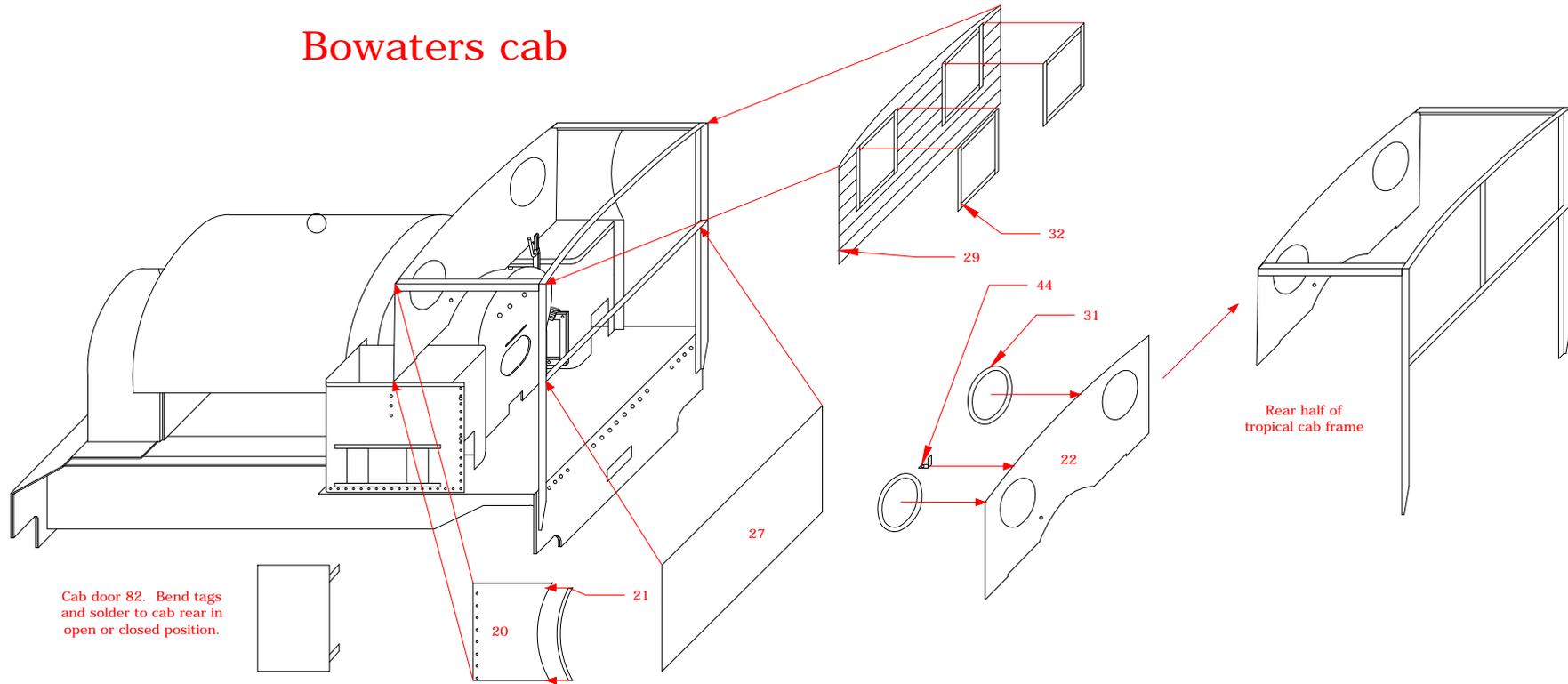
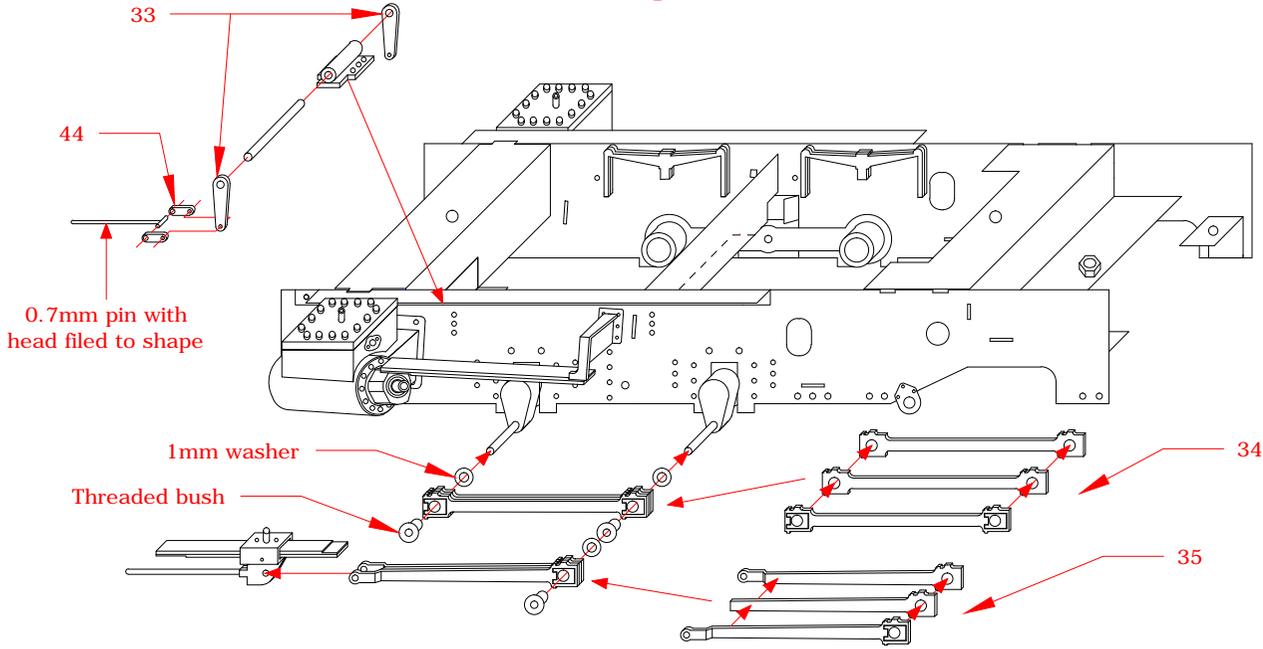
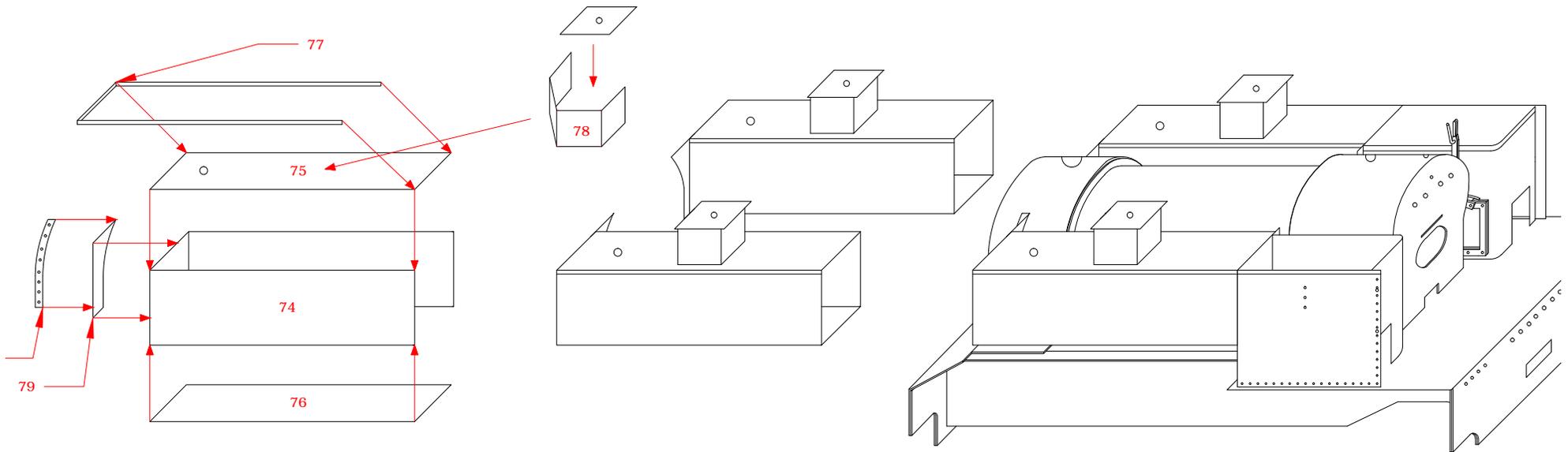


# Bowaters cab

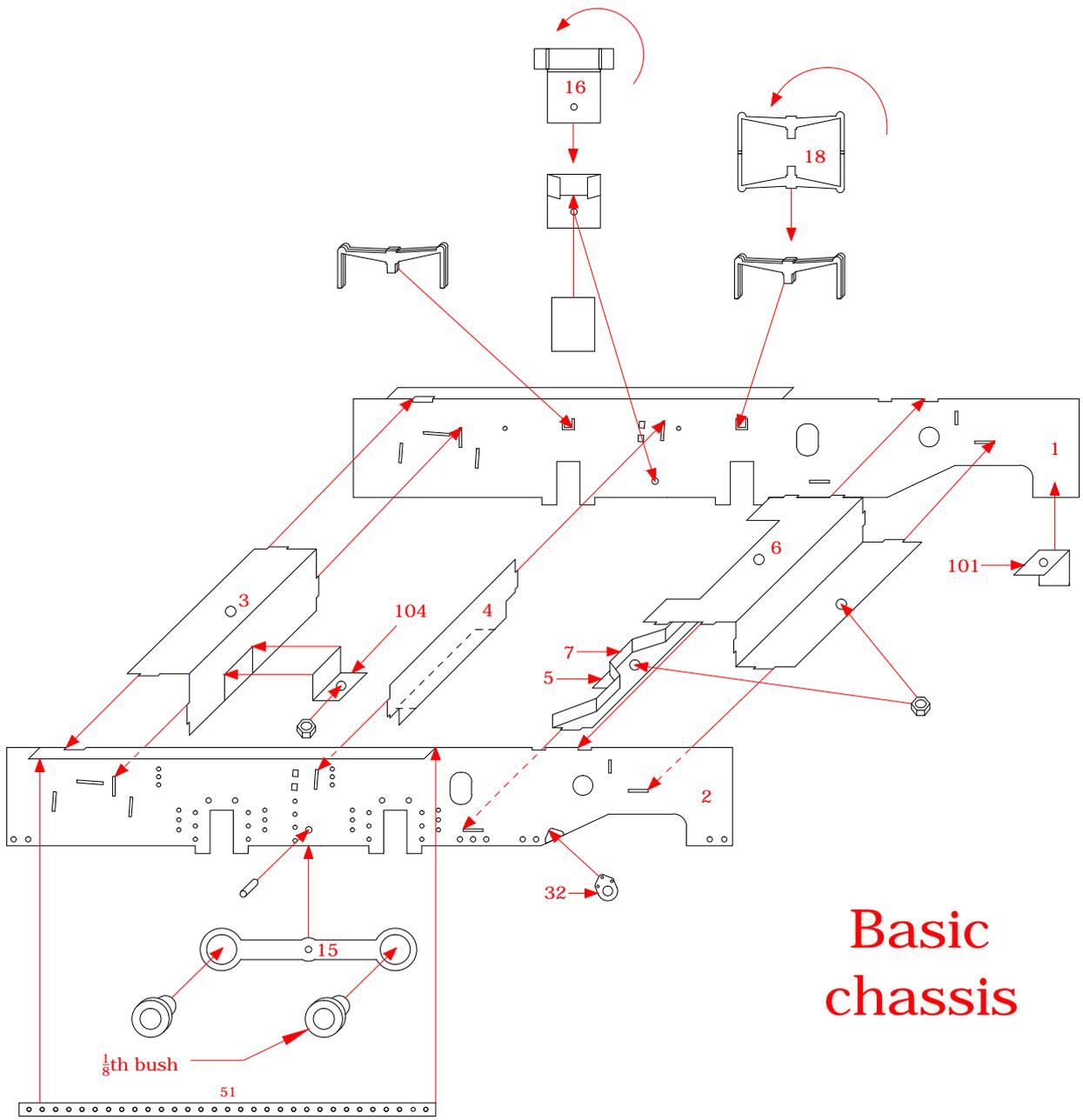


# Side rod fitting and valve gear - Stephenson's

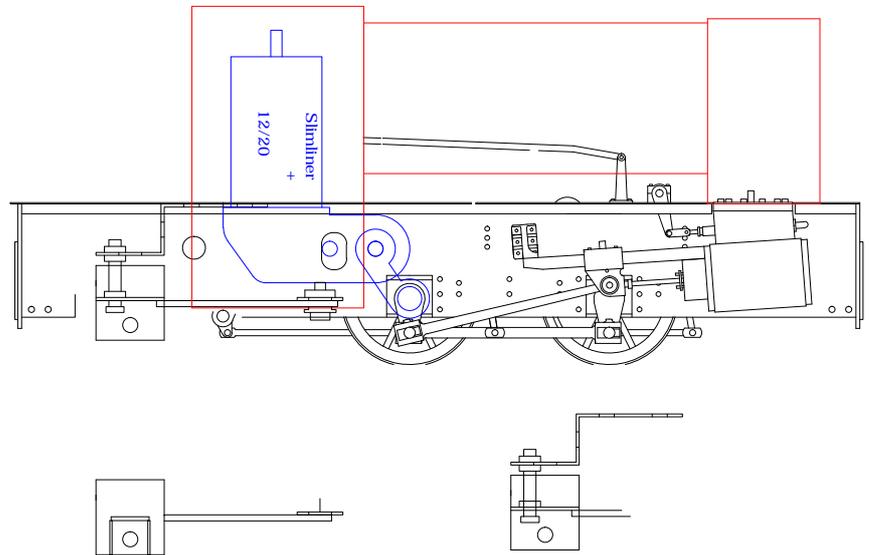




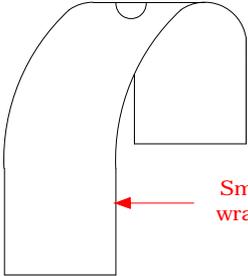
Tamar side tanks



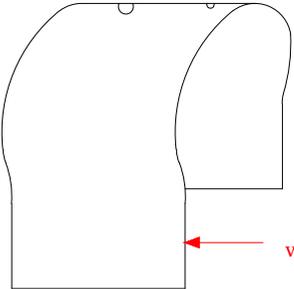
## Basic chassis



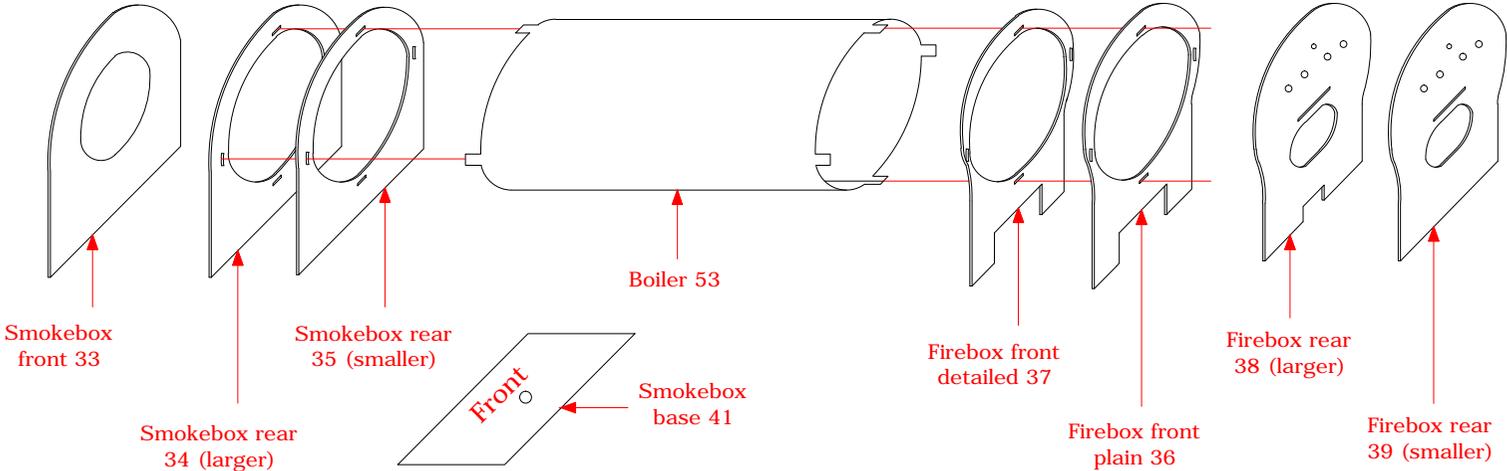
# Boiler, firebox & smokebox



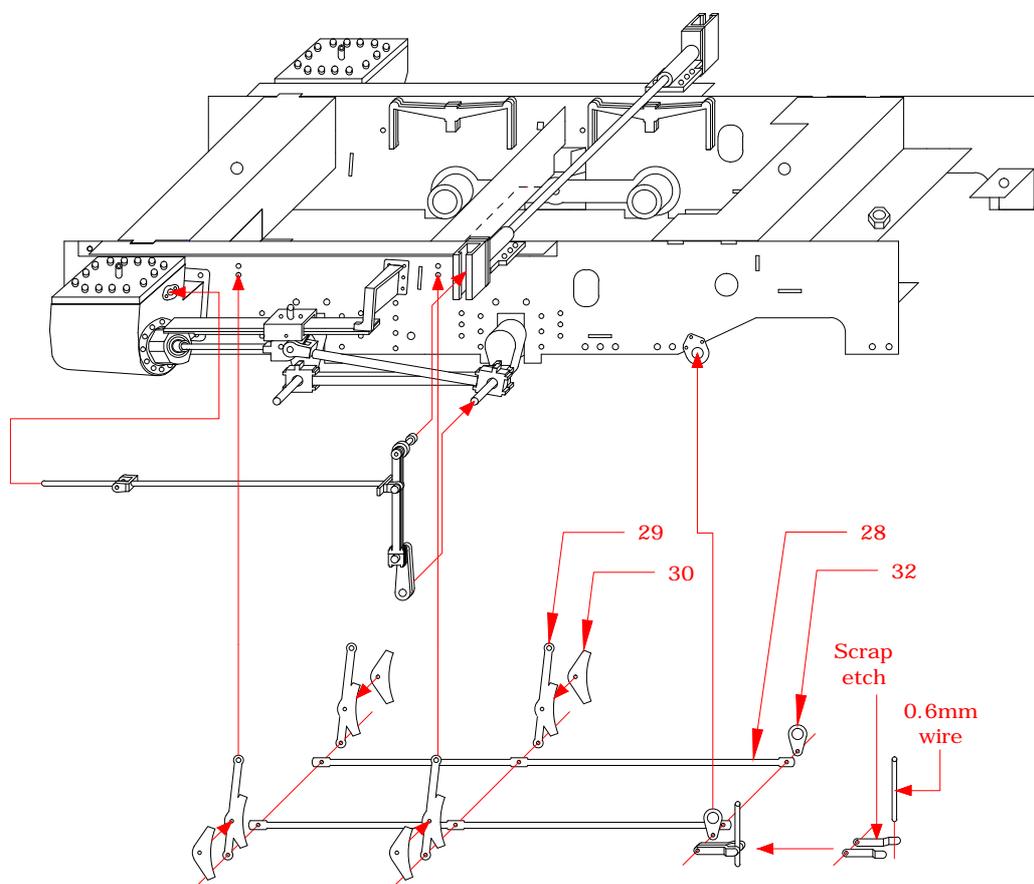
Smokebox wrapper 40



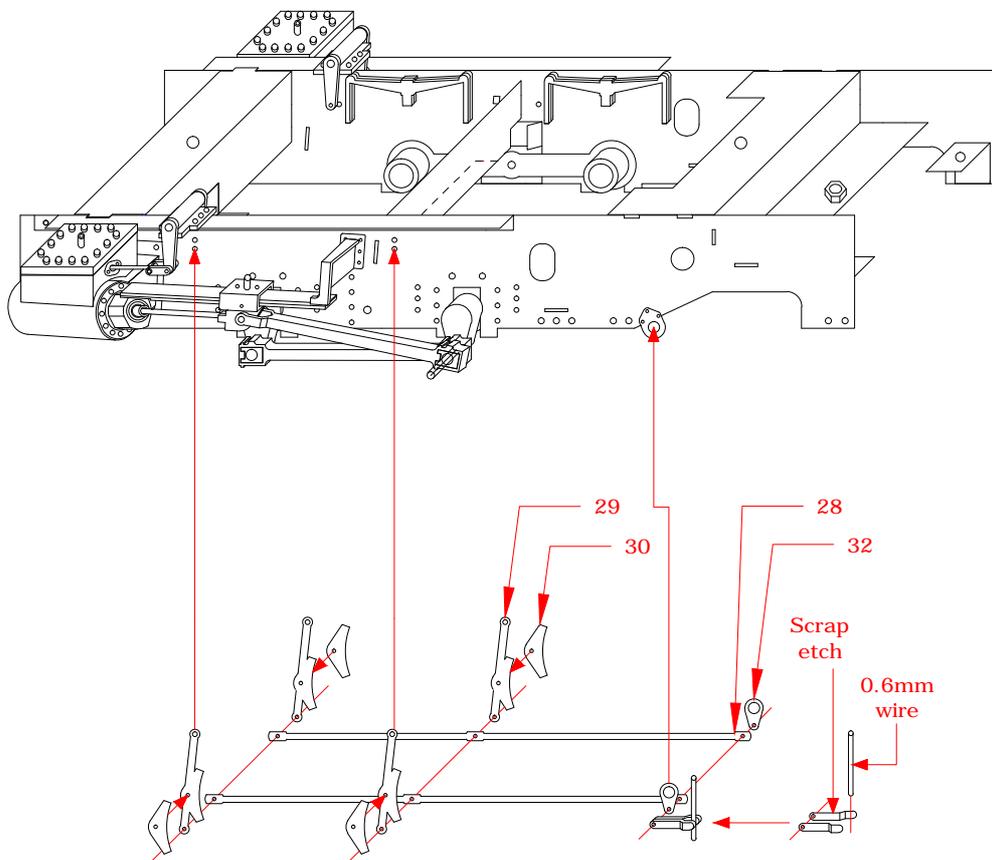
Firebox wrapper 42



# Brake gear & Hackworth fitting

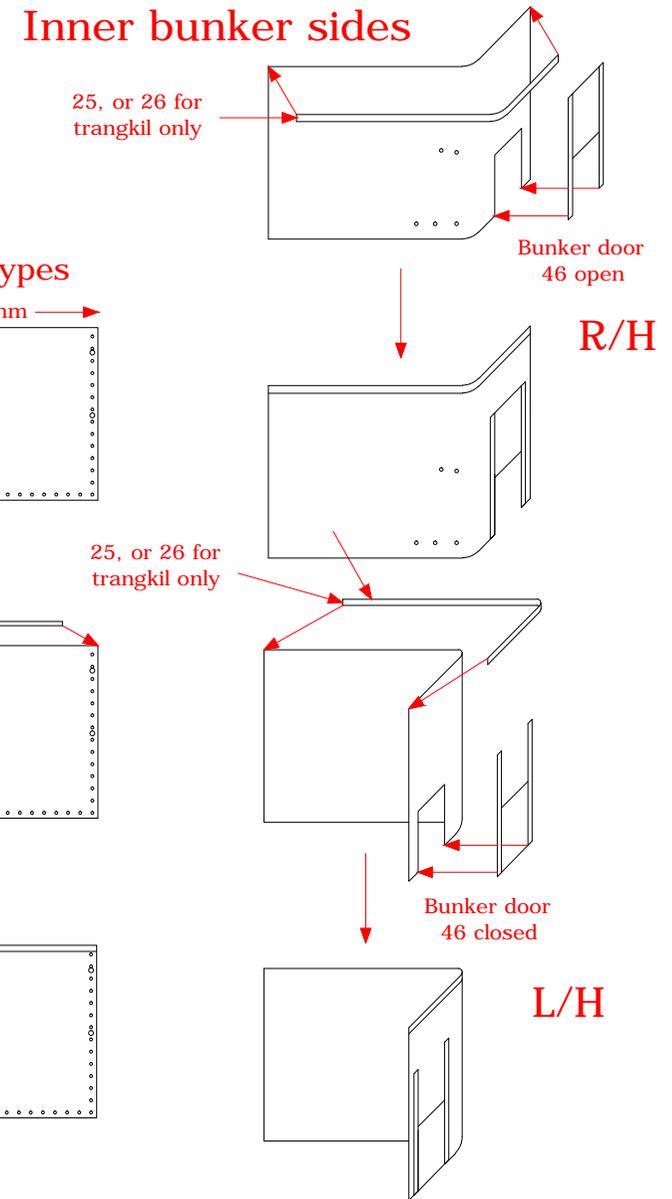
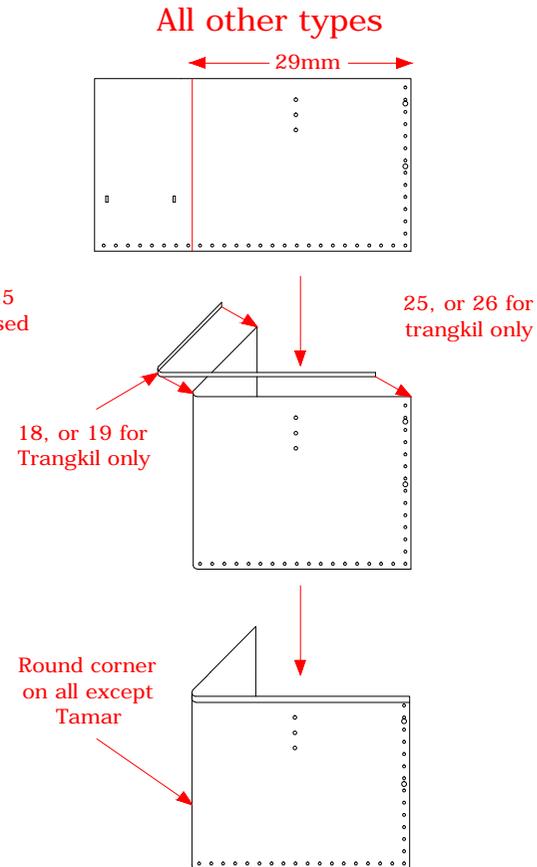
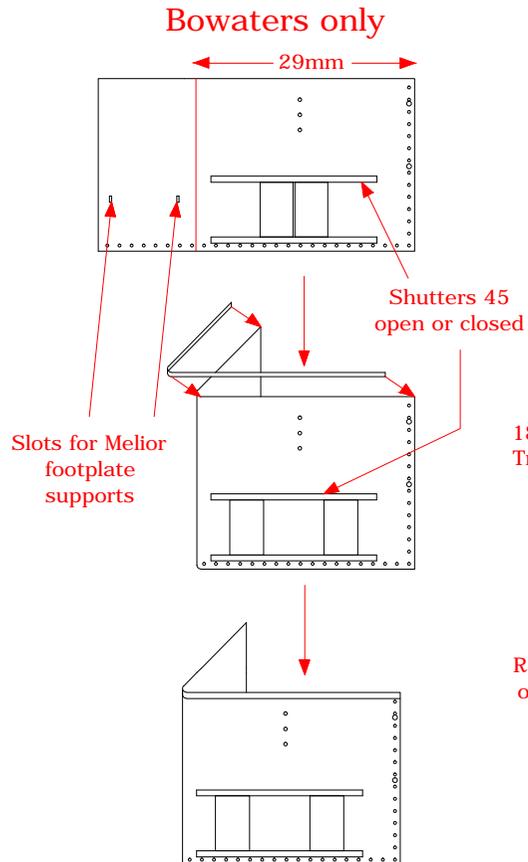
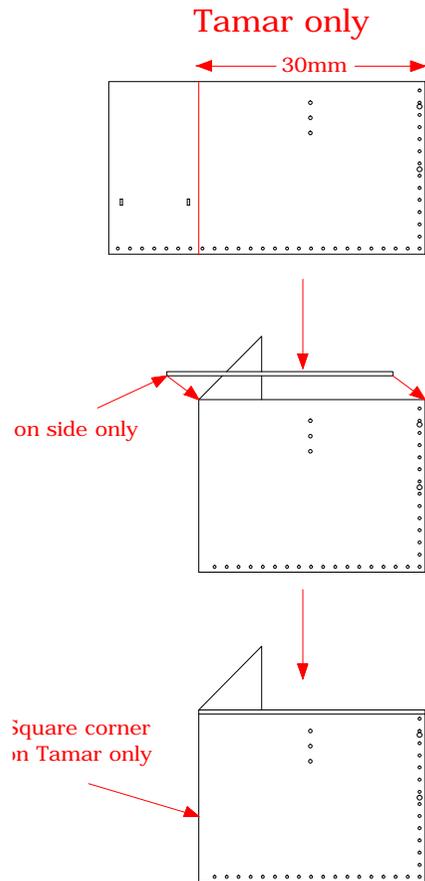


# Brake gear - Stephensons

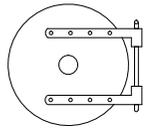
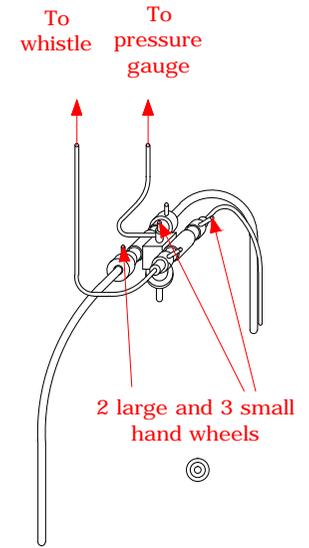
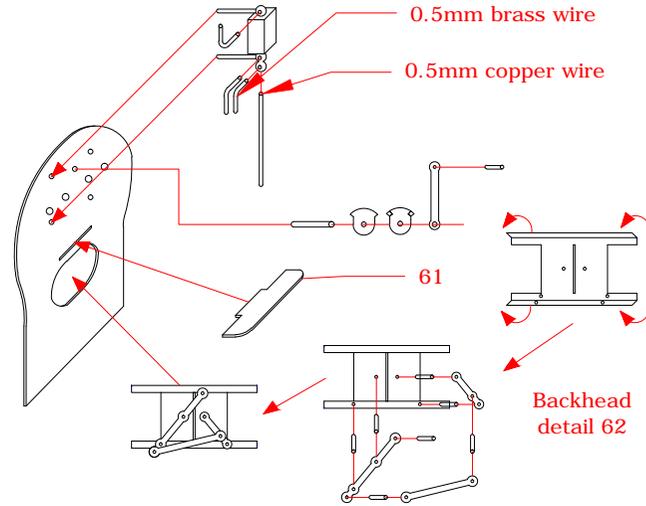
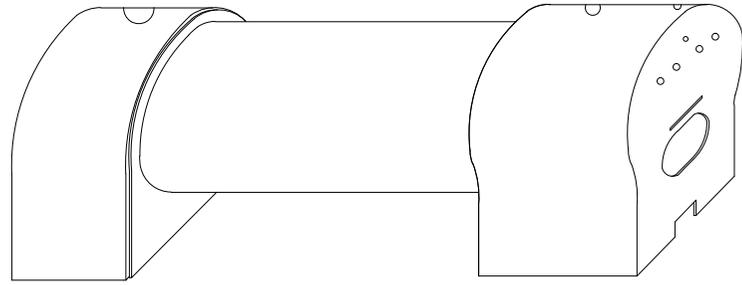


# Bunkers - all types

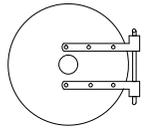
## Cab side 17, L/H shown



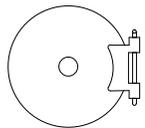
# Cab fittings & smokebox door



Seen on Melior & Leader

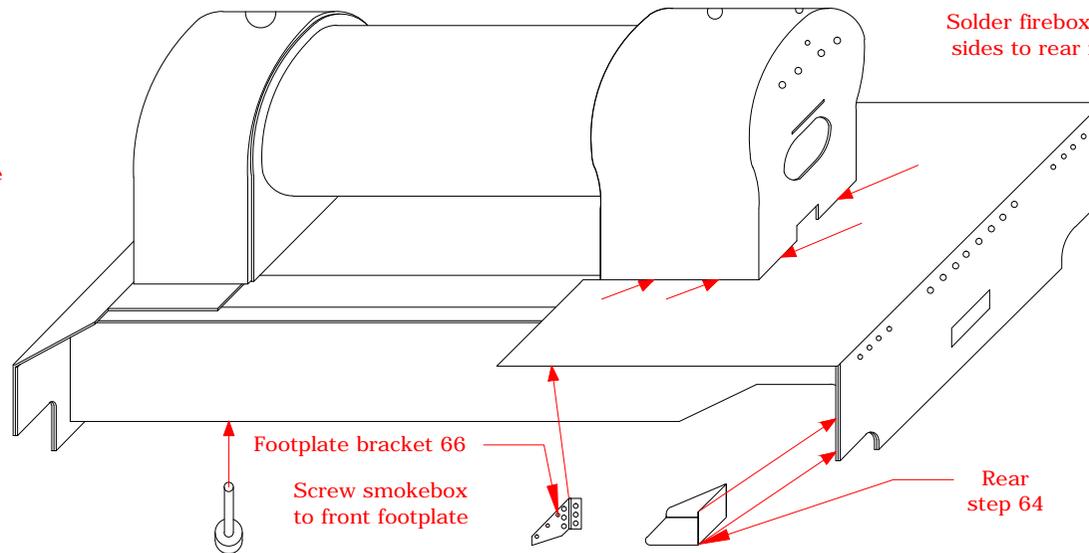


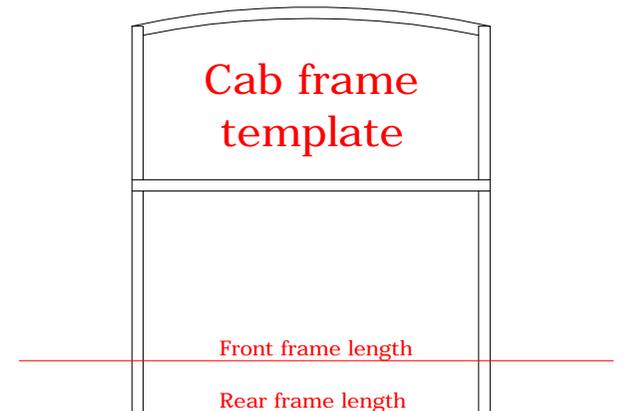
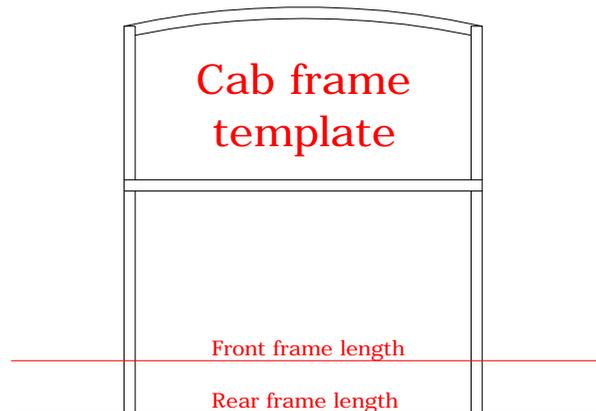
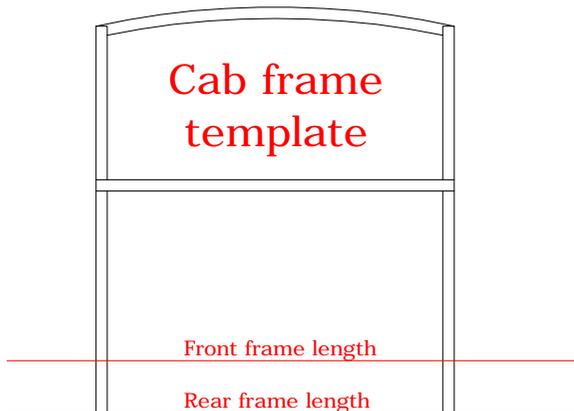
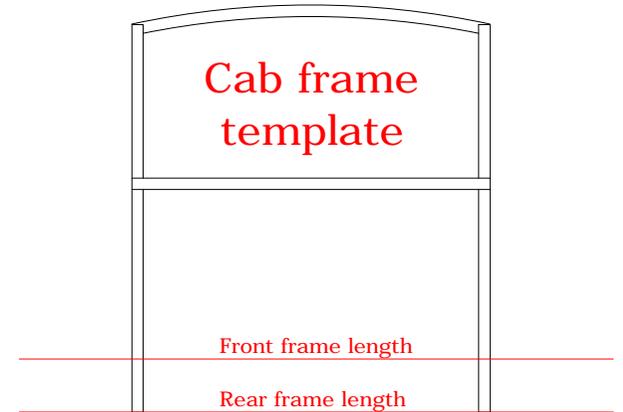
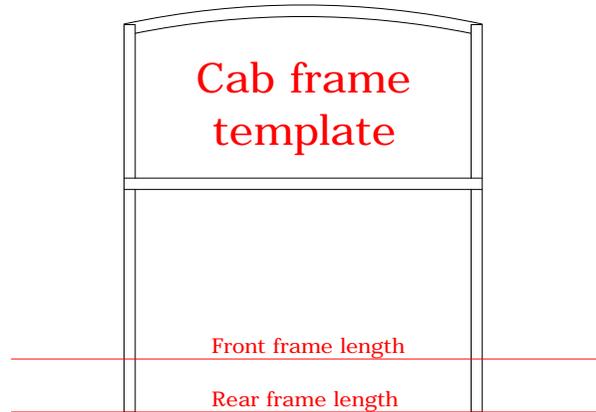
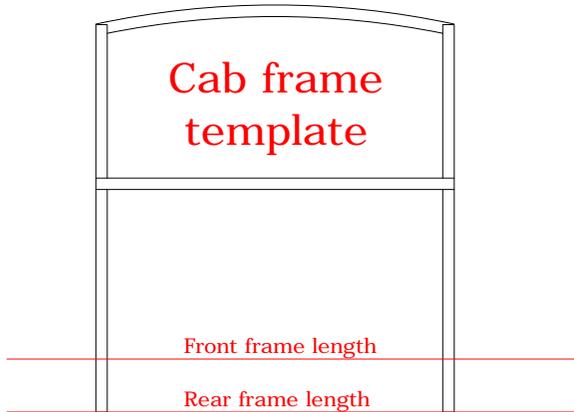
Most common type



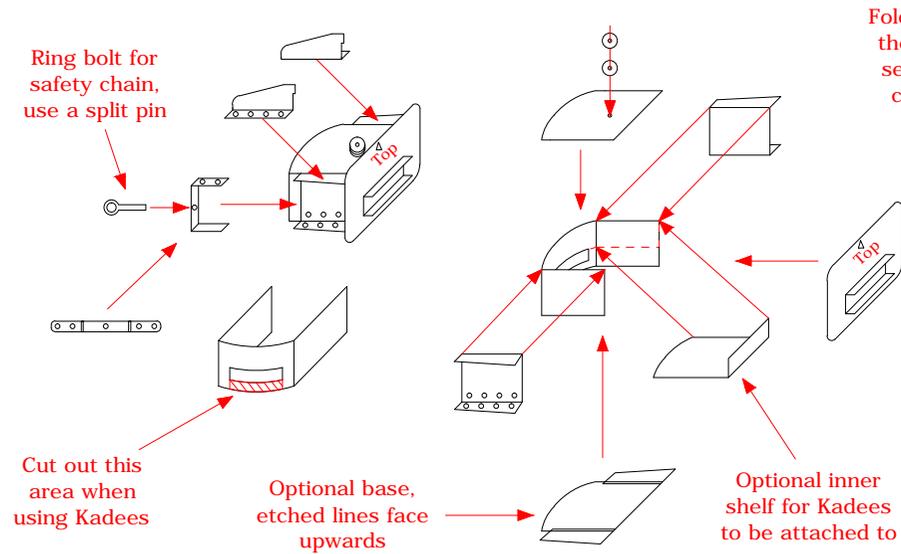
Seen on Premier & Excelsior

3 different varieties of door hinge are supplied. Check photos to find the one you need

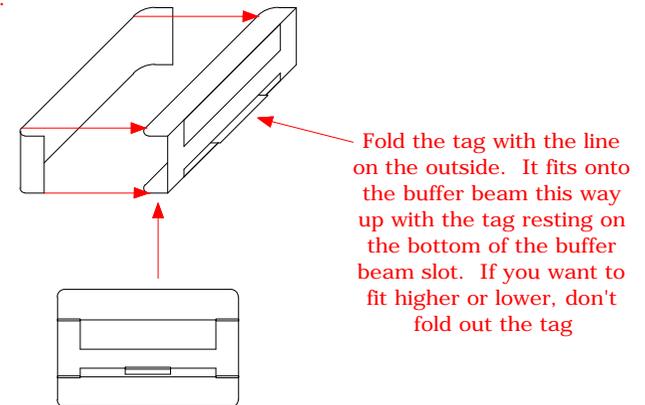




## Later Bowaters and SKLR coupling boxes

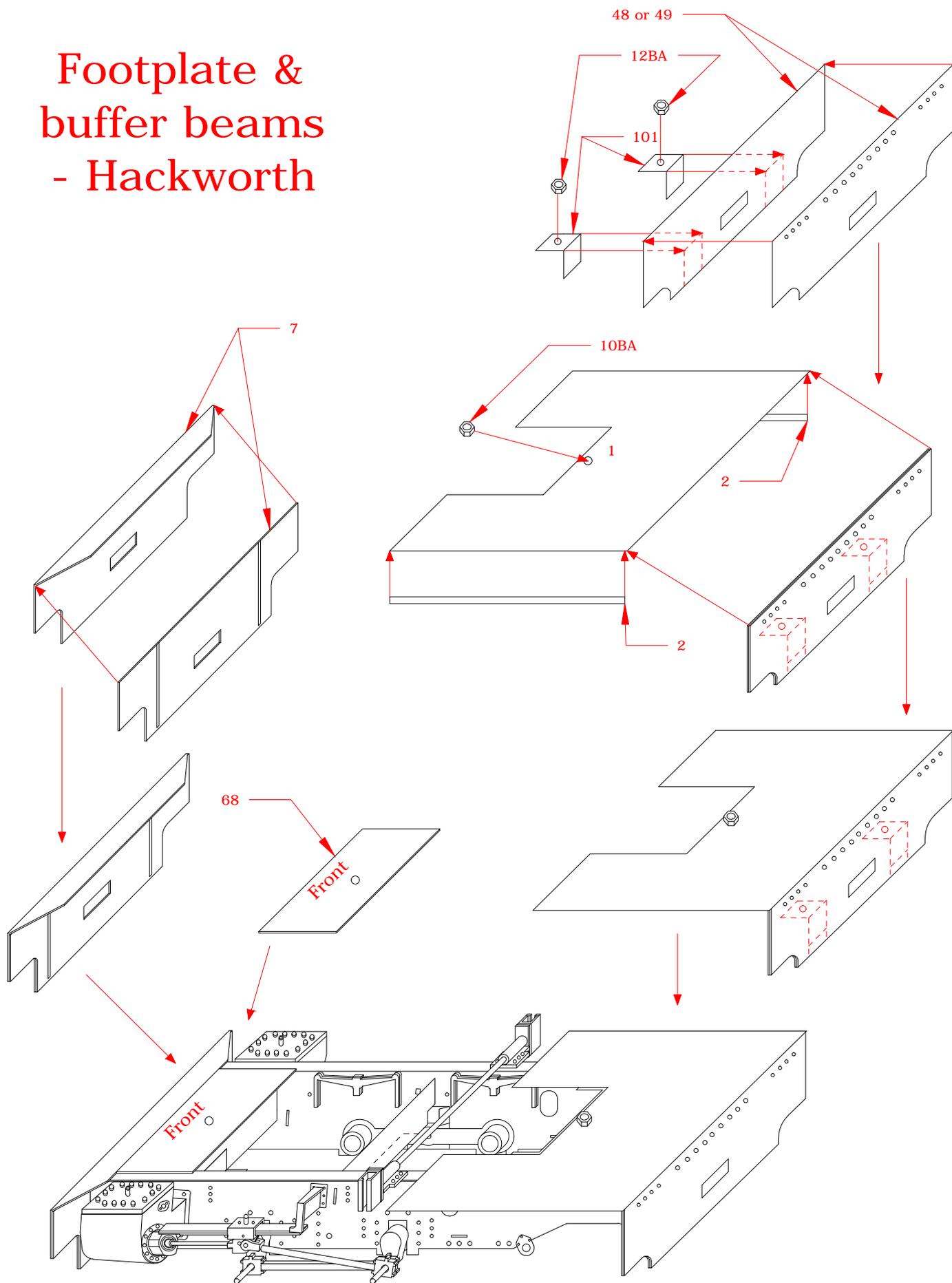


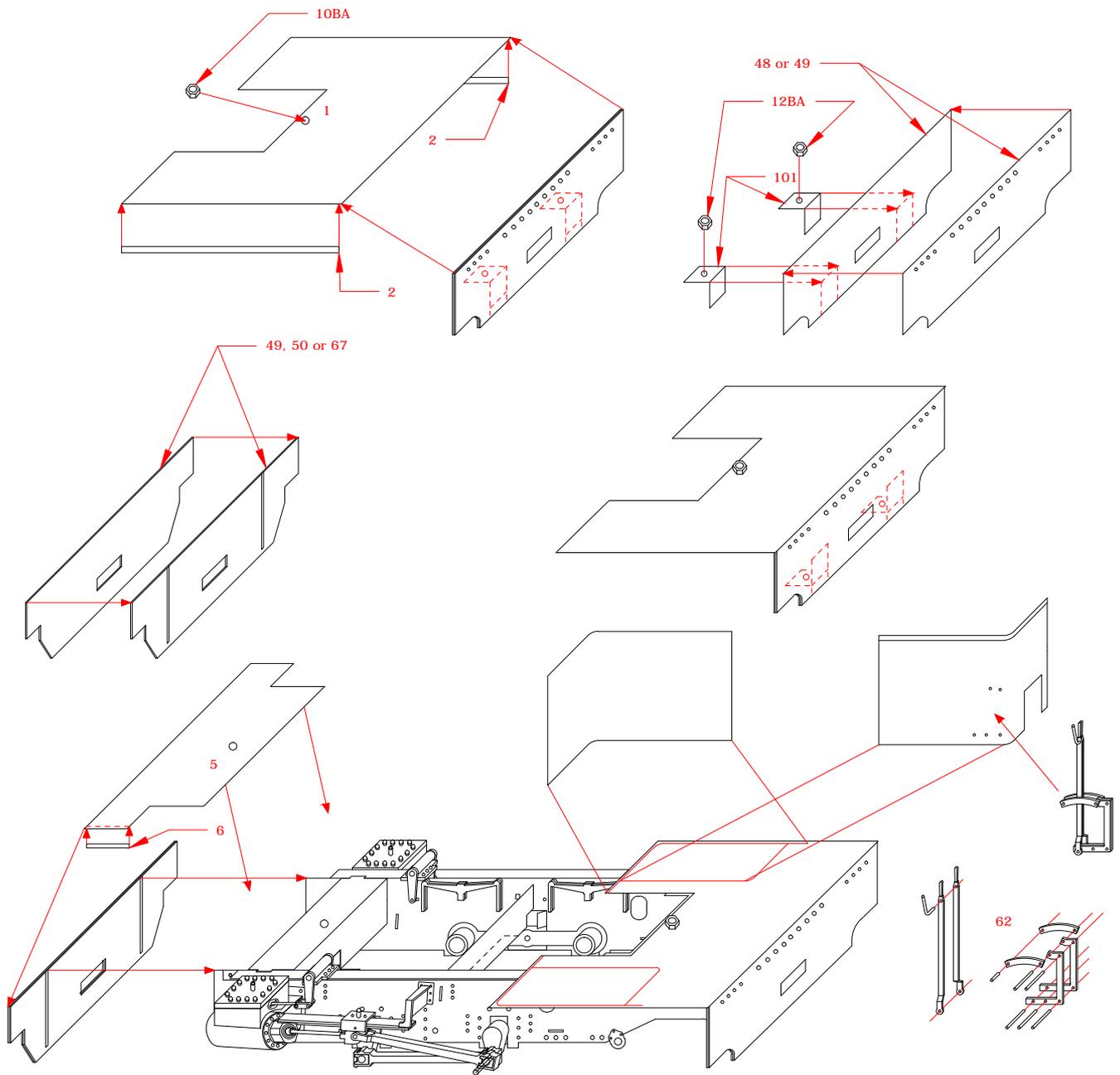
## Bowaters dumb buffers



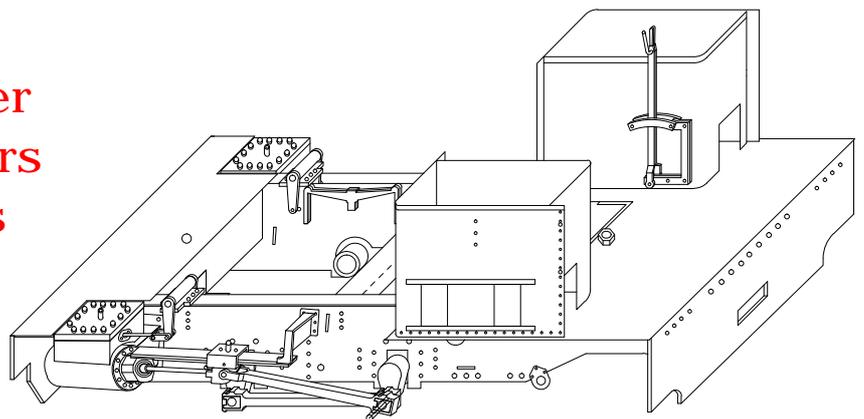


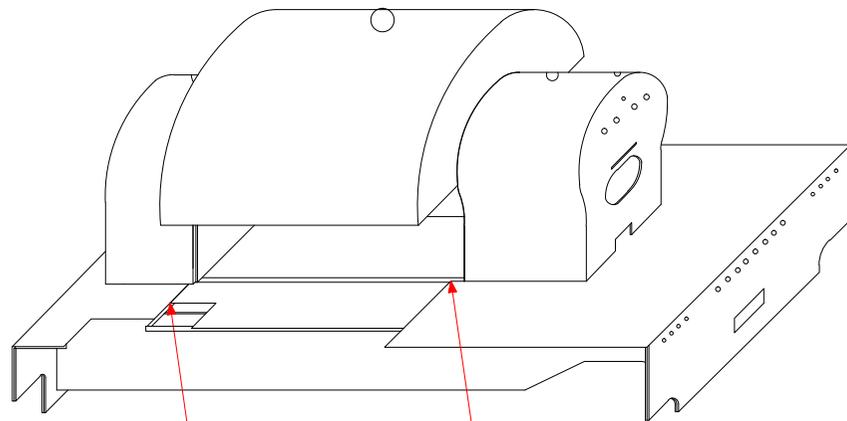
# Footplate & buffer beams - Hackworth



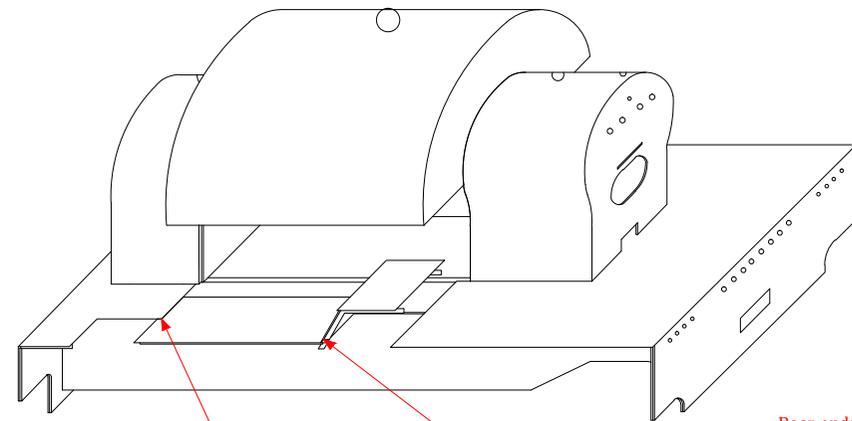
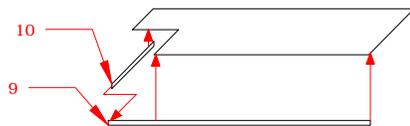


Footplate, buffer  
beams & bunkers  
- Stephensons

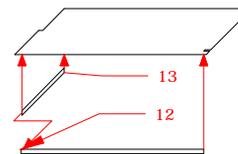




Mid footplate  
Pr/Le/Ex 8

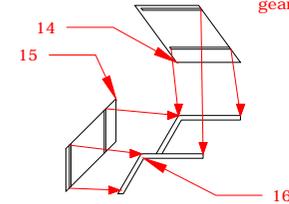


Mid footplate  
Mellor 11



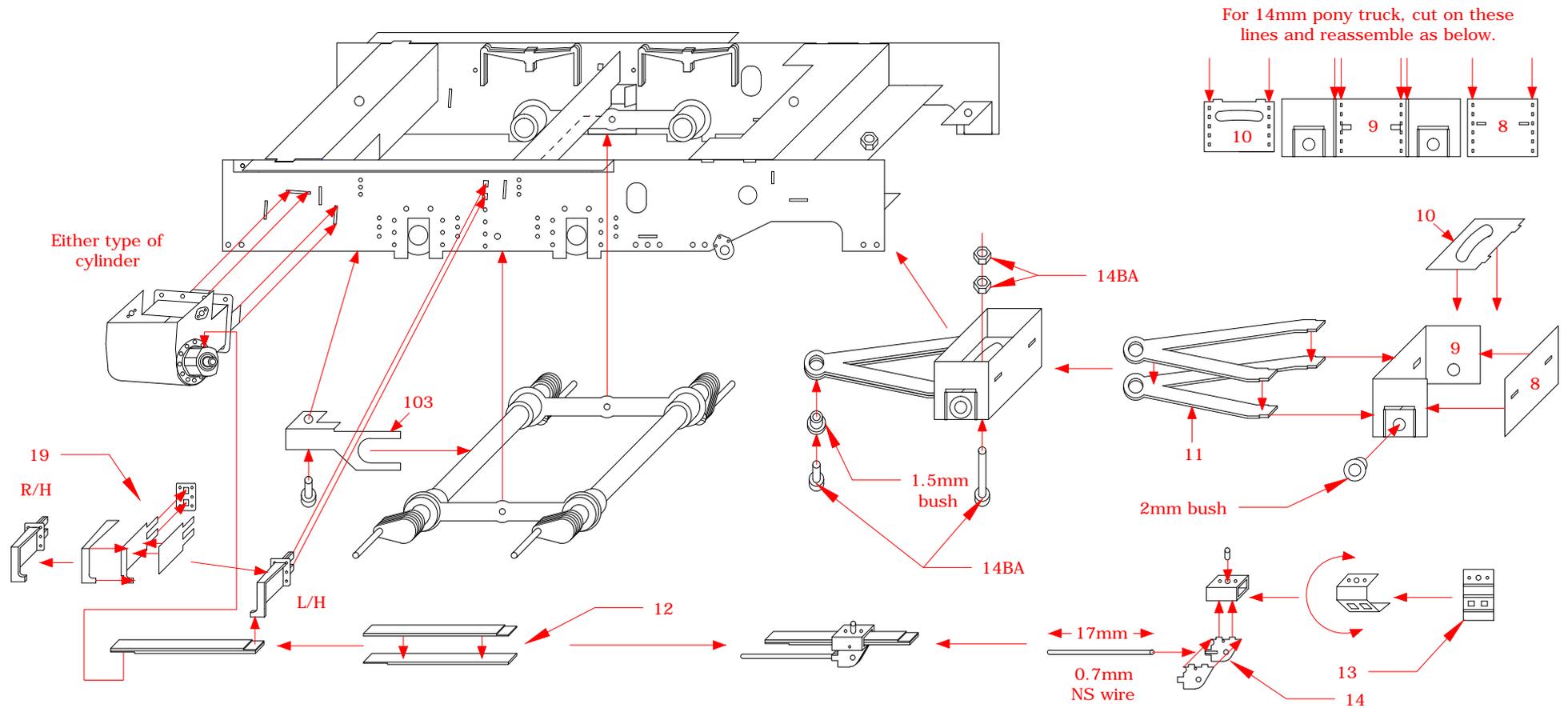
Rear ends of  
supports fit in slots  
in bunker front

Hackworth valve  
gear cover

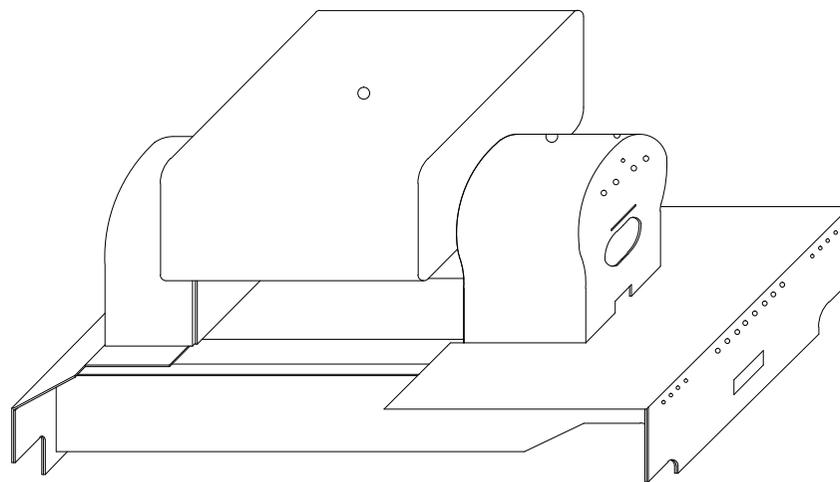
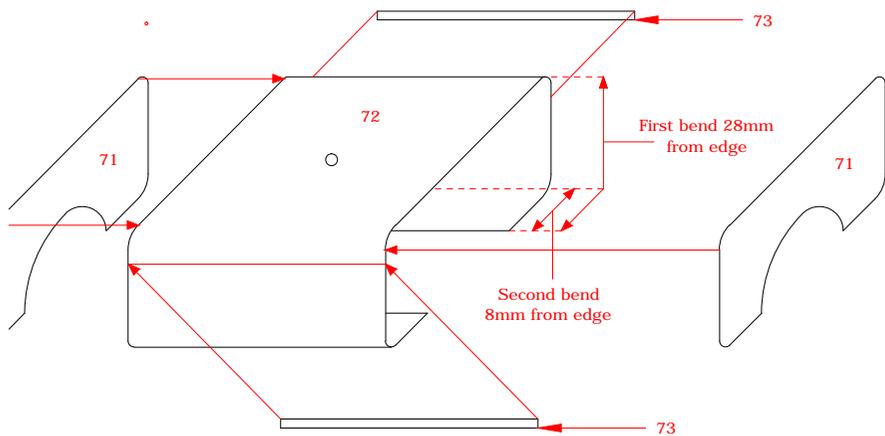
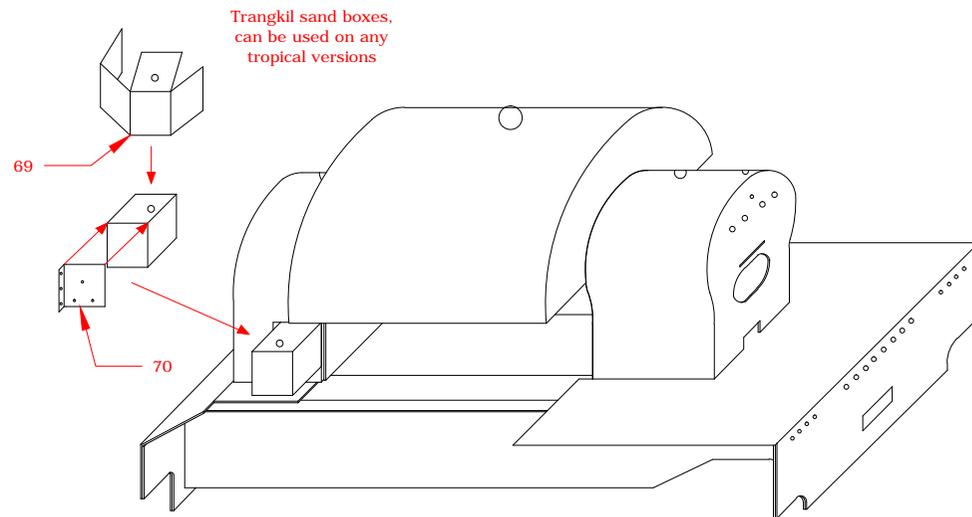
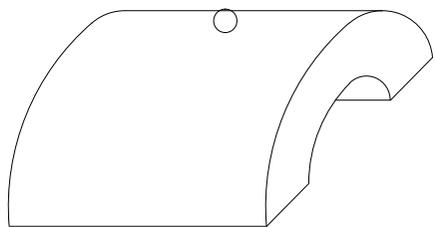
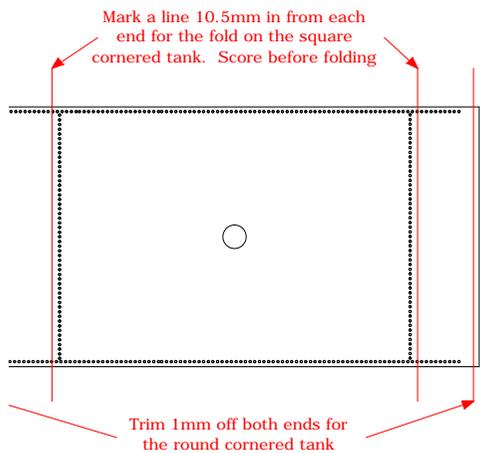


## Bowaters mid footplate & valve gear cover

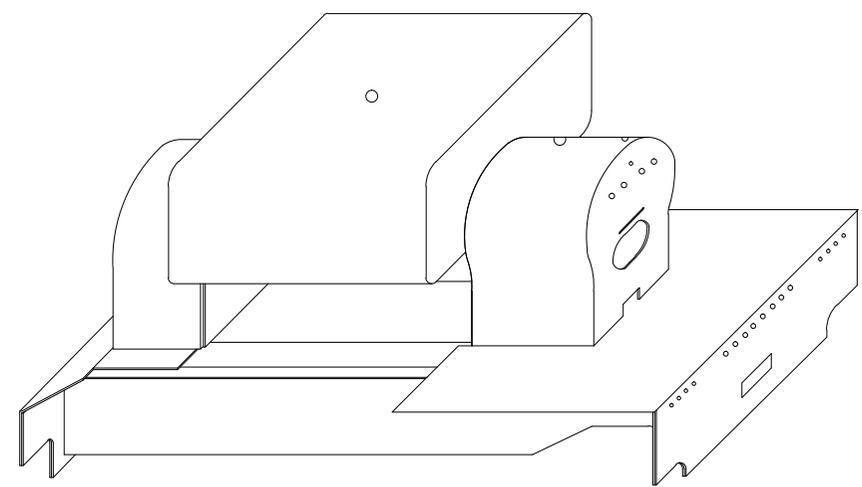
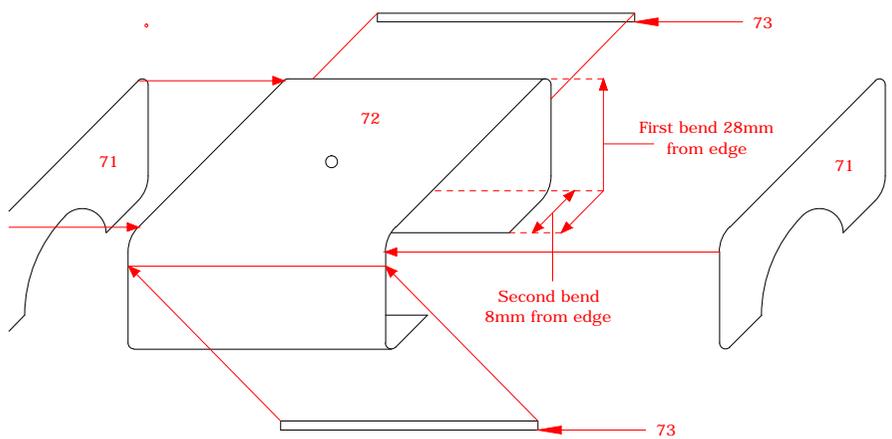
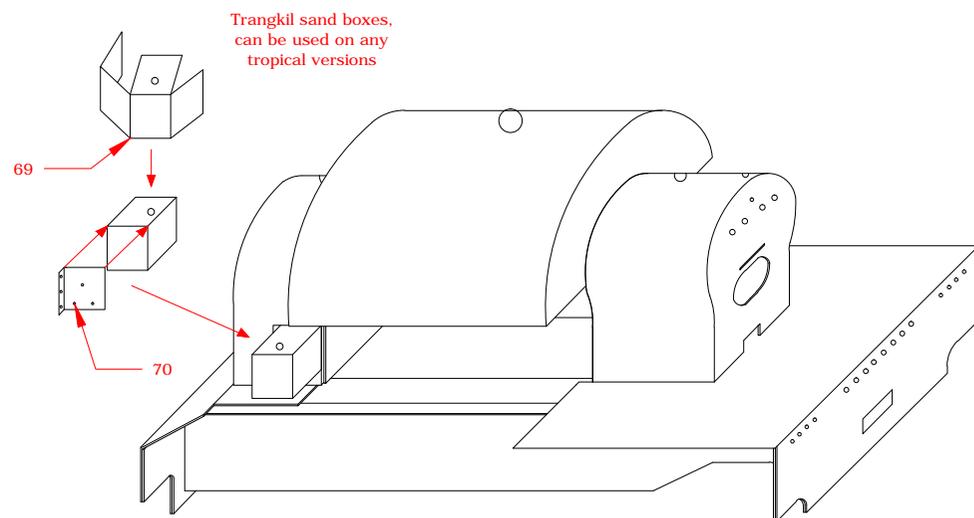
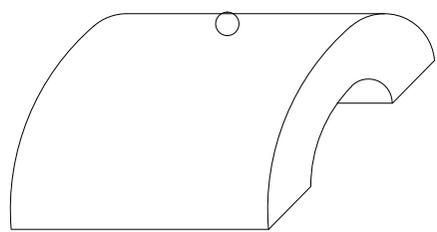
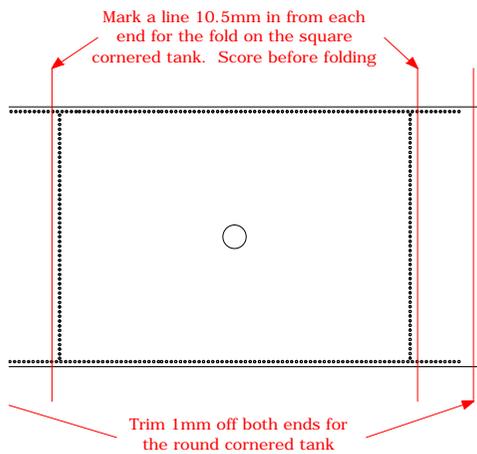
# Pony truck, compensation & cylinders

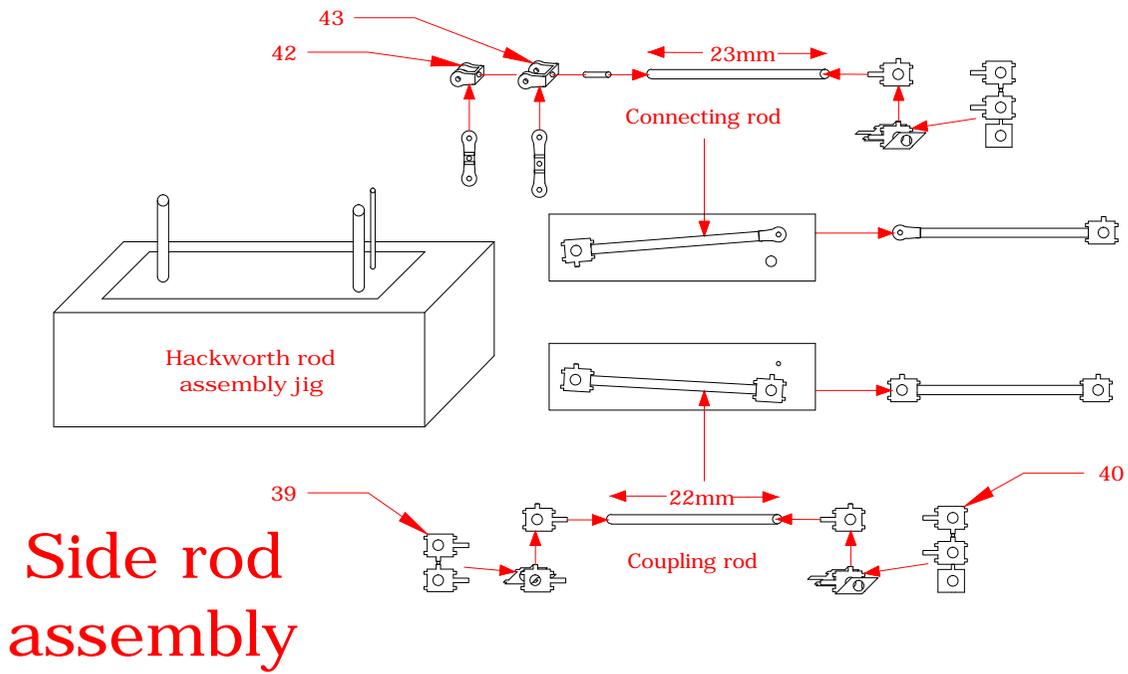


# Saddle tanks

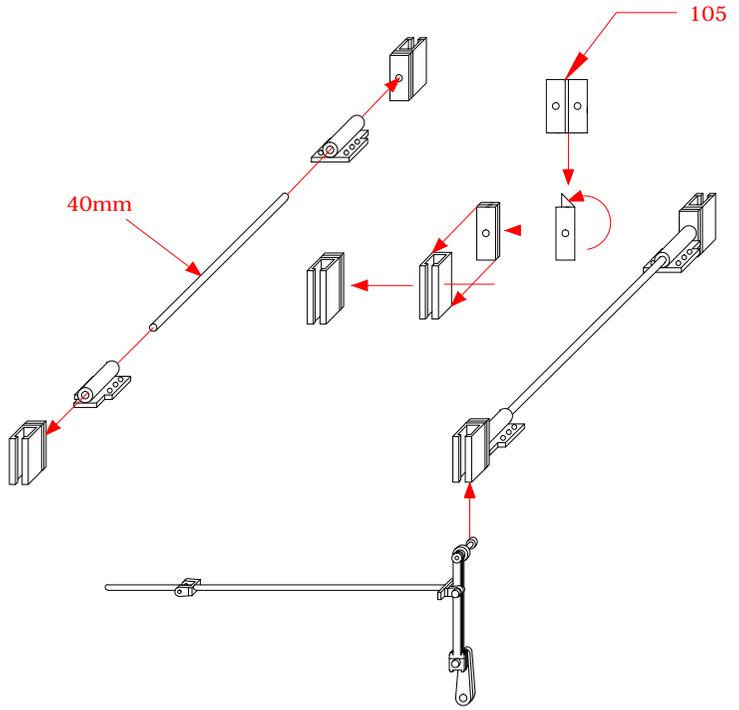
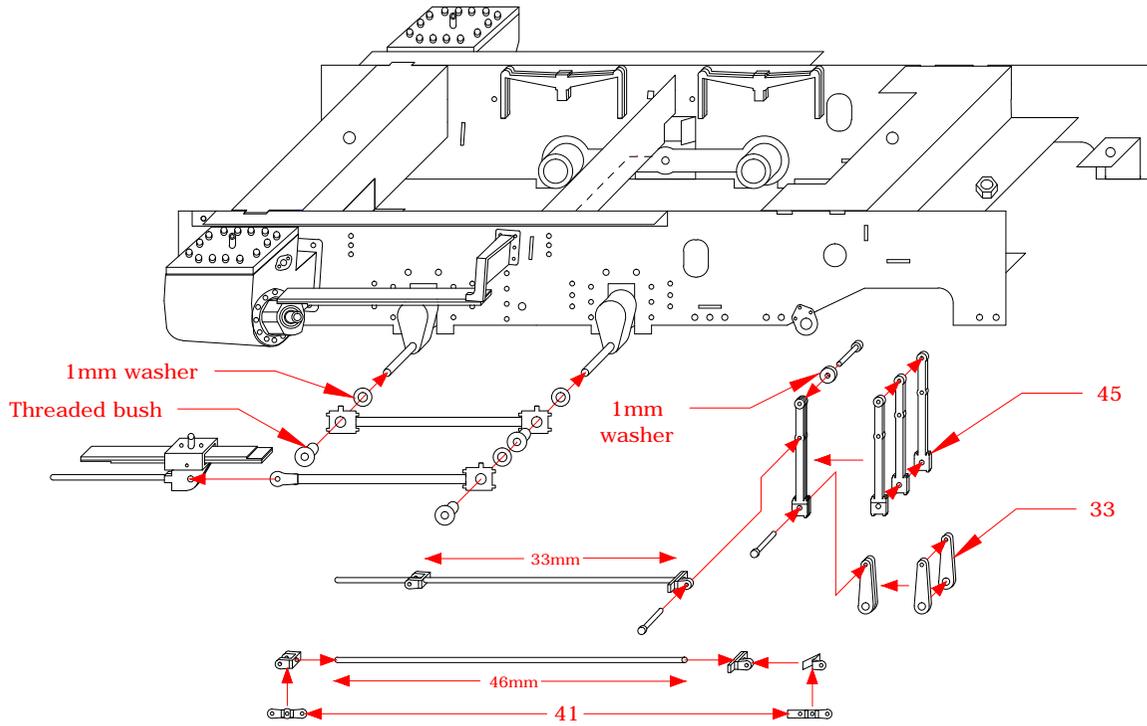


# Saddle tanks

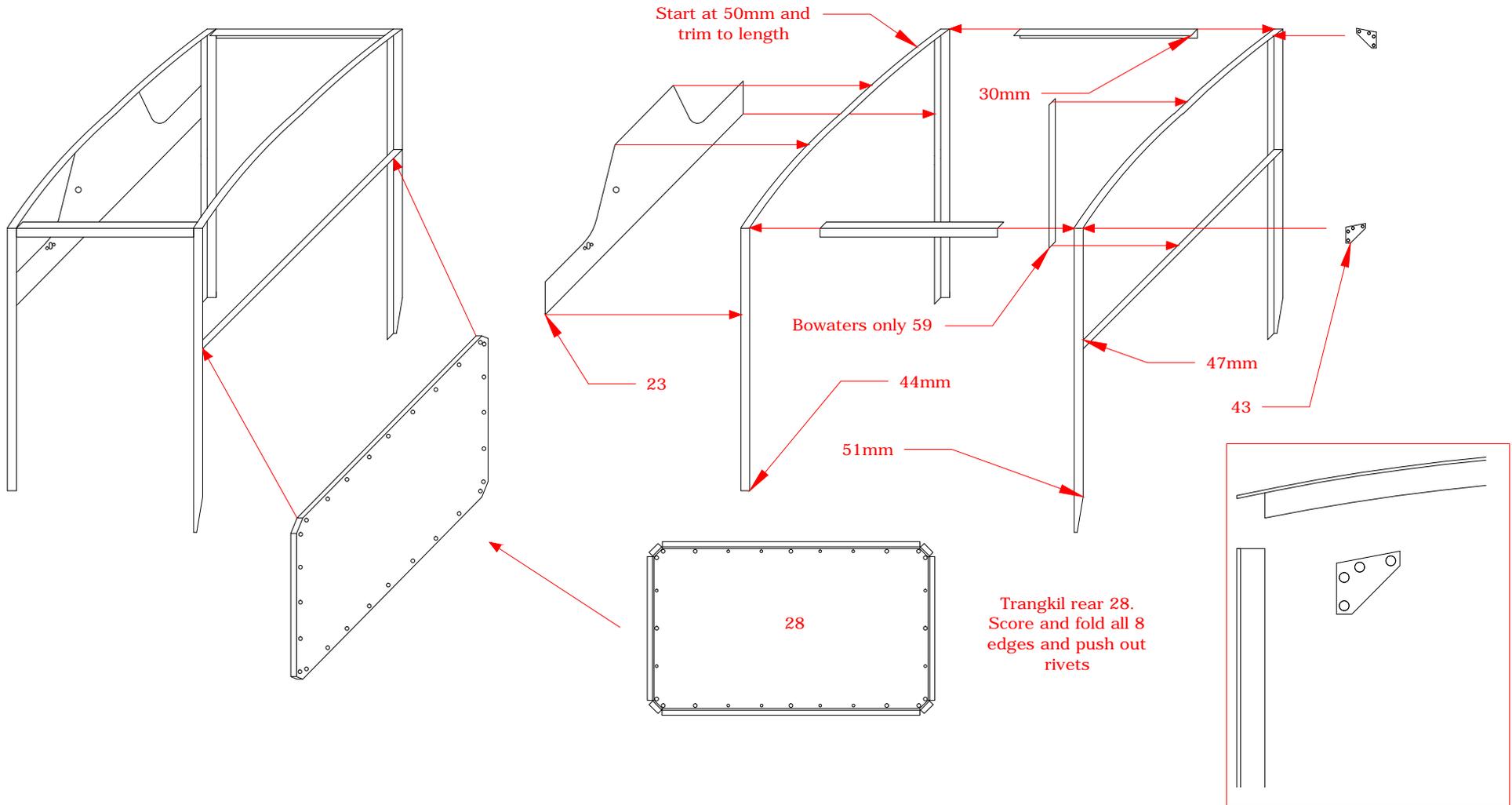




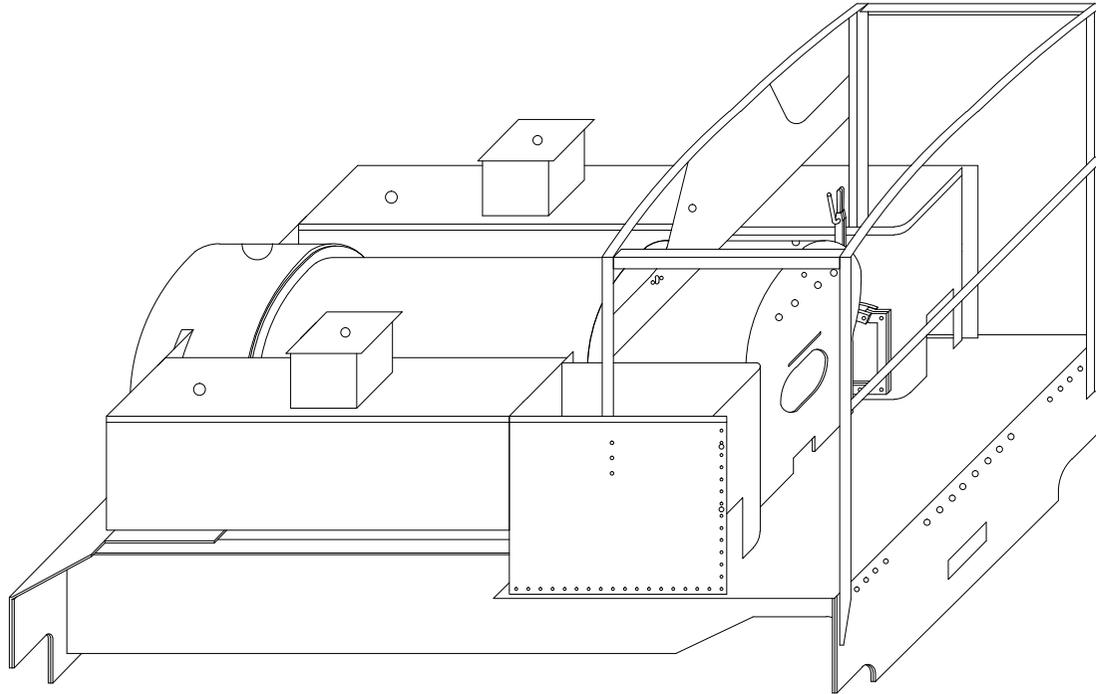
# Side rod fitting and valve gear - Hackworth

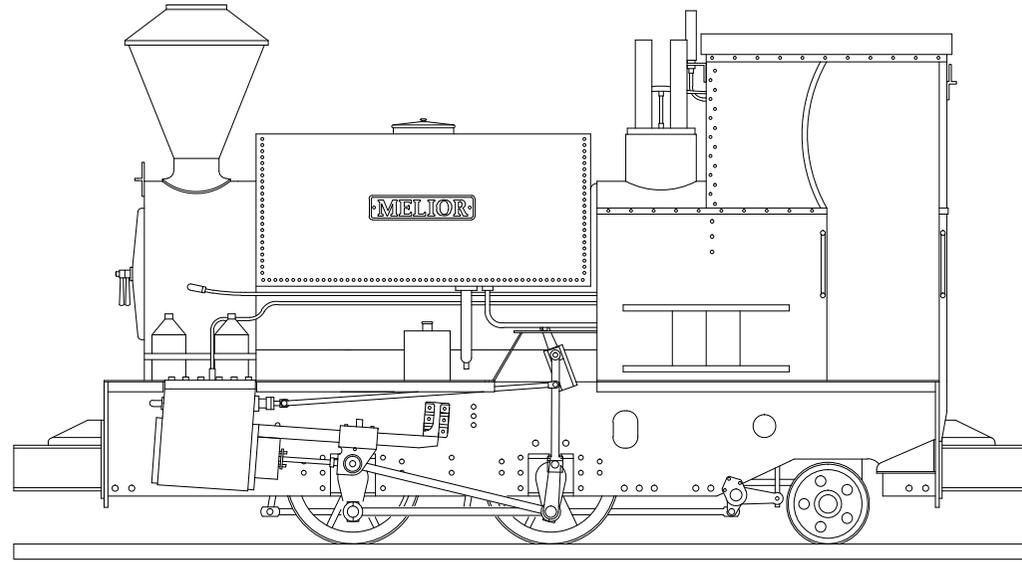
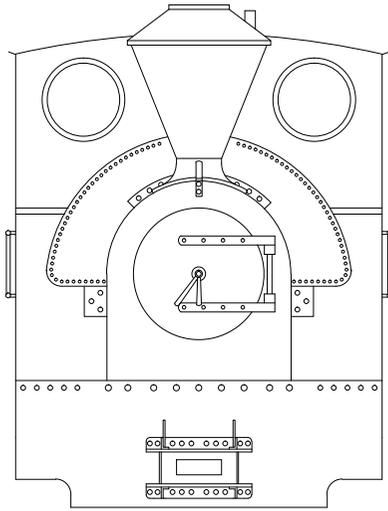


# Tropical cab assembly

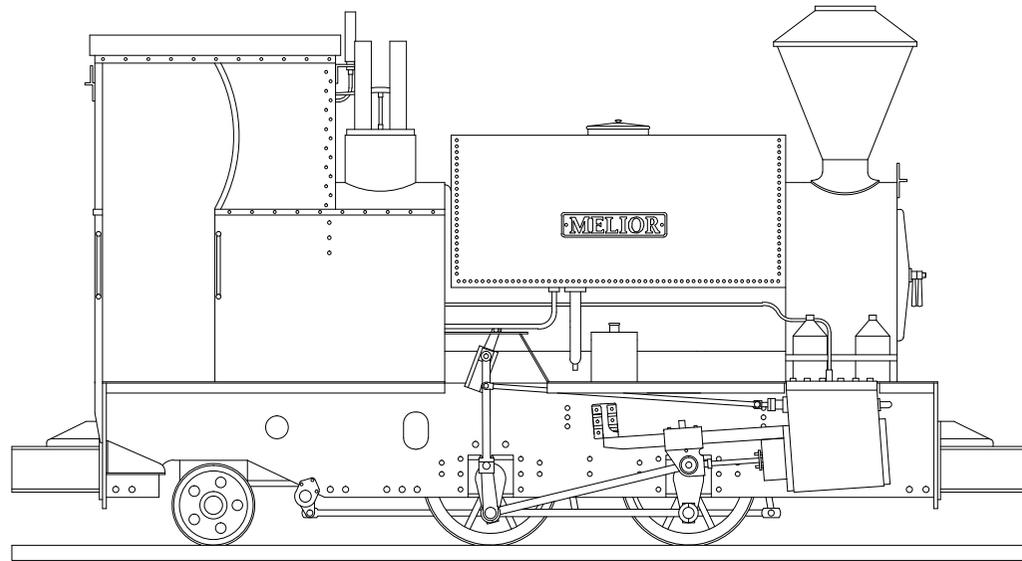
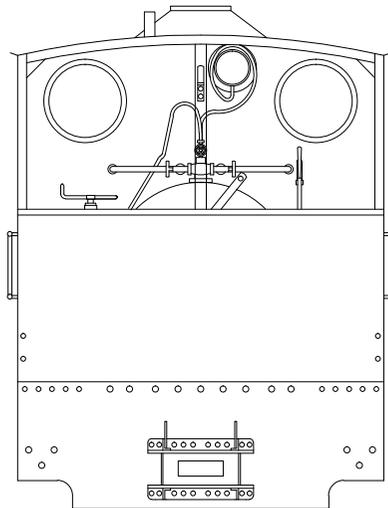


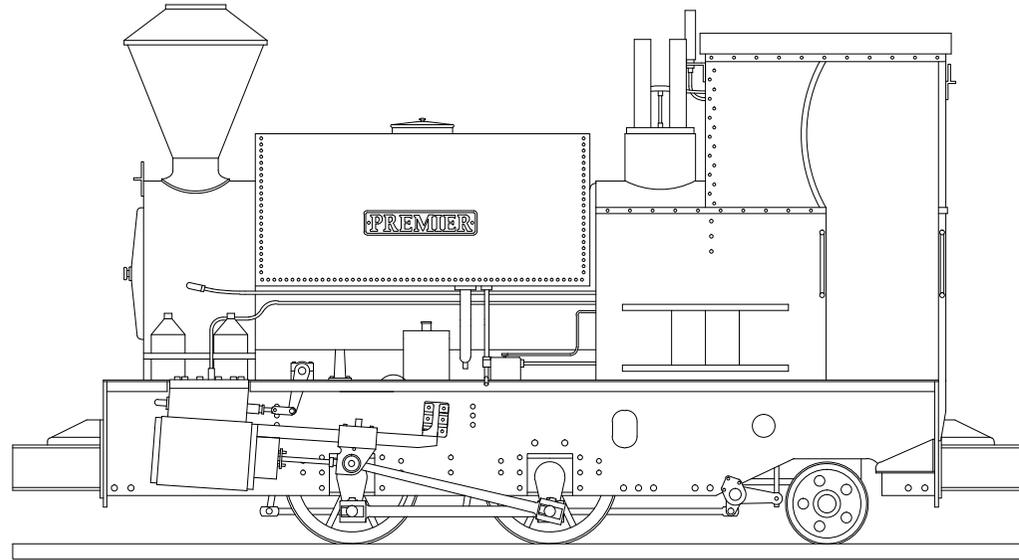
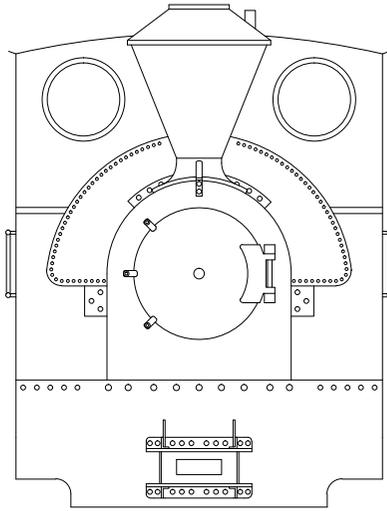
# Tropical cab fitted to a Tamar



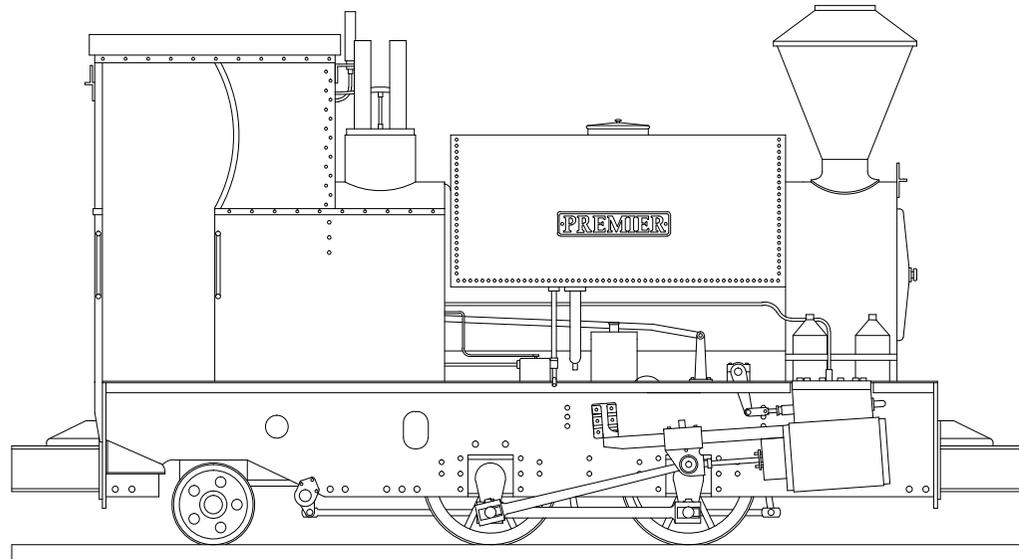
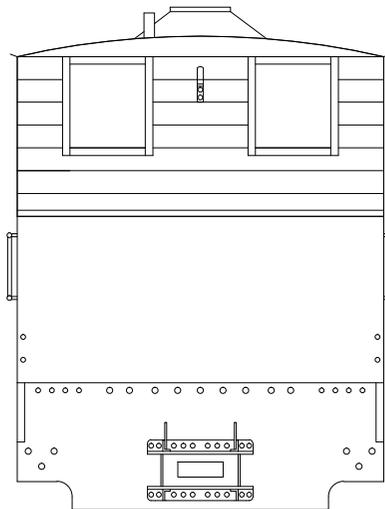


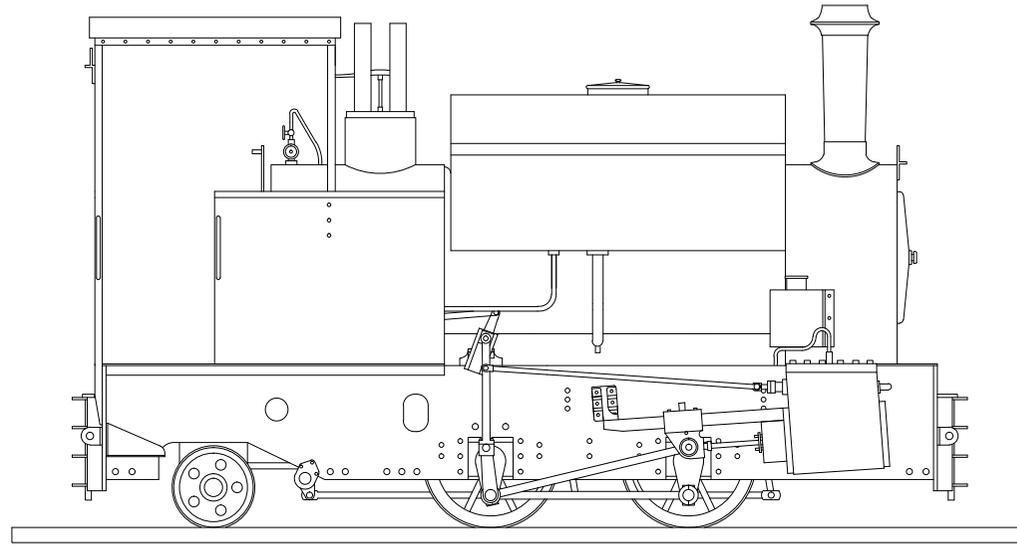
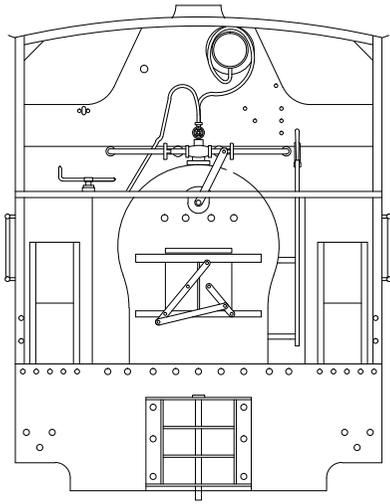
## Bowaters - Melior



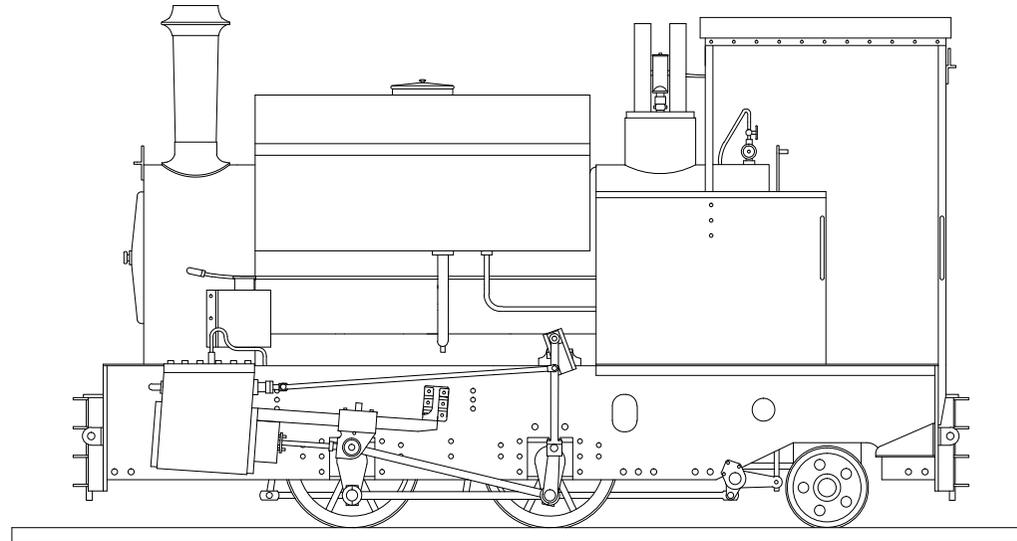
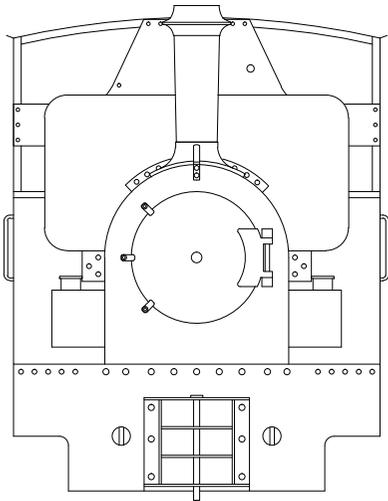


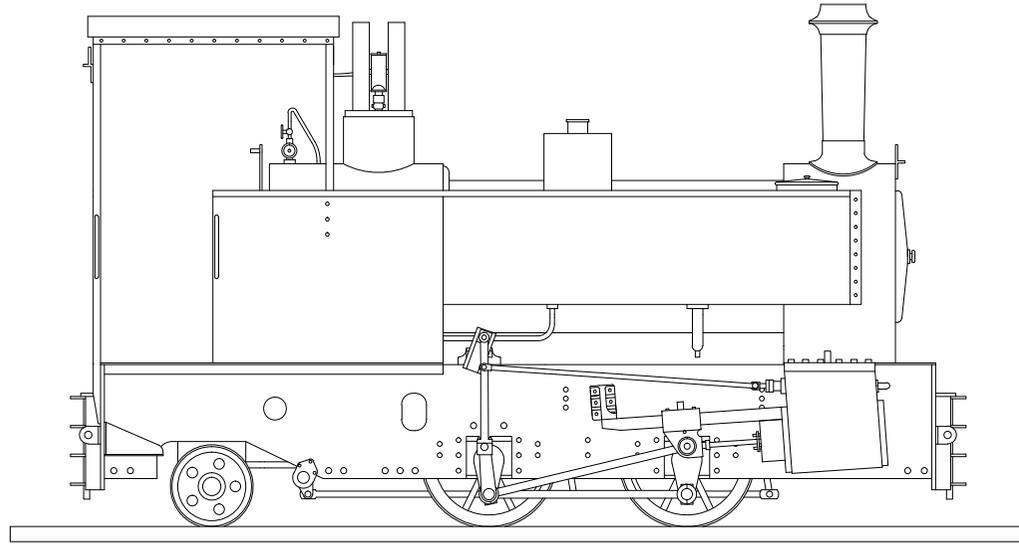
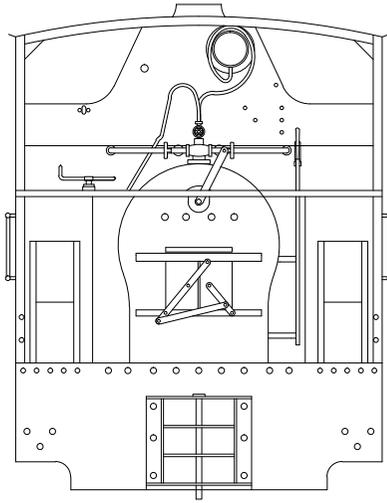
**Bowaters - Premier / Leader / Excelsior**



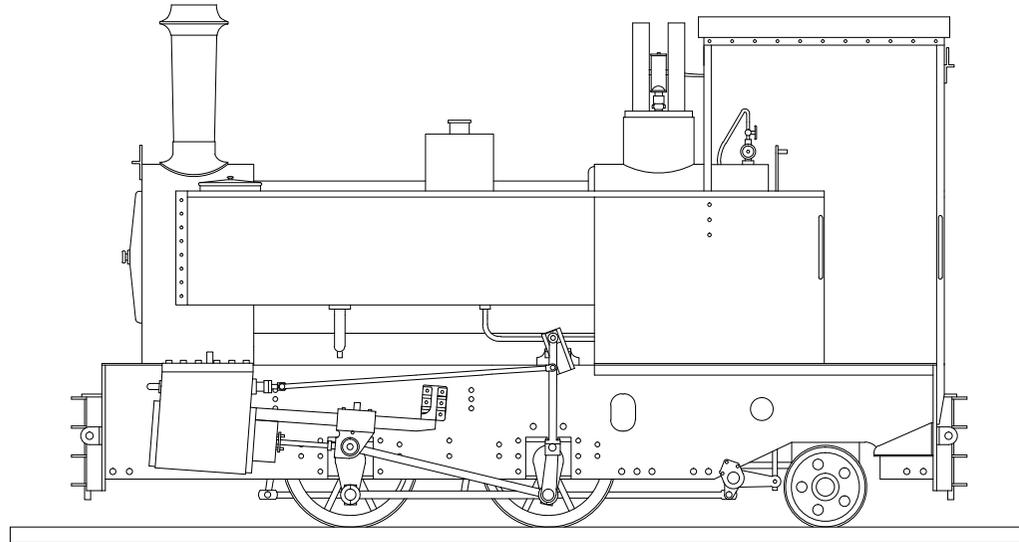
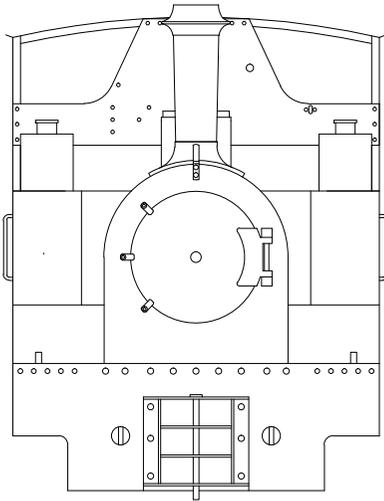


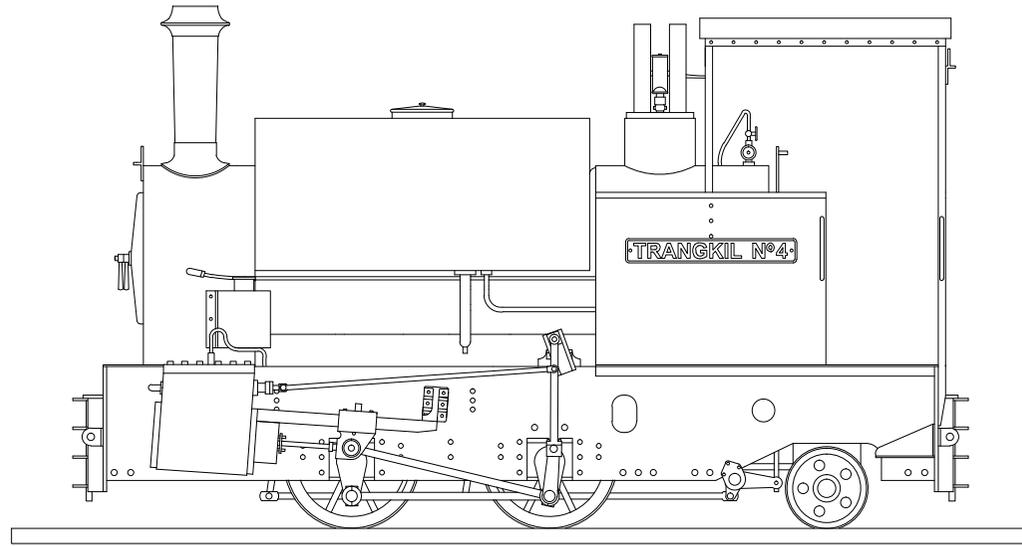
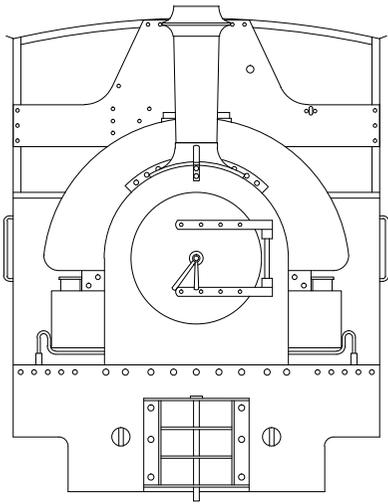
**Brazil - square tank shown with  
Trangkil type couplings**



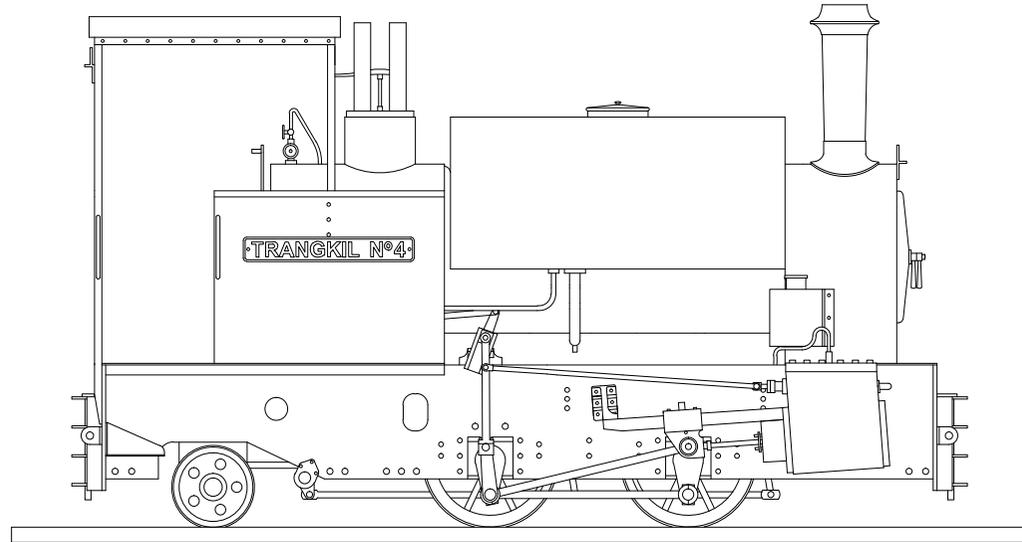
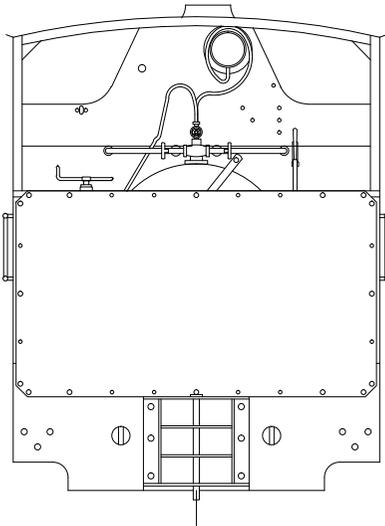


Tamar - generic shown with  
Trangkil type couplings





## Hunslet - Trangkil No4



## **Kerr Stuart Brazil class 0-4-2ST**

The Brazil was produced from the early 1900s, originally with a square saddle tank, for gauges from 2ft up to standard gauge, although those above 3ft would have had their wheels outside the frames. The standard model was designed for export and had a tropical cab, meaning it was just a roof on supports, but British versions had a more normal cab with sides and a proper front sheet.

The most well known examples are;

- Premier 886/1905, Leader 926/1905 and Excelsior 1049/1908 bought by Bowaters for their 2'6" Sittingbourne to Risham Dock line. All had a British style enclosed cab, although the upper rear was wooden and usually removed in good weather. They also had sliding wood and glass side shutters to keep the weather out when it was particularly bad. All had Stephenson's valve gear with conventional flat steel rods, the valve gear being inside and operating the outside valves by transfer shafts and drop links. As a running plate was not standard on smaller Kerr Stuarts, one was added from a light gauge metal on supporting brackets.

- Melior 4219/1924, also Bowaters. Melior had the same cab arrangement as the other three but had Hackworth valve gear. This uses a vertical slide to achieve the valve movement and was entirely external. The rods are bar section, as they seem to be on all Hackworth fitted locos. The added running plate had to be different to the other locos as it had to clear the valve slide mechanism.

- The square tank fitted loco was shown in the catalogue as the standard export version. Photos have recently surfaced of examples of this type in Antigua. It has a cab frame made from angle with a rudimentary front sheet, more to mount fittings on than to offer any protection. The Antigua square tanks had an extra strip along the length of the tank, possibly replacement tanks made in two parts with a joining strip.

- The Tamar variant is basically a standard export version with side tanks instead of a saddle, everything else seems to be much the same.

- Trangkil No4 was built by Hunslet, 3902/1971, to the original Kerr Stuart export design. The main differences are fewer rivets and more welding. It originally had an open frame cab but a lower rear sheet was added when it was restored at Statfold Barn.

The sand boxes of the various types are all different, Bowaters using footplate mounted cast ones, Trangkil had smokebox mounted cast ones on brackets, the Tamar had possibly fabricated ones on top of the tanks and the standard export version had none at all! It is possible that there were options available

and they were left off in the catalogue picture, but the Antigua examples don't seem to have any either.

The kit will build any of the above and any others that fit into the above styles, to any gauge 2' to 2'6". It will not build wider gauge versions straight from the box, but would not take too much effort to do so. Despite the 9' wheelbase, it will go round surprisingly tight curves and this can be improved by widening the slot in the pony truck.

You need to decide in advance what type you want to build as there are a lot of variations. Some parts are marked as one type or loco only and some parts changed over the years. Photographic research is essential to get it right.

### **Main variations**

|               | <b>Tank</b> | <b>Cab</b> | <b>Valve gear</b> |
|---------------|-------------|------------|-------------------|
| Prem/Lead/Exc | Round       | British    | Stephensons       |
| Melior        | Round       | British    | Hackworth         |
| Trangkil No4  | Round       | Tropical   | Hackworth         |
| Original      | Square      | Tropical   | Hackworth         |
| Tamar         | Side        | Tropical   | Hackworth         |

I have seen pictures of Bowaters locos with three different tanks, the early ones had square bottom corners and some replacements were all welded (no rivets). Early Bowaters locos had dumb buffers with chain couplings underneath, later replaced by the huge external coupling boxes and chopper couplings.

There was a Brazil at Lochaber Aluminium works, Fort William, 3024/1916. It seems to be mainly Premier with Stephenson's valve gear but Hackworth side rods. It also has Trangkil sandboxes fitted front and rear.

Another, 2139, used to be at T.W.Ward Ltd, Titan Works, Grays, Essex. This was a standard export version with a Bowaters tank, Trangkil's sandboxes and a definitely homemade cab. I think it was to 3' gauge and had its wheels outside the frames.

### **The kit**

The way this kit is supplied is a bit unorthodox as several different etches have to go together to make each type. The parts are;

**Basic kit** – a complete chassis with both types of valve gear, although only one type can be made from each kit. Body parts for the boiler, round saddle tank, rear footplate, bunkers, roof and most varieties of buffer beam.

**Bowaters add on** – includes the rest of the British cab, name and number plates, coupling boxes, Melior front buffer beam, two types of mid footplate, front footplate and sandbox parts.

**Trangkil add on** – includes tropical cab front and Statfold rear lower panel, sandboxes, name and number plates.

**Square tank** – just the square tank as a direct replacement for the round including Antigua side strips.

**Tamar add on** – includes the tanks, brackets and sandboxes.

Buyers will have specified on purchase which loco they want to build and only the relevant etches will be included. There is also a slight variation in the castings and fittings which will be supplied accordingly.

The instructions are general for most parts, but there are sections marked for certain types only. These can be skipped if not applicable to your particular choice.

## **Instructions**

### **Rear footplate**

Push out the rivets in the rear buffer beam 48 or 49 to suit your loco and solder the two layers together. Fold the left over brackets 101 from the chassis etch to 90° and solder a 12BA nut to the top. Fit them in the recesses in the buffer beam with the nut uppermost. Attach this assembly to the chassis with 2 screws. It should be hard up against the back of the frames, elongate the holes in the frame brackets if necessary. Push out the rivets in the cab steps 64, fold to shape and solder behind the buffer beam with the step 11.5mm from the top edge and not quite flush with the ends. Note that they are handed, check the sketches.

Solder a 10BA nut over the hole in the footplate 1, the number should be facing upwards. Turn it over and solder the valances 2 into the slots each side, flush at the front. Try for fit on the chassis and secure with a screw, the footplate should sit on the buffer beam without overhanging. Elongate the hole in the chassis if needed until it sits correctly then solder to the buffer beam at the sides only. Remove the assembly and solder right across.

### **Bunkers**

There are choices here depending on your prototype. Find parts 17 x 2, 18 x 2, 19 x 2, 45 x 2, 24 x 2, 25 x 2, 26 x 2 & 46 x 2 then carry on reading. Some, but not all Brazils had the L/H injector in the bunker. The Bowaters locos all did but not as originally produced by Kerr Stuart. You will need to drill a 1.5mm hole in the bunker front about 4mm up from the footplate and 4mm in from the bunker side. There will also have to be a smaller hole, about 0.8mm, in the footplate for the overflow pipe. Drill this hole when you fit the injector to get it in the right place.

**Bowaters** – There is a half etched area on the back of the L/H cab side 17. If you want the side shutter open, cut out this area with a sharp knife and solder the open shutter 45 over it, otherwise use the closed shutter. The strips at the top of the bunkers should be the riveted ones 18 & 25.

**Tropical** – Same as Bowaters but do not use the side shutter 45.

**Trangkil** – Same as Tropical but use the plain strips 19 & 26 and only push out the vertical row of three rivets at the top of the sides.

**Tamar** – Same as Tropical except that the front outer corner of the bunker is square and no top strip is required where the tank joins the bunker. Mark a line inside the bunker 30mm from the cab opening and score this several times with a pointed item until a line starts to show on the outside. Fold to 90° and assemble as per general instructions.

**All except Tamar** - Push out the rivets on the cab sides, mark a line 29mm from the cab opening and curve the side around a 2mm rod starting at this line. The side needs to be 31mm long including the 90° curved corner. When you have achieved this, position it on the footplate with about 0.5mm of footplate showing at the side and front and solder in place. Repeat with the other side.

Shape the bunker 24 similarly with a line marked at 27mm from the front for the curved corner, the one with a pattern of 5 holes goes on the right. Add the bunker doors 46, either way up for open or closed, and the strip 25 or 26 around the top edge.

Assemble the reverser from the parts in the small fret 62 by following the drawing. The best way is to lay one of the frame parts on a board and drill 0.5mm through all 5 holes. Put a 5mm length of wire in each hole, add the second frame and solder together. Remove from the board, add the curved top to each side and put back in the holes, drill through the other end of the curved top and fit another piece of wire and solder again. Remove the levers still joined as a pair and fold double. Splay the bottom ends to clear the frame, fit in place with another piece of wire and solder. Trim all the wires on the L/H side almost flush but leave the ones on the right as they plug into the holes in the bunker. You can fit it now or leave it until after painting if you wish.

## **Front footplate**

**Bowaters** – Select your particular front buffer beam 50 or 67, push out the rivets and solder together. Fit to the front of the frames lining up the etched slots and keeping the top flush with the frames, solder in place. The front footplate 5 has two sections around the cylinders that need removing if modelling Melior, otherwise leave them in place. Solder the valances 6 into the etched slots along the outer edges. Try it for fit with the front edge flush

with the buffer beam front. Having a chassis with cylinders fitted is helpful as they need to be central in the cut outs, which you can trim to get a better fit if required. Solder to the buffer beam and folded over top strips of the frames.

**All others** – Push out the rivets on buffer beam 7 and fold the top section over. Solder the two parts together and try for fit on the frames, lining up the etched lines on the back. Solder in place if all is OK. The smokebox support plate 68 sits on top of the frames butted up against the buffer beam. Check that it is the right way round and central, then solder in place.

## **Boiler**

Locate parts 33 – 42 and the left over parts of 62. Clean off all the tags and curve the smokebox wrapper 40 around a bar or tube until it fits the curve of 33 & 34. An easy way to assemble parts like this is to drill a hole in your work board put a piece of wire in it to act as a stop peg. Place the front 33, wording upwards, with the straight side against it. Put the curved wrapper in place and push gently against the peg while holding the sides in place. Solder around the inside where it touches. You can move the assembly to other positions to hold the sides in place while you solder them. Turn it over and repeat with 34.

Assemble the firebox wrapper 42, front 36 and rear 38 in the same way. Don't bother cleaning up too much as there is more to come.

Roll the boiler 53 with the pegs at the ends until the seam can be soldered easily. Make a good job of this as you can't get to it later. Gently fit 37 over the pegs at one end then push the pegs into the slots in the firebox front. Make sure everything is sitting flat and solder in place. Repeat with 35 and the smokebox. Solder a 10BA nut over the hole in the smokebox base 41 and try it for fit in the smoke box, a little filing will be required. Make sure it is recessed by at least 1mm and solder all round. Now you can clean up all the joints. Fill the rear two thirds of the boiler with lead but do not put any in the firebox as this space is needed for the motor. Do not put any forward of this as the balance will be affected. You can add more under the cab floor or in the bunkers if you want more.

Clear the holes in the front footplate and frame spacer if they don't line up too well and try the boiler for fit. If the boiler doesn't sit too squarely, the easiest solution is to rub the base on wet and dry until it does. When happy with the fit, secure the front with a screw, line up the boiler centrally and solder where the firebox touches the footplate while everything is still screwed down. On removal you should have a cab/boiler assembly that fits and goes back in the same place every time.

Finally, push out the rivets in the firebox rear 39, drill through the top hole into your board and solder in a length of 0.7mm wire. Remove and solder 1mm wire into the other four holes, filing the back flush and the front to leave 0.5mm or so. Score the lines on the fire door 62 and fold double. Plug the wire at the back into the hole in your board and solder the fire door centrally

over the fire hole with the small holes at the bottom. Drill through all four holes in the door 0.5mm and fit short lengths of wire. Fit the levers according to the sketch and solder all joints. The regulator glands 62 go on the wire at the top, half etched one last, and the regulator lever, also 62, goes on last. The shelf 61 fits in the slot, etched side upwards. File the wires at the back flush except the one for the regulator.

This assembly can be left off until after painting and locates on the regulator wire protruding from the back.

## **Saddle tank**

All types assemble in the same way. Locate the parts for your model; Bowaters early 54, x2 & 56; Bowaters late & Trangkil 55 x2 & 56; Square tank 71, 72 & 73.

The technique is much like the smokebox and firebox, pre-shape the wrapper and assemble with the end flat and the wrapper standing on end. Start the corners of the round saddle about 8mm from the edge and roll around a 3mm rod. For the square tank do the first curve 28mm from the edge and the second 8mm also around a 3mm rod. For Trangkil or a late welded Bowaters tank, roll the wrapper inside out so the rivets won't show and don't push out the rivets in the ends. If using the side strips on the square tank, the top edge is 5mm down from the top of the tank.

The tank needs a balance pipe which can be represented by 1.2mm copper wire, with a washer on each end if you wish. The position varies so check photos and drill holes in the relevant position about 2mm from the inner edges of the wrapper. Fit the pipe after the tank is finally fitted. The injector feed pipes also need a hole in the tank to fit into. These also vary in position but are most often around 9mm from the rear of the tank, about 2mm from the inner edge of the wrapper. The injector feed does not need to be glued or soldered, it can just sit there.

The finished tank sits on the boiler and can be secured with glue, before or after painting as you prefer, as can the tank brackets 57 & 58. Alternatively, the brackets can be soldered now. The round tank with rounded bottom corners will need the wrapper trimmed a little as it will foul the boiler. This can be done before or after assembly. About 1mm will need removing each side. It is not a good idea to put weight in the tank as the loco will end up a bit top heavy. There is more than enough room for weight in the boiler.

## **Side tanks**

Fold the tank sides 74 into a long U shape and fit the top 75, with the hole at the front, and the base 76. Add the long strip 77 flush with the top edge and trim off any excess at the rear. Solder the tanks to the bunker fronts flush with the top edge, ensuring that they run horizontally and square to the boiler. Stand the loco vertically and position the brackets 79, after pushing out the

rivets, in place against the smokebox. A small part of the top strip will need filing away to allow the brackets to fit. Solder to the tank and smokebox after checking that the tanks are still parallel with the boiler. Trim off any excess bracket above the tank top. Curve the strip 80 and add that to the smoke box next to the bracket and clean up all round.

## **Couplings**

Now is as good a time as any to consider how to fit your couplings. The slots in the buffer beams will take Kadees at the correct height if this is your choice. Other types of coupling can be fitted by making a blanking plate to go over the slots and cutting your own holes to suit.

Bowaters builders can use the extended draught boxes covered below, which will take Kadees by removing the bottom strip. For early Bowaters I have dumb buffers available which will need some kind of chain coupling underneath, a 4mm scale three link and hooks will work well. Whatever you use, the rear at least will have to have some side movement as this is a long loco and the rear end goes considerably off centre on curves.

The Bowaters draught boxes 52 look complicated but are quite easy to put together. Describing assembly would be very longwinded so just refer to the sketches which explain it all. The finished box has two flaps on the back which plug into the slot in the buffer beam, keeping it central and setting the height. They can be soldered or glued in place as you choose.

## **Mid footplate**

The mid footplate is only used on Bowaters locos in two versions and is not part of the original Kerr Stuart design. The fit doesn't have to be good as the real thing doesn't fit very well either. It has to be attached to the chassis as part of the valve gear goes through it.

Premier/Leader/Excelsior – Solder valance 9 in the etched slot under footplate 8 with the end flush at the rear. Solder valance 10 into the end slot so that it touches valance 9, solder the two valances together and trim off excess at both ends of 10. Try for fit between the two footplates already fitted and trim the rear end if necessary. You will need to remove a little of the short valance so that it sits down flat. Solder in place with the inside edge flush with the inside of the frames, the outside edges should not line up.

Melior – There are two half etched slots in the front of the bunker. Locate these and open them up with a sharp knife tip. Solder valance 12 into the etched slot under the footplate 11 with the rear end starting at the etched cut out. It will overhang the other end and needs trimming flush. Solder valance 13 into the other slot and trim off the excess. Try for fit up against the front footplate, you will need to trim off a little of the short valance so that it sits down flat, do not solder yet.

Solder the long end of the supports 16 into the slots under cover 14 so that the tip of the angle is at the end of the slot, make sure they are vertical. Push out the rivets in cover 15 and fit to the short ends of supports 16. Test fit this assembly in the slots in the footplate and bunker front. It should sit level and be square with the footplate. Note that these assemblies are handed, the larger overhang of the covers should be on the inside.

If things don't line up, it is probably because the bunker slots came out in the wrong place due to incorrect bunker forming. The cure for this is to cut off the support ends that should plug into the bunker, and solder the cover directly to the bunker.

## **Sandboxes**

The Bowaters 30 and Trangkil 69 sandboxes are much the same, just fold to shape and solder the edges generously. Round off all corners and edges as these are supposed to look like castings. The Bowaters ones fit on the footplate, see drawing for position, flush with the rear edge. For Trangkil, push out the rivets in the mounting bracket 70 and fold to shape. Solder to the front of each sandbox, bearing in mind that the filler hole is offset towards the outside. See the drawing for exact position on the loco and solder in place.

Tamar sandboxes 78 have separate lids which should be soldered on centrally. Do not round off the corners as these boxes were not castings. Position according to the drawing and solder in place.

## **Upper cab**

**Tropical** - The cab structure is formed from 1.5mm brass angle. Locate the printed template and cover the lines with double sided tape. Cut four lengths of angle for the uprights, file a slope as shown on the bottom outer edge of the rear pair only and stick them on the template. Cut two more lengths 4mm too long for the top sections, lay them flat on a board and gently form them into a curve with just finger pressure. When they match the template, trim the length to fit and file a notch at each end so that they fit on top of the uprights and lay flat. Cut another piece to go across the back in the mid position and lay in place.

Solder all the joints ensuring that the parts are lying flat as you do. If building Trangkil with the rear sheet 28, push out the rivets, score the etched lines and fold to shape. Fit in place and secure with a couple of dabs of solder. Remove from the template by carefully peeling the template off of the metal. Solder the rear sheet properly from the back. Gusset plates 43 are included (in the fire door hole of parts 38 & 39) for the top corners of the rear frame but not all locos had them. Fit them if you wish.

Lay the assembled front frame face up, push out the rivets in the front 23 and lay in place. Adjust until it is square and solder in place. Mark a line across the rear buffer beam 7mm down from the footplate top and stand the body

vertical. Lay the frame in place touching the line and equidistant from the sides and solder to the buffer beam. Check that it stands vertical from all directions. Position the front frame inside the bunkers in line with the three rivets each side. It has to be vertical from all directions and the same height as the rear frame. Tack solder in place and check for alignment. Adjust and re-solder as much as necessary to get it right.

Cut two more lengths of angle by measurement to form the sides. Wedge a piece in place with the front end in the corner of the front frame and the rear resting on the rear frame. Solder the front in place and repeat with the other side. Gently adjust the positions of the rear ends until the angle sits horizontal and parallel to the cab floor. Solder in place but be very quick or use a lower melting point solder as the rear corner can easily come apart.

**Bowaters** – Assembly is similar to the tropical above but with no front frame.

Push out the rivets in the cab front 22 and solder the whistle bracket 44 into its recess and the frames 31 over the windows inside and out. Attach the beading 21 to the sides 20 and push out the rivets. Join the corners with the sides butting against the front, lining up the bottom corners as you do. Position on top of the bunkers with the front about 1mm in front of the three rivets and solder in place.

Make up and fit the rear frame as above in the tropical section. Gusset plates 43 are included for the top frame corners but can only be used if the upper rear is not being fitted; see below, the choice is yours. The heights of the cab front and rear frame should be the same, if not, adjust the position of the rear frame until they are. Cut two lengths of angle as in the tropical for the sides and solder along the top of the cab sides. Adjust the position at the rear to get them parallel with the footplate and solder to the rear frame, but be very quick or use a lower melting point solder as the rear corner can easily come apart.

Push out the rivets on the cab lower rear 27 and solder in place in the angles of the rear frame. Fit the vertical strip 59 centrally from inside the cab. Fit the window frames 32 to the upper rear 29 and try for fit in the upper part of the frame. Ease the corners and top curved edge with files until it is a tight fit. It can be left removable or fitted permanently as you wish.

Bunker covers 83 are included if you wish to use them. They were home made and used as somewhere for the crew to put sandwiches and newspapers. The cab doors 82, only used by Bowaters, can be attached by bending the tags to around 120° and soldering or gluing to the cab rear, or left off if you don't want them.

### **Roof and odd bits**

Gently curve the roof 47 to match the top of the frames and/or cab front, fold about 1.5mm each side up about 20° and make sure that it fits all round. It can be soldered or glued permanently or fitted with wire clips and made

removable, see sketches. Fold the footplate supports 66 to 90° and fit to the frames just behind the end of the fold over top strip with the rivet plate pointing forwards.

The mid steps 65 are not present on all locos. Bowaters had them at first but they proved a bit fragile and were later removed. Refer to photos and fit them if you wish. Oil can castings are included with the Bowaters kit and are retained by the straps 60. Bend the straps to shape by reference to the drawing and photos but leave the cans off until after painting.

## **Sandboxes**

These vary according to prototype. The Bowaters and tropical ones fold to shape as per the sketch. Use plenty of solder and file all the edges and corners round to represent a casting. The Bowaters ones 30 sit on the mid footplate, see drawing, Trangkils 69 need the bracket 70 folded to shape and soldered to the front face, flush at the side touching the smokebox. Solder in place with reference to the drawing for position. The Tamar boxes 78 have separate lids (not numbered) and need to be left square in shape. Fit to the tank tops as indicated. The fillers are the same for all and can be fitted when you like.

## **Smokebox door**

Although the door is the same on all, there are three different hinges 63 and two locking methods, consult pictures to ascertain which ones you need. The two parts of the hinge are laid on top of each other trapping a piece of 0.5mm wire in the grooves and soldered together. Bend the hinge straps so that when laid on the door the hinge will lay flat on the smokebox front. Glue the door in place ensuring that it is central. If using the central levers, drill out the central hole to suit and fit, the inner lever should be straight down. If your loco uses dogs, drill the centre hole to 0.6mm and reduce a pin in a minidrill to a knob shape. Fit this in the central hole. The dogs can be represented by short pieces of 0.5mm wire. Drill the holes in the relevant positions, solder in place and bend over the door. They can be improved with tiny nuts if you wish or even left off if you consider them too fiddly.

## **Castings**

The bulk of the castings can be fitted in any order. Cut them off the sprue with cutters or a slitting disc and clean them up with files and wet and dry paper. A rotary wire brush in a mini drill can be used to remove surface debris and put a shine on the brass bits that need it. The chimney is best soldered but all the others can be glued. Make sure that they all sit squarely before fitting and take remedial action with files if they don't. Have a good look at the sketches to see how they all fit and drill out any holes indicated before fitting.

**Whistle** – The one with the pipe coming out the side is for the tropical version which mounts in the hole on the top of the dome, L/H side. The whistle with the pipe underneath is for Bowaters and mounts in the whistle bracket. The pipe either curves to the left and through the hole, to end up behind the steam fountain, or it goes in the spare hole on the top of the dome, check photos and decide which you want.

**Steam fountain** – The hole for the fountain needs re-drilling about 1.5mm nearer the back of the firebox as the casting for the fountain is probably a bit chunkier than the original. Drill out the ends as shown in the sketch and fit copper wire into the holes. Bend the wires so that the fountain can be fitted after painting with all the wires in the right place. The pressure gauge is joined to the fountain with 0.5mm copper wire and will need a spot of superglue on final assembly to stick it to the cab front. Fit hand wheels to the five valve spindles on the fountain, the larger two on the rear valves and double check that it all still fits.

The cylinder covers have a recess around three sides, the non recessed side goes nearest the centre of the loco. If you want lubricator pipes, drill out the hole in the centre peg and fit 0.5mm copper wire.

Drill four holes in the backhead to take the gauge glasses. The gauge glasses need four holes each drilled to take brass wire for the handles and copper for the drain pipe. They can be glued or soldered in place as you wish.

The injectors have given me problems as Kerr Stuart only fitted one, on the R/H side but with the pipe to the clack valve going round to the left. A second injector was fitted to Bowaters locos in the L/H bunker, which I think is identical to the one on the right. The various pipes and levers for both can be traced, all except the clack valve and pipe for the L/H one. It is not visible in side views of the boiler, it is not on the boiler backhead and it won't be under the saddle tank, in the smokebox or on the outside of the firebox. The only remaining possibility is the front of the firebox, below the boiler but above the ashpan.

I have supplied two identical injectors, one goes on the right with its mounting plate soldered to the back of the frame. See the sketches for where to run the pipes and positioning the clack valve. For the Bowaters L/H injector, make the pipe holes required in the bunker, cut the mounting bracket down and solder or glue to the bunker floor. A clack valve is supplied for this injector and I would be interested to find out where it goes if anyone knows.

## Parts list

Abbreviations: - P – Premier, L – Leader, M – Melior, E – Excelsior, T – Trangkil No4 (and other tropical versions). If unmarked, parts fit all types. L/R means there is a handed pair, check sketches for which is which.

|    |   |    |   |
|----|---|----|---|
| 1  | Footplate rear                          | 42 | Firebox wrapper   |
| 2  | Footplate rear valence x2               | 43 | Cab rear gusset plates L/R (in parts 38 & 39)                 |
| 3  | -                                       | 44 | Whistle bracket   |
| 4  | -                                       | 45 | Cab side sliding door x2 (1 open, 1 closed, between parts 17) |
| 5  | Footplate front (Bowaters)              | 46 | Bunker doors x2   |
| 6  | Footplate front valence x2 (M)          | 47 | Cab roof  |
| 7  | Footplate front (T)                     | 48 | Buffer beam pair - (L/E rear)                                 |
| 8  | Footplate sides L/R (P/L/E)             | 49 | Buffer beam pair - (P/M/T rear)                               |
| 9  | Footplate side long valence x2 (P/L/E)  | 50 | Buffer beam pair - (L/P/E front)                              |
| 10 | Footplate side short valence x2 (P/L/E) | 51 | -   |
| 11 | Footplate sides L/R (M)                 | 52 | Bowaters draught box (small etch of 13 parts) x2              |
| 12 | Footplate side long valence x2 (M)      | 53 | Boiler  |
| 13 | Footplate side short valence x2 (M)     | 54 | Saddle tank ends early x2                                     |
| 14 | Hackworth top cover L/R (M)             | 55 | Saddle tank ends late x2                                      |
| 15 | Hackworth front cover L/R (M)           | 56 | Saddle tank wrapper   |
| 16 | Cover supports x4 (M)                   | 57 | Saddle tank front bracket (2 parts)                           |
| 17 | Cab lower sides L/R                     | 58 | Saddle tank rear brackets x2                                  |
| 18 | Cab side strips riveted (P/L/E/M)       | 59 | Cab rear vertical strip (P/L/E/M)                             |
| 19 | Cab side strips plain (T)               | 60 | Oil can straps x2 (P/L/E/M)                                   |
| 20 | Cab side upper L/R (P/L/E/M)            | 61 | Firebox shelf   |
| 21 | Cab side beading x2 (P/L/E/M)           | 62 | Reverser, regulator, firebox door (small etch of 13 parts)    |
| 22 | Cab front (P/L/E/M)                     | 63 | Smokebox door hinge (3 types)                                 |
| 23 | Cab front (T)                           | 64 | Cab steps L/R   |
| 24 | Bunker x2                               | 65 | Mid steps x2 (P/L/E early)                                    |
| 25 | Bunker rivet strip x2 (P/L/E/M)         | 66 | Footplate supports L/R  |
| 26 | Bunker plain strip x2 (T)               | 67 | Buffer beam pair - (M front)                                  |
| 27 | Cab rear (P/L/E/M)                      | 68 | Smokebox support plate (T)                                    |
| 28 | Cab rear (T)                            | 69 | Sand box L/R (T)  |
| 29 | Cab rear upper wooden (P/L/E/M)         | 70 | Sand box bracket x2 (T)                                       |
| 30 | Sandboxes x2 (P/L/E/M)                  | 71 | Square tank ends x2   |
| 31 | Round spectacles x4                     | 72 | Square tank wrapper   |
| 32 | Wooden frames x2                        | 73 | Side trim x2  |
| 33 | Smokebox front                          | 74 | Tamar tank sides x2   |
| 34 | Smokebox rear (larger)                  | 75 | Tamar tank tops x2  |
| 35 | Smokebox rear (smaller)                 | 76 | Tamar tank bottoms x2   |
| 36 | Firebox front (larger)                  | 77 | Tank top beading x2 (long strips)                             |
| 37 | Firebox front (smaller)                 | 78 | Sand boxes L/R  |
| 38 | Firebox rear (larger)                   | 79 | Tank front brackets L/R                                       |
| 39 | Firebox rear (smaller)                  | 80 | Rivet strips x2   |
| 40 | Smokebox wrapper                        | 81 | -   |
| 41 | Smokebox base                           | 82 | Cab doors x2 (P/L/E/M)  |
|    |   | 83 | Bunker covers x2  |

Designed and produced by Mark Clark - Locos n Stuff

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## **Kerr Stuart Brazil – Chassis instructions**

This chassis is designed to be compensated and everything needed is included in the kit. When built it will be possible to remove cylinders and motion as an assembly, wheels, rods, motor and gearbox as another assembly and all that will need to be dismantled is the brake pull gear.

The fret tags will need removing with files from the parts before assembly, but do not clean up all the edges, it is not necessary and is detrimental to the fit. Only clean up edges that will show after assembly. For parts that are layered, solder together first and clean off the tags afterwards. This is quicker and gives a better finish.

All folds will be with the etched line on the inside and to 90° except where told to fold double. In this case the etched line is on the outside and the parts are folded 180°. With folds involving narrow parts, the etched lines are best scored with the back of a knife tip until a line shows on the other side. The fold will be much easier to do this way.

### **Frames**

Fold over the top strips on the frames 1 & 2 then solder the rivet strips 51 under the top folded strip. Push out the rivets then open out the hole halfway between the axle slots on each frame to 1mm, then solder in a short piece of wire pointing inwards, the opposite way to the top strip. Trim the wire flush on the outside. Fold parts 16 double on the long etched line and bend up the two side tags to a bit less than 180° and fit over the 1mm wire with the tags uppermost and solder in place.

Fit 1/8<sup>th</sup> bearings into the holes in the compensation beams 15, open the centre holes to 1mm and fit over the protruding 1mm wires on the back of the frames. The wires must only just show through the beams and must be filed until they do. The retaining plates 17 should slide into the side tags of 16 and bear against the 1mm wire, allowing the beams to move unhindered. It helps if the plates are bent a little near their bottom edge, to give better access with pliers when fitting/removing. The tails of the bearings should point inwards.

Fold the springs 18 double and solder together. Clean up the edges and fit to the inside face of the frames, with the top of the central bar in the square U etched there, with the tops of the hangers level with the frame top. Fold the wider frame brackets 101 and solder to the inside of the rear frames, centrally in that part of the frames with the bottom edges flush, see sketches. The narrower brackets 101 should have been marked 102 and go on the rear buffer beam when you get to that stage. Push out the rivets in the brake shaft brackets 31 and solder into their recesses in the frames.

Fold spacers 3 & 4 on the lines and similar with 6, which should finish up Z shaped. Solder a 10BA nut over the rear hole in 6. Fold strip 7 until it fits into

the etched line in spacer 5 and solder in place. Solder another 10BA nut over the hole in 5. Check that all spacers fit in their frame slots. Fold bracket 104 and fit into the recess in spacer 3. Solder a 12BA nut over the hole.

Solder 3 to one frame and 6 to the other, put the frames together and solder as one unit. Check on a flat surface that they are reasonably square and adjust if necessary. Spacers 4 & 5 can be sprung into place and soldered. The cut outs in 5 and the folded strip on 4 both point forward.

## **Pony truck**

Study the sketches before assembly, 14mm builders will have to modify some parts first. The loco will easily manage 20" radius and, if the guide slot in the pony truck is extended, will probably go down to 16".

For 16.5mm, fold the body 9 and solder the rear 8 between the sides flush with the ends, the slots in 8 being nearer the top. File a cut out centrally in the top of 8, 7mm wide and 2mm deep for later access to the height adjusting nut. Solder the anchor arms 11 together as a pair and plug into the slots in 9. The guide plate 10 is fitted by dropping mostly into place, engaging the tags in the rear 8 and pushing down onto the legs of the anchor arm. When it all sits square, solder all round with the anchor arm horizontal.

For 14mm, much the same applies except that the rear 8 and guide 10 need shortening back to the etched dotted line. The body 9 needs to be cut in three from the etched solid to dotted lines. The whole thing then assembles as above but without the aid of folds. This is obviously divine punishment for modelling finescale, but fortunately the only one in this kit.

Open out the hole in the anchor arm to take the bushes supplied, trim the length of the bushes so that the arm can be secured but allow some up and down slop and screw in place to spacer 5. Try a 10BA screw through the truck into spacer 6 and check that it does not rub in the truck guide slots, if it does ease the slots with files. Remove the truck and fit a screw through from below with a nut inside and secure with loctite/superglue about half a turn loose. When this has gone off, fit 2mm bearings and the wheels with shims 53 as required, then fit another nut loosely about halfway down the thread and refit the truck, tightening the arm screw but leaving the rear screw loose for now.

## **Setting the ride height**

Assemble the gearbox following High Level's instructions and fixing the pivoting carriage at around 20 - 25° from the vertical. The motor can be left off for now if you wish.

Fit the driving wheels and gearbox to the axles, making sure that they are to your gauge and central. When the final drive gear in the gearbox is secured it will hold the gearbox central. With the chassis upside down, remove the compensation beams, slip over the axle ends and drop the assembly into

place. Re-engage the beams on their pins and refit the retaining plates. Anyone building to a true 2'6" gauge (that would be me) will have to trim back the bearings to gain clearance. Make sure that the driving axles can rock in opposite directions to each other. If they are reluctant to move, open out the bearings very slightly until they do.

Stand the chassis on its wheels and check the angle of the frames relative to the surface they are standing on. To adjust the height, screw in or out the pony truck guide screw until the frames sit level. Run the extra nut on this screw up until it hits the frame spacer and tighten in place. Later, when the chassis is running and you are sure that the ride height is correct, this nut can be locked to the screw as before. The truck can then be removed by removing the arm screw and bushes and unscrewing the guide screw with its nuts prefixed. It will always go back to the same height when refitted.

Lastly is the compensation restrictor 103 which is folded and screwed to the bracket at the front. You needn't fit this until the valve gear is fitted, but without it the valve gear will disengage every time the loco is picked up, intensely annoying. When it is fitted, the bracket will need to be gently bent so that the restrictor holds the axle in its level position. The two prongs can be closed up slightly to restrict the axles more. Only about 0.5mm movement is required up and down.

## **Cylinders**

Cylinders are usually arranged to drop into slots from the top of the frames, but that was never going to work on a Brazil. The solution I came up with is to make them plug into slots in the frames. The tags are then bent over a little to hold them in place. Removal requires the tags to be straightened and the complete cylinder/slidebar/motion bracket/valve gear assembly just unplugs.

The cylinders are the same for all gauges but you must choose between Hackworth and Stephenson's valve gear, the relevant cylinders are on the same half of the etch as their matching valve gear.

**Hackworth** – You will need cylinder fronts 20, cylinder rears 21, back plates 46, wrappers 27 and end covers 24 & 25. Push out the rivets in the back plates, fold the narrow section of the fronts to 90° and plug into their matching back plate, then fit the rears similarly. Ensure that they fit squarely and meet the back plate, adjust with files if required then solder in place.

Fit a 16mm length of 1.5mm tube through the central holes flush at the front. Pre-form the wrappers to fit, note that they are handed, and fit flush with all edges and meeting the top corners. Push out the bolt heads in the front and rear covers and fit with bolts at the 3 and 9 o'clock positions. These assemblies should plug into the frames. Try them for fit but do not bend over the tags.

**Stephenson's** – You will need cylinder fronts 22, cylinder rears 23, back plates 46, wrappers 26, end covers 24 & 25 and valve chests 36. Assembly is the same as for the Hackworth example above plus the valve chests. Fold the ends and sit them on top of the cylinders noting that they are handed and that the top should be level with the frame tops when fitted. Depending on how your cylinder wrappers came out, they may not sit properly and will need minor adjustment with files. The final position is central on the cylinder top and the top edges should be level from all directions. It may help to position these with the cylinders fitted to the frames.

**Both types** – Add the gland covers 38 to the back and front of the cylinders by lining up the holes, you can add short lengths of 0.4mm wire in the small holes if you wish. Open the rear central holes to 0.8mm and the fronts to 1mm. Solder short lengths of 1mm wire into the front holes, trim to 2mm and round off the ends.

Clean up the short lengths of tube supplied. There is 1.7/2.4mm, 2.4/3.0mm and 3.0/4.8mm, all 2mm long. The largest needs reducing to a diamond shape with files and also needs a small flat at one end, see the sketches. Slip one each over the piston rod tube and line the largest up with the flat uppermost. Solder all three in place. Reduce the protruding centre tube to around 1mm and clean up all round.

### **Time for a break**

This is the stage that the chassis needs to be built to before starting the body. You can do this now or plough on with the chassis, although, on the Stephenson version, you will have to stop when you get to the valve slides as the body is required for this.

### **Coupling and connecting rods**

**Hackworth** – Locate the rod ends 39 & 40 and cut them out in twos and threes as arranged on the fret. Fold them as shown and thread onto an oiled tapered broach or sanded down cocktail stick. Solder together and clean up the edges. Identify which end goes where from the sketch and lay them out accordingly. Cut two 22mm and two 23mm lengths of 1.3/0.8mm tube, clean the ends and put the shorter with the coupling rod ends and the longer with the connecting rod ends.

Push two coupling rod ends into the relevant tube, ensuring that they are the right way round and in line with each other. Push a piece of writing paper over the pins of the jig supplied. Try a coupling rod for fit, it should drop on easily but the tube is likely to need shortening slightly with files. When you have a good fit, lightly oil the jig pins and solder the ends to the tube. Repeat with the other rod.

Fold the connecting rod ends 42 & 43 into a square U shape and fit the smaller into the larger. Insert a piece of 0.7mm wire into the pair ending flush with

the inside of the U and solder in place. Assemble this plus a remaining rod end onto a tube and try on the jig for fit. Trim the tube as required, oil the pins and solder together. Repeat with the other rod. Check that the U ends fit around the crossheads and ease with files as required.

**Stephenson's** – The rods 34 & 35 are triple layered with the non etched one in the middle. Form a small zig-zag in the ends of the connecting rod outer layers and solder the layers together, they are not handed at the moment. Gently tease the zig-zag ends until they fit around the crossheads.

**Both types**- The cranks are on a separate etch and come in five layers, four with a square hole and one without. Layer four with a square hole together, line them up and solder. Clean out the square hole until it just fits on an axle end then add the fifth blank layer. Test that it still fits then repeat with the other three cranks.

Countersink the small hole from the rear with a drill held in fingers only and fit a crankpin screw. If you add flux and heat, it will solder in place. Alternatively, you can use loctite or similar. Repeat with the other three. Test fit the cranks making sure that they all go fully on and also squarely. Decide if you need to fit shims 52 behind the cranks to remove side play, almost none is required but if using particularly tight curves, allow some on the rear axle. When you are happy superglue the cranks in place, not forgetting to quarter them, R/H side leads.

Open out the holes in the coupling rods to fit the bushes. The front bushes will need reducing in length by fitting in the rod, turning over and filing almost flush. Test fit one rod with 1mm washers 37 on each crankpin first. If binding is present, ease the holes until the chassis pushes along smoothly, then repeat with the other rod. Fit both and you should have a partly working chassis.

### **Motion bracket, crossheads and slidebars**

The motion bracket parts are in a group numbered 19, push out the rivets in the back plates, fold the L shaped piece after scoring the line and solder together as shown in the sketch. Plug them into the frames and also the cylinders, if they are not there already.

Solder the slidebars 12 together in pairs with both etched areas facing out and at opposite ends. The crosshead tops 13 need to be folded into a box shape after scoring and soldered at the joint. The crosshead bottom parts are soldered face to face with the etched parts facing each other. Plug this into the square holes under the top part and solder here. Drill 0.7mm carefully into the half etched part and fit a 17mm length of 0.7mm NS wire.

Test the fit of the slidebars in the crossheads, they probably won't fit at first. Clean out any excess solder and slightly chamfer the corners of the slidebars. If they are still tight, file or sand the faces or edges as required until they are a

smooth easy fit all along their length. It is a good idea at this point to keep these parts in matched pairs.

Fit the connecting rods to the crossheads with 14BA screws from the inside. Check that the rod has enough swing to operate with almost no side slop and secure the nut with solder or loctite and trim off the excess. Fit a rod loosely to the rear crank, put the slidebar in place, the longer half etched area goes at the front, and push gently along to see if the crosshead binds at all. If all seems OK, tack the slidebar to the motion bracket and retest. If all is still OK, tack the front to the collar around the piston gland. Problems that may occur are the slidebars not being parallel to the frames, following the line of the piston rod or being twisted. These can be adjusted by heating and moving the bar one end at a time until correct. You shouldn't have issues with clearance behind the crosshead, in fact the rod may need a gentle tweak inwards to line up with the rear crank. When full travel is smooth, solder permanently at both ends without moving anything.

Take a lot of time over this as once the valve gear is fitted, the rods become difficult to remove. When all seems OK, lock the final drive gear in place, fit the motor if you haven't already and test under power. Make sure that running at this stage of the build is perfect before proceeding. A good long play session, sorry that should have been test session, is in order. Run it with no oil for a while until it starts to stiffen up then oil and see what it's like. If tight spots persist, try removing the oil and "lubricating" with Brasso for another 30 minutes of testing. Clean off the Brasso, re-oil and see if it has improved. If problems still persist, remove the rods, ease the holes a little and try again. It will come right eventually.

## **Brake gear**

Have a good look at the sketches to familiarise yourself with the various parts and their assembly. Solder the brake shoes 30 over the outline brake shoes on the hangers 29 with a piece of 0.5mm wire to represent the pin. You must end up with two L/H and two R/H. Fit two lengths of 0.5mm wire through the frame holes and brake shoes and solder to the frames. Line the hangers up with the outer face of the wheels and solder so that they don't quite touch the wheels. Fit more 0.5mm wire through the bottom of the hangers with the two pull rods 28 between. Solder to the hangers and leave the pull rods loose for now.

Somehow the master for casting the brake mechanism disappeared, so there is no casting. The simple solution is to make one from a piece of waste etch and 0.6mm wire, see the sketch for details. Thread a length of 1.4mm rod through the brake shaft brackets from the left including, between the frames in this order, the brake mechanism and two levers 32. Solder the shaft to the brackets only, position the mechanism with the wire vertical and in line with the brake standard, then solder this too. Thread a length of 0.5mm wire through the levers and ends of the pull rods with the pull rods outside. Position the pull rods parallel to the frames and about 2mm inboard, but not

close enough to touch the wheels. Solder the pull rods and levers to all three wires and the 1mm rod. Cut out the section of 0.5mm wire between the levers and trim all the wire and rod ends almost flush.

### **Pick ups**

PCB and phosphor bronze wire is included to make pick ups from. My solution was to glue a piece of PCB, suitably gapped into two halves, to the underside of frame spacer 4. I ran PB wire over the front axle and under the rear, then bent it as appropriate to rub on the back of the wheel rims without touching any brake gear in the process. The same can be done with the pony truck with a thinned piece of PCB glued to the front, inside the truck. Drill two holes in the truck top and run wires through these to the front PCB, there is room enough. You can of course invent your own or use plungers if you feel so inclined, split frames might be a bit of a chore though.

### **Valve gear**

**Hackworth** - Solder together the triple layered combination levers 45 and the twin layered fly cranks 49. Clean them up and clear the holes. It will help if the small hole in the fly cranks and the top hole in the levers are a tight fit on the pins supplied, and the others a loose fit. If you like to paint the chassis during the build, now is the last chance to do it.

The moving parts of the valve gear are assembled with needlework pins, the heads of which will need reducing in a mini drill with files. Aim for around 1mm or less across and less than 0.5mm thick. When assembling parts with the pins you have several choices; you can oil the joint, apply graphite paste or use a paper washer. All methods work but I find the graphite paste more reliable generally. Oiling is more suitable for forked joints where graphite is difficult to apply, which doesn't apply to this loco. Use whichever method you are happiest with.

Reduce the heads of four pins in a mini drill to less than 1mm and squarer looking. Do another two to a size that slide comfortably in the slotted square tube. You will need to clean up the slots with files and wet and dry first. Fold the valve rod ends 41 as per the sketch, noting that there are two types, the rear ones marked by arrows on the etch. Fit to a 46mm length of 0.7mm nickel silver wire as shown. The front joint is a dummy, a proper joint here would be impossible to assemble and far too fragile. Slide it up the wire until it is 33mm from the rear joint and solder in place.

Fit the slide pins at the top of the valve lever, with a 1mm washer 39 against the back of the lever, a piece of card can be used as a spacer while soldering. Enough clearance is required for the pin to slide easily without being sloppy. Assemble the valve rod to the lever as shown with the pin from the front using oil, graphite or paper to prevent the whole lot being soldered solid. Do the same with the fly cranks. This part can go horribly wrong so be quick with the

soldering iron and don't be afraid to take it apart and start again if it all goes wrong.

The valve trunnions need to be drilled out to 1mm, test that wire will pass through. Fold the Hackworth backing plates 105 double, solder centrally to the back of the square tubes and drill the hole right through 1mm. The length of the finished slide should be 7mm. Cut a length of 1mm wire 40mm long, clean up all the sides of the slides and fit one on the wire, soldering securely in place. Slide the trunnions on the wire with the smaller ends pointing outwards and fit, but don't solder the other slide. Lay this assembly in place on the frame tops then try the lever assemblies, one at a time, then both together to see if everything fits and moves freely. You may need to make very slight bends in the lever to get it all to line up or shorten the 1mm rod slightly.

If all seems OK, slide the trunnion away from the loose slide and solder the slide in place. Put a spot of superglue under each trunnion to locate it in place. It should be directly above the centre of the wheels. They should be glued onto the folded over top strip of the frames. Tin the ends of the rear crankpin screws, position a fly crank as shown in the sketch, oil the connecting rod end and solder the fly crank to the bush outer face and screw. Test and repeat with the other side. Once the trunnions are fitted, the slide pins can be engaged by turning the slides horizontal. Both sides must be fitted at the same time. To operate reliably the slides need locking in place. Tilt backwards about 20° for forward gear and apply a tiny spot of superglue to one trunnion. This will stop it rotating in use but won't prevent disassembly later if required.

If you don't like the idea of the trunnions being glued to the frames, after testing and everything proving to be OK, you can remove the slide assembly by breaking the glue joints with a knife. Clean off any traces of glue and solder the trunnions in place. This can be a bit risky so, if you can't trust your soldering to be quick and accurate, leave it all glued in place.

Very little of the reverser arm and linkage can be seen so neither are included. If you want to make something representative, use the Stephenson parts 47 & 48 which can be shortened and fitted as appropriate.

**Stephenson's** – The parts supplied are purely cosmetic. The four drop links 33 are used two outside the frames and two inside, where they would have connected with the valve linkage. The valve rod is an L shaped piece of 0.7mm NS wire and the valve links 44 join this to the drop link. The trunnion block is the same one used in the Hackworth version and can be glued or soldered to the frame top centrally behind the footplate cut out, see sketch for details. The drop lever must line up with the valve spindle gland on the rear of the valve chest.

Feel free to try to make the arms move as they should. The usual modelling approach to this would be for the piston rod to move the valve gear, but that is not simple on this loco as the valve chest is separate from the cylinder and it

would permanently join the chassis and body. I thought that it was a bit beyond most modellers so did not include it.

The reverser rod 48 and link 47 are a bit of a problem as they need to be attached to the body at the rear and the chassis at the front. Since this is not possible you have three options. Join them together and attach to the back of the R/H frame or between the R/H bunker and firebox. Option three is to not join them and fix one part to each. Use whichever method you are happiest with. If you leave them off not many would notice.

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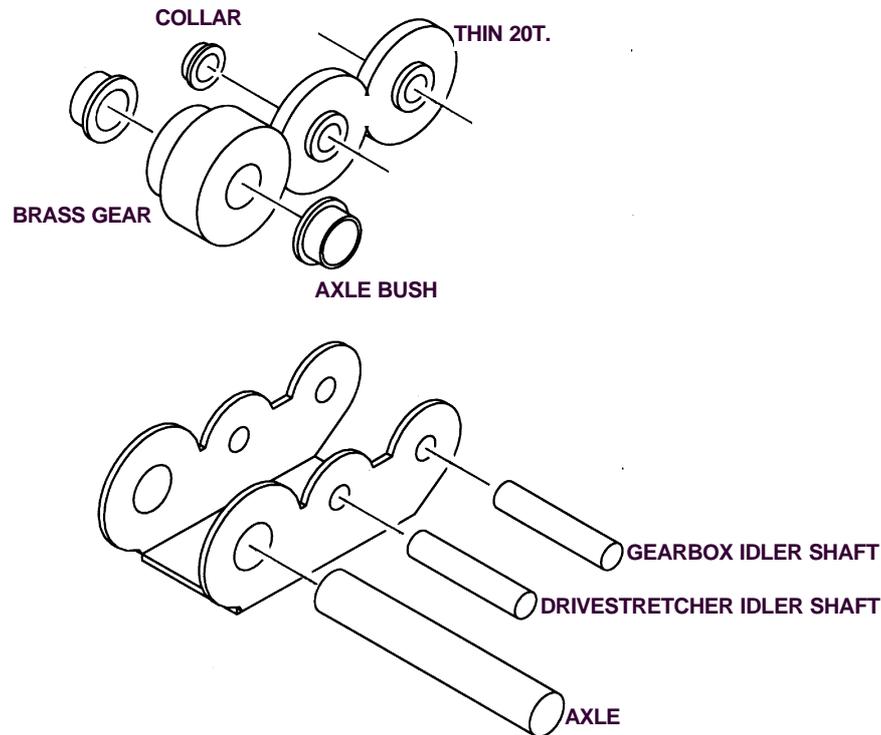
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## Parts list

Identify which valve gear you will be using and use parts marked (S) – Stephenson or (H) – Hackworth, unmarked parts are used for both types. Premier, Leader and Excelsior had Stephenson's, Melior, Trangkil No4, the square tank and the Tamar all had Hackworth.

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| 1 – Mainframe L/H                    | 28 – Brake pull rods x2               |
| 2 – Mainframe R/H                    | 29 – Brake hangers x4                 |
| 3 – Front frame spacer               | 30 – Brake shoes x4                   |
| 4 – Mid frame spacer                 | 31 – Brake shaft brackets x2          |
| 5 – Pony truck anchor plate          | 32 – Brake levers x2                  |
| 6 – Rear frame spacer                | 33 – Valve drop links x4 (S)          |
| 7 – Anchor plate stiffener           | 34 – Coupling rods - 6 parts (S)      |
| 8 – Pony truck rear                  | 35 – Connecting rods - 6 parts (S)    |
| 9 – Pony truck body                  | 36 – Valve chest L/R (S)              |
| 10 – Pony truck guide plate          | 37 – 1mm washers x 10                 |
| 11 – Pony truck anchor arm x2        | 38 – Valve chest glands x4            |
| 12 – Slidebars x6                    | 39 – Rod end sets front x2 (H)        |
| 13 – Crosshead top x2                | 40 – Rod end sets rear x4 (H)         |
| 14 – Crosshead bottom 2L/2R          | 41 – Valve rod ends x4 (H)            |
| 15 – Compensation beams x2           | 42 – Connecting rod end inners x2 (H) |
| 16 – Beam retainer part 1 x2         | 43 – Connecting rod end outers x2 (H) |
| 17 – Beam retainer part 2 x2         | 44 – Valve links x4 (S)               |
| 18 – Springs x4                      | 45 – Combination lever 6 parts (H)    |
| 19 – Motion bracket (10 parts)       | 46 – Cylinder back plate L/R          |
| 20 – Cylinder front L/R (S)          | 47 – Reverser link (S)                |
| 21 – Cylinder rear x2 (S)            | 48 – Reverser rod (S)                 |
| 22 – Cylinder front L/R (H)          | 49 – Fly cranks x4 (H)                |
| 23 – Cylinder rear x2 (H)            | 50 – Hackworth rod assembly jig       |
| 24 – Cylinder front covers x2        | 51 – Frame rivet strips x2            |
| 25 – Cylinder rear covers x2         | 52 – Driving axle shims x8            |
| 26 – Cylinder wrappers x2 (S)        | 53 – Trailing axle shims x4           |
| 27 – Cylinder wrappers L/R (H)       | Reverser lever (H)                    |
| 101 – Frame brackets x2              | 102 – Buffer beam brackets x2         |
| 103 – Compensation restrictor arm x1 | 104 – Restrictor bracket x1           |
| 105 – Hackworth slide backing x2     |                                       |

## D 3 DriveStretcher Final Drive Carriage (For SlimLiner+)



Study the diagram before starting work. Before cutting the etch from the fret, progressively ream out each of the **holes** to suit their shafts or bushes. Components should be offered up until they a tight push-fit in their holes. Remove burrs by inserting the tip of a drill bit (of much larger diameter than the hole) and gently rotating it between your fingers.

The axle bushes will be one of two types, depending on the axle diameter. Solder the **axle bushes** into place on the DriveStretcher with the larger-diameter shoulders on the same side of the etch as the bend lines. You can file the outside (non-shouldered) face of the bush flush or, alternatively, file the bushes to length so they eliminate any sideplay on the gearbox when fitted into the chassis.

**Fit the DriveStretcher into the gearbox** in the same way as you would fit the final drive carriage, using the **gearbox idler shaft** as the pivot. This shaft should include a thin 20T. The raised boss on the gear runs nearest the frame side. After checking the gear is still free to revolve, secure the shaft ends to the gearbox etch using a tiny amount of glue.

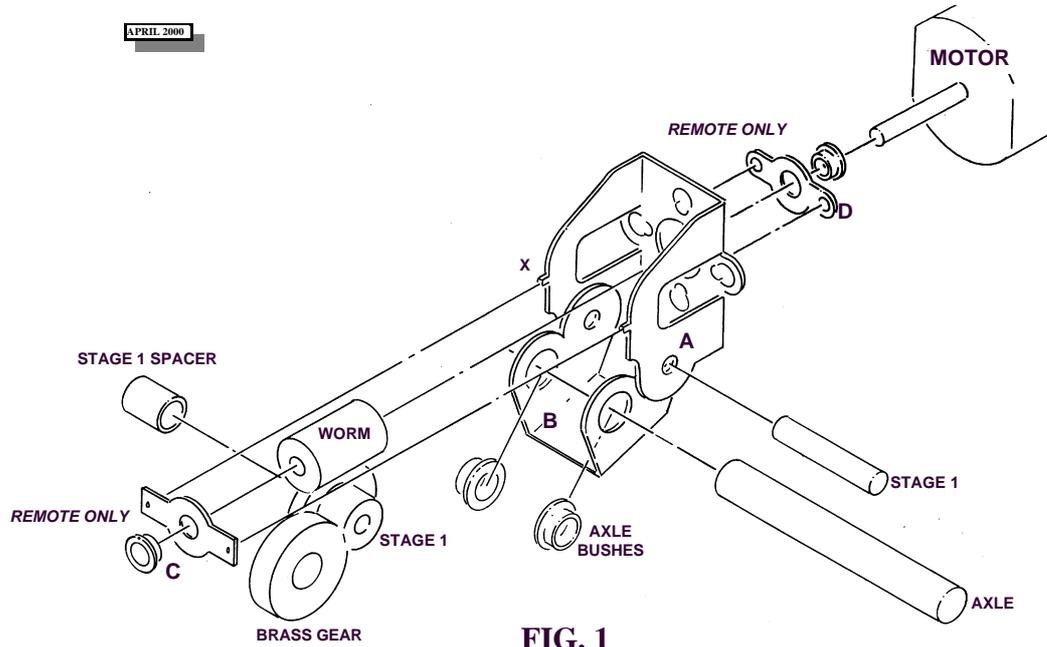
Fit the **DriveStretcher idler shaft** and gear into the DriveStretcher, along with the collar, and position and fix them as above.

Temporarily fit the axle and final **brass 20T.** gear into the DriveStretcher. If the motor is not fitted, check that all the gears revolve smoothly. Now **test the gearbox** under power. Remove the drive axle and brass gear. Fit the gearbox into the **chassis** by slotting the axle through the frames, the DriveStretcher and the brass gear, making sure the latter is correctly meshed with the idler gear.

If necessary, **fit washers** between the outside faces of the carriage and the inside of the frames, to stop the gearbox/carriage sliding along the axle, causing the gears to go out of mesh. The brass gear should run close up against axle bush.

*The gears are effectively self-lubricating but a little plastics-compatible grease will do no harm. Do not use general-purpose modelling oil, which attracts dust and grit. Metal-on-metal contact areas (motor bearings, axle*

## RoadRunner Compact+ 30/40/54:1



Study Figs 1 and 2. Before cutting the gearbox etch from the fret, progressively ream out each of the **holes** to the sizes shown in Fig 2. Components should be offered up until they a tight push-fit in their holes. Once the gearbox is assembled, the shafts are fixed but the gears are free to revolve. Remove burrs by inserting the tip of a drill bit (of much larger diameter than the hole) and gently rotating it between your fingers.

Solder the **1/8in bushes** into place on the final drive carriage (B) with the larger-diameter shoulders on the *same side* of the etch as the bend lines. File the outside (non-shouldered) face of the bush flush. Remove burrs as above. Check that the motor mounting screws will pass through their holes and into the motor, carefully opening out the holes in the etch with a reamer if necessary. Opening out the holes allows you to move the motor vertically in order to adjust the mesh. Some modellers may prefer a deeper mesh (especially for a heavily loaded loco) but avoid 'bottoming out' the gears. If the mesh is too shallow, the gears may wear or even come out of mesh.

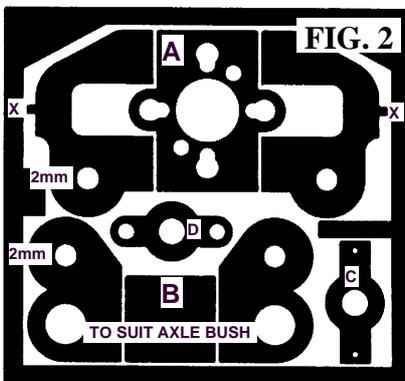
The kit includes the additional etched components (C, D) you will need to convert the gearbox into a remote-drive system, using cardan shafts linked to the motor by universal joints. The last will need to be sourced separately - Formil, Branchlines, NWSL and Exactoscale produce suitable designs. As the diameter of the input/output shaft varies between makes, you will need to provide your own bearings to fit into our remote drive attachments. For 1.5mm or 2mm shafts, ordinary 'straw hat' bearings available from Gibson, Sharman etc. will work reasonably well but for a proper engineering job, try to get some turned up from sintered bronze. The worm driveshaft should ideally be of hardened steel (like a motor shaft) but again, the silver steel supplied with the kit will do at a pinch. Before beginning construction, read the notes overleaf, covering remote drive attachments.

If you intend to use the **remote drive attachments**, open out their central holes to accept either a 1.5mm or 2mm bore bush, depending upon the diameter of your motor shaft. Solder these bushes into their holes, making sure they sit dead square.

Now cut the etches from the fret with a heavy blade and trim off the tabs, taking care not to accidentally remove any locators. **Fold up the gearbox** (A) as shown in Fig. 1, using flat nosed pliers to grip the motor mounting plate near the bend lines when doing so. This will prevent the plate from accidentally buckling across the hole centres. All bends are 90 degrees, with the bend lines on the inside of the gearbox. Add fillets of solder to the inside of the folds to strengthen the gearbox. If you are using the **remote attachments**, open out the small location holes in the front attachment (C) so they fit snugly over the locators (X) on the main gearbox etch, and then solder it in place. Now fold up the final drive carriage (B) and strengthen with solder, as above. De-flux the gearbox and carriage by scrubbing them with household cleaner, then rinse and allow to dry. If they are likely to be visible then **paint** them black.

Using a carborundum disc in a mini-drill, cut the stage 1 **gearshaft** so its length equals the overall width of the gearbox. Wear effective eye protection – cutting discs can and do disintegrate if they snag. Remove any burrs with a fine file. If shafts are a tight fit, you will only be able to pass them through both sides of the etches if they are truly square. If they won't go through, then the etches haven't been folded accurately. Light finger tweaking should put things right.

Push the **worm** onto the motor shaft until its mid-point is 6mm from the front face of the motor. The worms provided may be either **brass or nylon**, according to type and gear ratio (they are not interchangeable). The nylon type worms should



be a firm push fit on the motor shaft. Some brass worms supplied to us are fractionally tighter than others and if they aren't an easy push-fit, they can be gently forced onto the shaft in a vice. Don't use excessive force or the shaft may bend. Instead, use a broach to ease the fit of the worm and then, if necessary, secure the brass worm with a small drop of Loctite 601 at the outer end of the motor shaft.

A variety of **motor fixing holes** is provided, to allow for different screw spacings. We suggest that, if possible, you use the outer (lateral) or the diagonal screw holes, which will allow you to fit (and remove) the motor once the power unit is assembled and installed in the chassis. This will enable you to add wheels, valve gear and other fittings to a free-rolling chassis, and makes it much easier to identify and put right any tight spots or clearance problems.

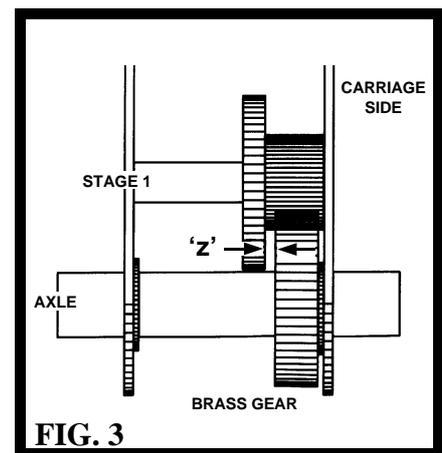
If clearance restrictions dictate that the vertical motor mounting holes must be used, we suggest that the motor is fitted before the Stage 1 gearshaft and then the latter is lightly glued at one end only. Should the motor require attention, then the gearshaft can be easily removed by gently tapping it out with a drift. If you are using these vertical motor mounting holes, you can now **fit the motor** and worm assembly onto the gearbox and secure it with the fixing screws supplied with the motor.

Refer to Fig. 1. The stage 1 double gear will be one of three types - 15/10T (30:1), 20/10T (40:1) or 27/10 (54:1) - depending on the overall reduction ratio of the gearbox. The **final drive carriage** can be mounted facing backward or forward, depending on the configuration you require.

Offer up the final drive carriage and slot the stage **stage 1 gearshaft** through the gearbox and carriage, slipping on the double gear and spacer as you do so. Sight through the opening in the gearbox sides to check the mesh with the worm - there should be daylight between the gear and the worm, but avoid having too much backlash. If necessary, loosen the motor fixing screws and adjust the mesh. When satisfied, secure the shaft to the gearbox side using a tiny amount of glue. The unit will run smoothly if the final drive carriage is free to pivot about the idler shaft, but suitable restraint must be provided for the gearbox and motor in order to prevent the carriage from curling up on itself when torque is applied. It may be preferable fix the final drive carriage in one position (this position can be determined later, when the gearbox is installed).

Temporarily fit the axle and final **brass 20T** gear into the gearbox. If the motor is not fitted, check that all the gears revolve smoothly. Now **test the gearbox** under power by fitting the motor and worm assembly as described above. Remove the drive axle and brass gear. Fit the gearbox into the **chassis** by slotting the axle through the frames, the gearbox and the brass gear, making sure the latter is correctly meshed with the stage 1 gear.

Fit washers between the outside faces of the carriage and the inside of the frames, to stop the gearbox/carriage sliding along the axle. The amount of movement may be small but if unchecked it will sandwich the gears together, causing premature wear. Washering will cure this problem. Use extra washers to eliminate all sideplay on the driven axle - aim for a running clearance only. The brass gear should run close up against the side of the carriage, away from the side face of the stage 1 gear. This clearance ('Z' in Fig. 3) must be maintained at all times. When satisfied, glue the brass gear to the axle using tiny spots of Loctite 601 applied with a pin. Rotate the axle to ensure an even distribution of the adhesive.



To use the **remote drive attachments** push the worm onto the driveshaft so that 3mm of the shaft is protruding and secure the worm with Loctite if necessary. Slot the short end of the shaft through the motor mounting plate and into the bearing in the front remote attachment (C). Slot the rear remote attachment (D) over the opposite end of the driveshaft and slide it up to the motor mounting plate (The gearbox can be driven from the opposite end by reversing the shaft). Work out how many washers you will need to centre the worm directly over the stage 1 gear and eliminate endfloat. Remove the shaft assembly, fit the washers on either side of the worm and then refit the shaft along with the washers. Secure the rear remote attachment to the motor mounting plate using 12B.A. nuts and bolts through the side holes. With the bolts partially tightened, position the attachment so its circular middle sits centrally over the hole in the motor mounting plate (like lining up a gun sight). Tighten up the bolts and test the gearbox. The worm and drive shaft can be removed at any time simply by unbolting the front remote attachment plate.

*The gears are effectively self-lubricating but a little plastics-compatible grease will do no harm. Do not use general-purpose modelling oil, which attracts dust and grit. Metal-on-metal contact areas (motor bearings, axle bushes) should be lubricated with a tiny amount of Zeuthen ultra-adhesive oil.*

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## SlimLiner+ 30/40/54:1 Gearbox

FEB 2003

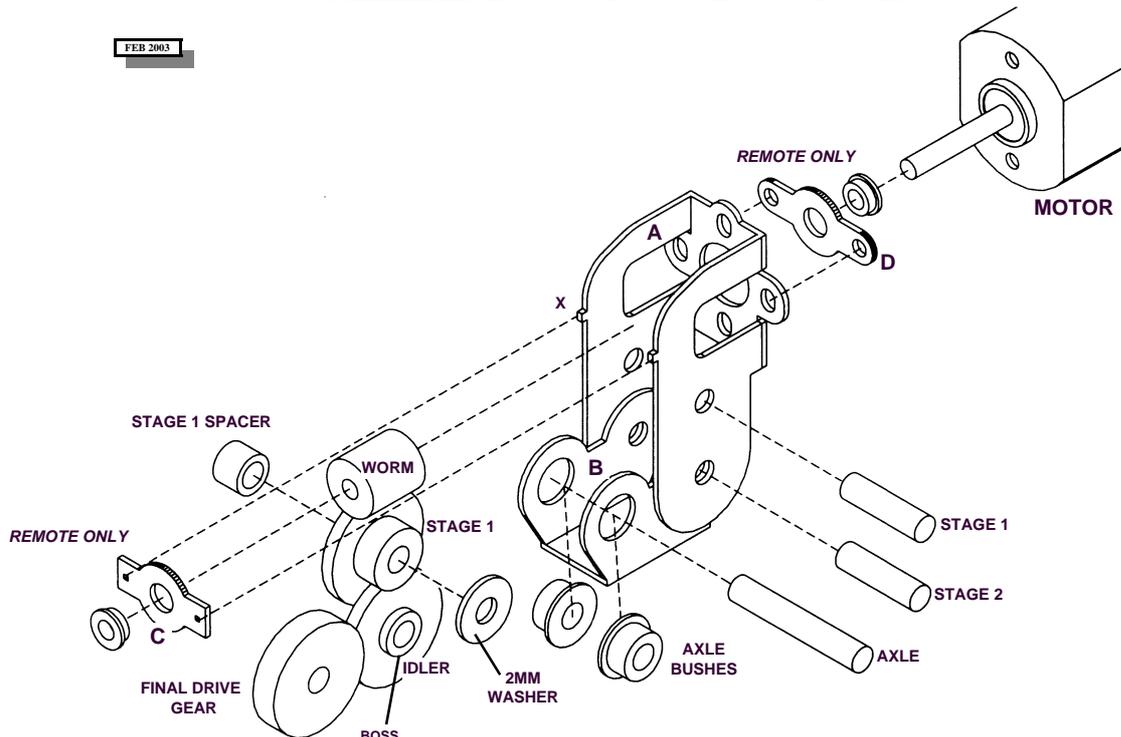


FIG. 1

Study Figs 1 and 2. Before cutting the gearbox etch from the fret, progressively ream out each of the **holes** to the sizes shown in Fig 2. Components should be offered up until they a tight push-fit in their holes. Once the gearbox is assembled, the shafts are fixed but the gears are free to revolve. Remove burrs by inserting the tip of a drill bit (of much larger diameter than the hole) and gently rotating it between your fingers.

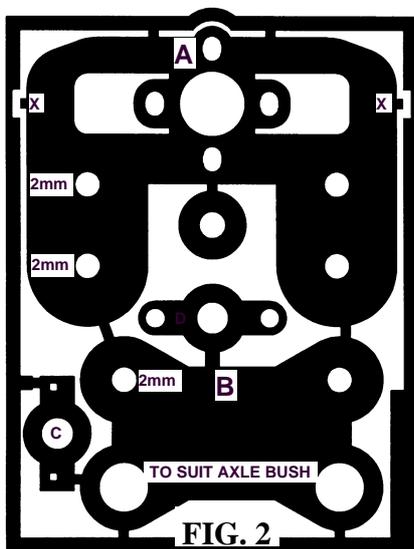
The axle bushes will be one of two types, depending on the axle diameter. Solder the **axle bushes** into place on the final drive carriage (B) with the larger-diameter shoulders on the same side of the etch as the bend lines. You can file the outside (non-shouldered) face of the bush flush or, alternatively, file the bushes to length so they eliminate any sideplay on the gearbox when fitted into the chassis. Remove burrs as above. Check that the motor mounting screws will pass through their slots and into the motor.

The kit includes the additional etched components (C, D) you will need to convert the gearbox into a remote-drive system, using cardan shafts linked to the motor by universal joints. The last will need to be sourced separately - Formil, NWSL and Exactoscale produce suitable designs. As the diameter of the input/output shaft varies between makes, you will need to provide your own bearings to fit into our remote drive attachments. Ordinary 'straw hat' bearings available from Gibson, Sharman etc. will work reasonably well but for a proper engineering job, try to get some turned up from sintered bronze. The worm driveshaft should ideally be of hardened steel (like a motor shaft) but again, the silver steel supplied with the kit will do at a pinch. Before beginning construction, read the notes overleaf, covering remote drive attachments.

If you intend to use the **remote drive attachments**, open out their central holes to accept either a 1.5mm or 2mm bore bush, depending upon the diameter of your motor shaft. Solder these bushes into their holes, making sure they sit dead square.

Now cut the etches from the fret with a heavy blade and trim off the tabs, taking care not to accidentally remove any locators. **Fold up the gearbox** (A) as shown in Fig. 1, using flat nosed pliers to grip the motor mounting plate near the bend lines when doing so. This will prevent the plate from accidentally buckling across the hole centres. All bends are 90 degrees, with the bend lines on the inside of the gearbox. Add fillets of solder to the inside of the folds to strengthen the gearbox. If you are using the **remote attachments**, open out the small location holes in the front attachment (C) so they fit snugly over the locators (X) on the main gearbox etch, and then solder it in place. Now fold up the final drive carriage (B) and strengthen with solder, as above. De-flux the gearbox and carriage by scrubbing them with household cleaner, then rinse and allow to dry. If they are likely to be visible then **paint** them black.

Using a carborundum disc in a mini-drill, cut the stage 1 and idler **gearshafts** so their length equals the overall width of the gearbox. Wear effective eye protection – cutting discs can and do disintegrate if they snag. Remove any burrs with a fine file. If shafts are a tight fit, you will only be able to pass them through both sides of the etches if they are truly square. If they won't go through, then the etches haven't been folded accurately. Light finger tweaking should put things right.



Push the **worm** onto the motor shaft until its mid-point is 6mm from the front face of the motor. The worms provided may be either **brass or nylon**, according to type and gear ratio (they are not interchangeable). The nylon type worms should be a firm push fit on the motor shaft. Some brass worms supplied to us are fractionally tighter than others and if they aren't an easy push-fit, they can be gently forced onto the shaft in a vice. Don't use excessive force or the shaft may bend. Instead, use a broach to ease the fit of the worm and then, if necessary, secure the brass worm with a small drop of Loctite 601 at the outer end of the motor shaft.

A variety of **motor fixings options** is provided, to allow for different motor types. The vertical slots will accommodate the Mashima 10 series motors (these have 8.5mm mounting screw centres) as well as narrower open-framed motors, such as the Mashima 9/16 (which have 8mm screw centres). The horizontal slots are spaced to suit the 10 series only. If possible use the latter as this will allow you to fit (and remove) the motor once the power unit is assembled and installed in the chassis. This will enable you to add wheels, valve gear and other fittings to a free-rolling chassis, and makes it much easier to identify and put right any tight spots or clearance problems. The motor can be removed or refitted at any stage of construction.

If clearance restrictions dictate that the vertical motor mounting holes must be used, we suggest that the motor is fitted before the Stage 1 gearshaft and then the latter is lightly glued at one end only. Should the motor require attention, then the gearshaft can be easily removed by gently tapping it out with a drift. If you are using these vertical motor mounting holes, you can now **fit the motor** and worm assembly onto the gearbox and secure it with the fixing screws supplied with the motor.

Refer to Fig. 1. The stage 1 double gear will be one of three types - 15/10T (30:1), 20/10T (40:1) or 27/10 (54:1) - depending on the overall reduction ratio of the gearbox. Fit the **stage 1 gearshaft**, double gear (according to ratio) the spacer bush and the etched thrust washer (with the ribbed side facing the gear) into the gearbox. Sight through the opening in the gearbox sides to check the mesh with the worm - there should be daylight between the gear and the worm, but avoid having too much backlash. Some modellers may prefer a deeper mesh (especially for a heavily loaded loco) but avoid 'bottoming out' the gears. If the mesh is too shallow, the gears may wear or even come out of mesh. If necessary, loosen the motor fixing screws, adjust the mesh and then lightly glue the shaft in place.

The **final drive carriage** can be mounted facing backward or forward, depending on the configuration you require. Offer up the final drive carriage and slot the **idler gearshaft** through the carriage and gearbox, slipping on the thin 20T. gear as you do so. (Note that the larger boss on this gear runs nearest the gearbox side). Secure the shaft to the carriage side using a tiny amount of glue. The unit will run smoothly if the final drive carriage is free to pivot about the idler shaft, but suitable restraint must be provided for the gearbox and motor in order to prevent the carriage from curling up on itself when torque is applied. It may be preferable fix the final drive carriage in one position (this position can be determined later, when the gearbox is installed).

Temporarily fit the final **brass 20T.** gear and axle into the final drive carriage. If the motor is not fitted, check that all the gears revolve smoothly. Now **test the gearbox** under power by fitting the motor and worm assembly as described above. Remove the drive axle and brass gear. Fit the gearbox into the **chassis** by slotting the axle through the frames, the gearbox and the brass gear, making sure the latter is correctly meshed with the idler gear. You may need to fit washers between the gearbox sides and the frames in order to prevent the gearbox from moving sideways on the axle. It is also advisable to fit washers behind the wheels on this axle in order to eliminate any sideplay. When you are happy with the position of the gear and gearbox on the axle, glue the brass gear to the axle using tiny spots of Loctite 601 applied with a pin. Rotate the axle to ensure an even distribution of the adhesive.

To use the **remote drive attachments** push the worm onto the driveshaft so that 3mm of the shaft is protruding and secure the worm with Loctite if necessary. Slot the short end of the shaft through the motor mounting plate and into the bearing in the front remote attachment (C). Slot the rear remote attachment (D) over the opposite end of the driveshaft and slide it up to the motor mounting plate (The gearbox can be driven from the opposite end by reversing the shaft). Work out how many washers you will need to centre the worm directly over the stage 1 gear and eliminate endfloat. Remove the shaft assembly, fit the washers on either side of the worm and then refit the shaft along with the washers. Secure the rear remote attachment to the motor mounting plate using 12B.A. nuts and bolts through the side holes. With the bolts partially tightened, position the attachment so its circular middle sits centrally over the hole in the motor mounting plate (like lining up a gun sight). Tighten up the bolts and test the gearbox. The worm and drive shaft can be removed at any time simply by unbolting the front remote attachment plate.

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