- 152. Central cab roof ventilator - shutters - two positions
- 153. Central cab roof ventilator - safety valve plate
- 154. Side cab roof ventilator - (2)
- 155. Workspate - five different locomotives
- 156. Firehole door and fire screens
- 157. Regulator lever - (2)
- 158. Whistle lever - (2)
- 159. Injector handwheel - (2)
- 160. Cab seat bracket - (2)
- 161. Backplate shelf
- 162. Cut off indicator
- 163. Steam distribution box handwheel - large - (2)
- 164. Steam distribution box handwheel - small - (2)
- 165. Vacuum ejector handle
- 166. Cab gauges - (5)
- 167. Bracket - vacuum/steam chest pressure gauges
- 168. Bracket - boiler pressure/pyrometer gauges
- 169. Bracket - boiler pressure gauge
- 170. Bracket - heater gauge

WHITEMETAL CASTINGS

- W1. Single chimney
- W2. Double Chimney
- W3. Cartazzi axlebox/spring – left
- W4. Cartazzi axlebox/spring – right
- W5. Front sandbox - (2)
- W6. Brake cylinder - (2)
- W7. Backplate
- W8. Cab seat - (2)
- W9. Cab footplate platform - left
- W10. Cab footplate platform - right
- W11. Buffer spring gaiter - (2)

NICKEL SILVER CASTINGS

- N1. Crosshead/piston rod - (2)
- N2. Piston rod gland - (2)
- N3. Cylinder front cover – left
- N4. Cylinder front cover – right
- N5. Lamp bracket – upper
- N6. Lamp bracket - lower – centre
- N7. Lamp bracket - lower - side - (2)
- N8. Valve crosshead guide - front - old type - (2)

OTHER COMPONENTS

- 1/8" Flexichas bearing - (6)
- 2mm top hat bearing - (6)

- 6 BA C.H. screw - (9)
- 6 BA nut - (6)
- Self-tapping screw - short - (4)
- Self-tapping screw - long - (9)
- Nickel silver wire - 1.0mm - for coupling rod pins, crosshead pins, radius link pivots & 2-to-1 lever pivot
- Nickel silver wire - 0.7mm - for Cartazzi axlebox ties & radius rods
- Nickel silver wire - 0.55mm - for valve gear pins
- Brass wire - 0.3mm - for lubricator linkage pins
- Valve gear rivet - (2)
- Lubricator linkage pin - (2)
- Brass wire - 1/16" - for compensation beam pivots and exhaust steam injector pipe
- Brass tube - 3/32" outside diameter - for compensation beams

- Steel wire - 1/32" - front compensation beam
- Brass wire - 0.3mm - for radius link bolts and casing inspection door handles
- Brass wire - 0.45mm - for brake hanger pivots, sandpipes and spring wire

BRASS CASTINGS

- B1. Drain cock - (4)
- B2. Cylinder relief valve - (4)
- B3. Mechanical lubricator - (2)
- B4. Safety valve - (2)
- B5. Blowdown tap
- B6. Anti carboniser valve
- B7. Whistle
- B8. Ejector exhaust pipe elbow
- B9. Mason reducing valve
- B10. Vacuum ejector
- B11. Injector valve - left
- B12. Injector valve - right
- B13. Steam distribution box
- B14. Valve crosshead guide - front - (2)
- B15. Valve crosshead guide - rear - (2)
- B16. Screw reverser column
- B17. Vacuum pipe

- Brass wire - 0.8mm - for valve rods
- Brass wire - 1.0mm - for sandbox pipes, reversing cross shaft and vacuum ejector exhaust pipe
- Brass wire - 1.2mm - for front brake cross shaft
- Brass wire - 0.9mm - for rear brake cross shaft
- Nickel silver wire - 0.45mm - for handrails
- Brass wire - 0.5mm square - for washout plugs
- Brass wire - 0.2mm - for anti-carboniser valve pipe

- Spring wire - for rear truck & bogie side control
- Handrail knob - (26)
- Buffer housing, head, sleeve and springs - (2)
- Copper wire for cylinder draincock pipes
- Copper wire for backplate pipes

COMPONENTS NOT PROVIDED

- Wheels (Ultrascale, Alan Gibson or Markits)
 - Driving: 6' 8" - 20 spoke, 13" throw c.b.s
 - Bogie wheel 3' 2" diameter - 10 spoke
 - Trailing wheel 3' 8" diameter - 12 spoke

- Motor and gears
 - Portescap RG4 1624 or 1616 motor (or equivalent)

- Name and numberplates
- Paint, transfers and couplings