Chapter 5 Techniques, Tools and Processes

This is an extract from Chapter 5 of the forthcoming Track Handbook which will deal with a variety of techniques that are needed for track making. This extract covers just the essentials that are needed for Easitrac turnouts.

Where a switch in a turnout meets the stock rail there is often a joggle. We explain a very simple way of producing reliable joggles with a "gadget" that takes only seconds to make.

You will need to file tapers on rails for the pointwork, and for crossings you will need to solder them together. We start by explaining the basic principle of filing tapers in rail. These don't seem to be very widely understood. We explain the various techniques that you can use. They are all applicable to any method of building track. We describe how to file tapers by hand without special tools or jigs, a very simple tool for filing both crossing and switch tapers that you can easily make yourself in a few minutes and a filing jig for crossing tapers that is available from the Association.

We describe the Association jigs for soldering complete crossings and assembling them and explain how to use it. We also describe a simple soldering jig that you can make yourself in a few minutes for assembling crossing noses.

The terminology for comparing crossing angles can be confusing. In this handbook we use the terms sharper and wider where 1 in 10 is sharp and 1 in 4 is wide.

Joggles and Recesses for FB Switch Feet

In order to maintain strength the tip of a switch should not be filed to a feather edge As a result the small blunt end may catch wheel treads on stock travelling in the facing direction. On the prototype this can damage the switch, on small scale models it is more likely to result in derailment. Therefore, it is common practice to introduce a joggle in the stock rail so that the switch tip is protected, fig 1. On the prototype other techniques are also sometimes used but these involve complex chamfering of the rails which is difficult to reproduce in model form.

A joggle can potentially cause a shock to wheels travelling in the trailing direction but as long as it is gently rounded and is not a sharp step this is not a problem.

Some modellers prefer not to use joggles. If you don't use joggles the tip of the switch should be filed to a knife edge and the top of the tip of should be rounded and to ease the passage of wheels onto it.

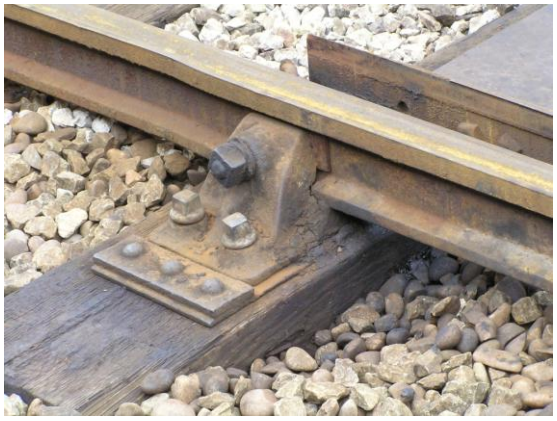

Fig 1 Prototype Joggle (Also note the bolted chair always used for switch chairs both BH and FB because there is nothing to restrain the rail on the inside)

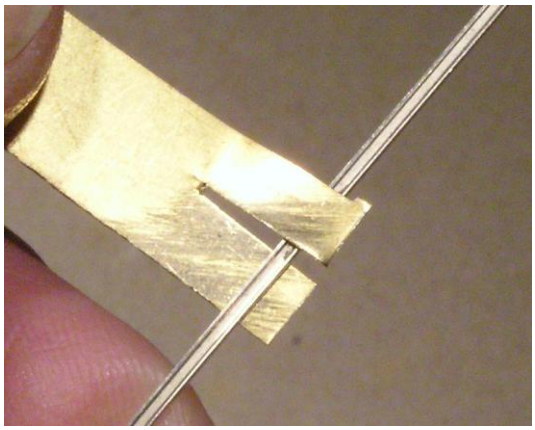

Fig 2 Joggle gadget with rail in position for joggling

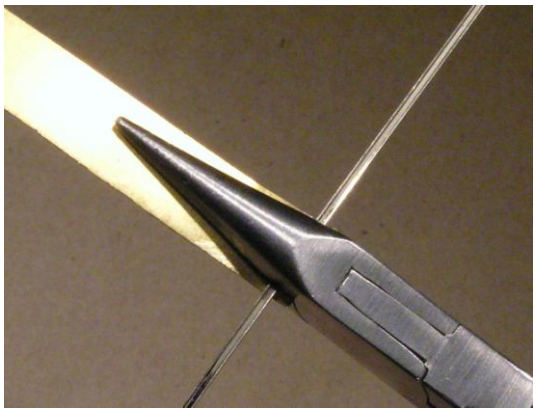

Fig 3 Pressing the Joggle. The rail should be close to the pivot of the pliers to maximise the pressure

It is difficult to produce consistent smooth joggles with normal hand tools but this is a little gadget that can help. It is incredibly simple: just a piece of 0.25mm brass with a slot about 1mm wide cut in it. The brass can come from waste surround from an etched kit and the slot can be cut with a pair of scissors, fig 2.

Simply put the rail through the slot in the gadget as shown in fig 2 and squeeze with a pair of pliers. The pliers need to have a smooth inside to the jaws close to the pivot and this is where you squeeze, fig 3. In this position you can exert a considerable pressure which is enough to create the joggle. There will probably be some slight distortions on the top and bottom surfaces of the rail which are easily removed with a fine file.

Fig 4 Joggle in BH Rail

FB rail is a little more difficult but the same basic technique works. The problem is that the foot of the rail gets in the way and so some packing pieces are necessary, fig 5. This is simply two narrow strips of 0.25mm brass, scrap from etches again, which can be fixed in place on either side of the rail with cyano glue, fig 6. When you have made the joggle these can easily be broken off and any remaining traces of cyano are quickly removed. As with BH a touch with a file top and bottom is necessary to remove any slight distortion.

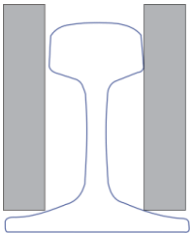

Fig 5 Packing for FB Rail

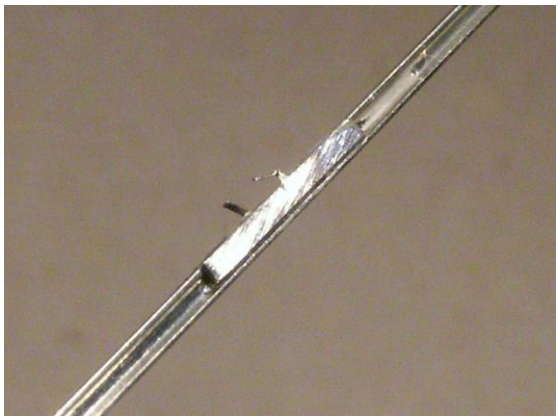

Fig 6 0.25mm Packing for joggling FB Rail – scraps from etch kit surround.

FB rail also needs the foot of the stock rail removed on the inside where the switch blade will fit against it. You can just lay the rail on the bench and file it, but it is difficult to do this accurately as it does not sit flat. A simple guide made from styrene sheet will hold the rail so that it is flat and you can then file it neatly, fig 7. This is assembled very quickly with 0.25 and 0.5 styrene sheet on a base of thick styrene 1mm or more. You simply lay the rail with the outer foot in the bottom slot and then file the inner foot until it is flush with the 0.5 styrene. It is a good idea to run a felt tip pen over the rail beforehand so that you can see if you are starting to file the head of the rail.

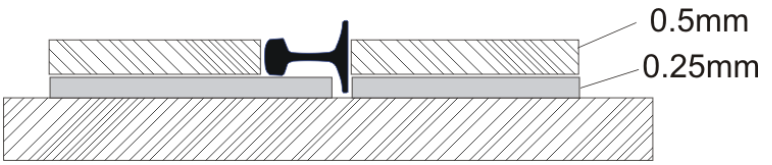

Fig 7 Filing Guide for FB Stock Rail Foot to accommodate the switch

Filing tapers for Crossings and Switches

We explain how you can file tapers for crossings and switches by hand. However, this is not an easy option and it takes some practice to become proficient so we also describe a very simple wooden jig that can help you to file accurate tapers very quickly and easily. A more elaborate and durable version of this jig is described in chapter 6.

The Association sells filing Jigs for crossings – Jig 1 (1-205 to 1-209): These are used for filing the tapers for vees. They can also be used for soldering the vees. A separate jig is required for each crossing angle. At present the jig is not suitable for FB rail, but a modified version is being prepared.

Filing Tapers on Rail

If you file a taper on rail and keep filing until you have a fine point you will find that you have a two pronged point or, more likely, a very thin web which is providing little support to the top and bottom of the rail, figs 8 and 9. If you cut off the prongs you will be left with a blunt nose. This will not do; the tips of switch blades and the nose of a crossing must be as sharp as possible with only a tiny bit of rounding for strength. The nose of a prototype crossing is typically ¾" wide: 0.13mm in 2mm scale. A long length of very thin web in a switch blade seriously reduces its strength.

Figs 8 and 9 BH rail filed to a taper on one side only showing the wafer thin web. The presence of the very thin metal is just visible in the right hand picture as a pale area.

The technique, which applies to all methods of filing, is file – bend - file. This produces much stronger tapers for both crossings and switches.

1. File a taper on one side of the rail until you are just starting to file the web

2. Bend the rail so that the filed taper is now in a straight line with that side of the rail

3. File the taper on the other side of the rail.

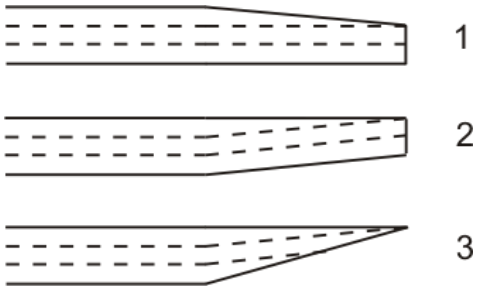

Fig 10 The taper filing sequence

Filing a taper by hand

You can use this technique for crossing and switch tapers. The basic procedure detailed here is used for all the taper filing methods described here. Hand filing of tapers may be the simplest method of filing tapers but it is certainly not the easiest; and we do recommend that you spend a little time building one of the jigs described below.

For hand filing you need a block of strong aluminium angle, melamine faced chipboard or hard wood that you can hold in a vice, plus some double sided tape. Soft wood will not do. The rail must be resting on a hard surface for the file to cut an accurate taper.

So that you can judge the taper you are filing you should mark the block with the length of the taper from the end as follows:

Angle	mm
1 in 4	2
1 in 5	2.5
1 in 6	3
1 in 7	3.5
1 in 8	4
1 in 9	4.5
1 in 10	5
A Switch 1 in 24	12
B Switch 1 in 32	16
C switch 1 in 40	20
D Switch 1 in 48	24

Remember you always need these tapered rails in handed pairs so you should file them in pairs.

The procedures for BH and FB are slightly different so we have detailed them separately to avoid confusion.

This is the procedure for BH

- Take two lengths of rail and fix them with double sided tape to the block. Leave about 15mm from the end clear of tape as the rails must be on a hard surface for the file to cut an accurate taper. The ends of the rails should come exactly to the end of the block.

- File a taper on the rails until you are just cutting into the web. For switches you will get a stronger final result if you file a sharper angle for the first cut. For example for a B switch file the first angle as though for a C switch. This sequence may sound odd but it results in less of the web near the tip being filed away at the first cut.

- Take the rails off the block and bend the tapers that you have just filed so that they are straight with the rails. The bends should be at the point where the tapers start.

- Replace the rails on the block with the unfiled sides uppermost and file a taper on that side until you have a fine point. The length of the taper should be as shown in the table above.

- You will find that you can remove the rails by gently peeling them off the double sided tape. The tape should then be usable for a few more tapers. If you have any problem removing the tape from the base you will find that white spirit is a good solvent for the adhesive used on these tapes.

This is the procedure for FB

You will need to stick two lengths of 0.25mm styrene sheet to the block about ½ mm apart to accommodate the feet of the rail. This is essential to prevent the FB rail tipping sideways.

- Take two lengths of rail and fix them with double sided tape to the block. Leave about 15mm from the end clear of tape as the rails must be on a hard surface for the file to cut an accurate taper. The ends of the rails should come exactly to the end of the block.

- File a taper on the rails until you are just cutting into the web. For switches you will get a stronger final result if you file a sharper angle for the first cut. For example for a B switch file the first angle as though for a C switch. This sequence may sound odd but it results in less of the web near the tip being filed away at the first cut.

- Take the rails off the block and bend the tapers that you have just filed so that they are straight with the rails. The bends should be at the point where the tapers start in the heads of the rails.

- Replace the rails on the block with the unfiled sides uppermost and file a taper on that side until you have a fine point. The length of the taper should be as shown in the table above.

- You will find that you can remove the rails by gently peeling them off the double sided tape. The tape then should be usable for a few more tapers. If you have any problem removing the tape from the base you will find that white spirit is a good solvent for the adhesive used on these tapes.

For both type of rail:

Remove burrs and finish off with 400 grade wet and dry. Small blocks of wood with wet and dry glued to each side are ideal for this and are incredibly useful for all sorts of tasks where a file is a bit inconvenient. A longer block with 240 grade is very good for the main filing of tapers so you may prefer to use that rather than a file.

A Simple Filing Jig for Tapers

If you use the method described above, and it is frequently recommended, you will find that it is very difficult to judge the angles for crossings. Fig 11 shows a filing block marked with the distances for a 1 in 6 crossing and three switch angles. There wasn't room to mark for 1 in 5 or 1 in 7 alongside the 1 in 6. They are just too close together and this shows how difficult it is to file these angles accurately by this method..

A very simple variant on this method is to put a small block on the filing board for the file to rub against, fig 12. The block has a channel cut in the bottom to clear the rail. This guarantees the angle but the block is likely to get filed away pretty quickly unless you have a very light and delicate hand for filing. The simple wet and dry file shown in the background is the answer. This is a strip of fairly thick ply or strip wood with a length of 240 grade wet and dry glued to one end and some 0.5mm styrene sheet on the other end. You should also stick similar strips on the other side to prevent warping. The styrene strip rubs against the block while the wet and dry cuts the taper.

Fig 11 basic Filing board for tapers

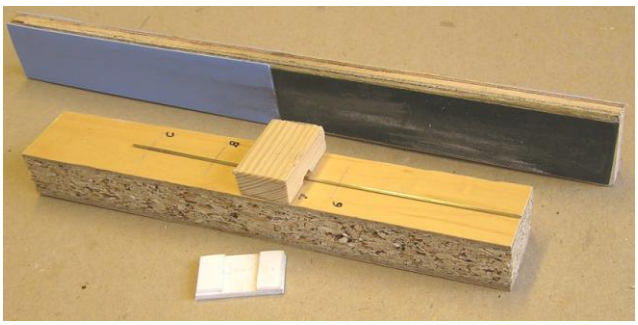

Fig 12 Filing board with wooden crossing block in position, styrene switch block in front and wet and dry file behind.

You will need two rubbing blocks: one for crossings, which can be made from strip wood about 10mm thick, and the other for switches about 3mm thick, which can be built up from three layers of 1mm styrene sheet.

The actual thickness of the blocks is not particularly critical as you need to mark their positions on the base as follows:

Distance from end of base = angle x thickness of block

For example if your crossing block is 9.5mm thick, for a 1 in 6 crossing the edge of the block should be 6 x 9.5 = 57mm from the end of the base. The angles for switches are shown in the table above. These should use the thinner rubbing block to keep everything to a reasonable length.

To use the jig simply fix the rail and the appropriate block onto the base with double sided tape and file the taper as described above. Don't forget to leave about 15mm clear of tape at the cutting end. The wet and dry file cuts very quickly and smoothly so don't file for too long before you check the progress. You don't need to hold the base in a vice: simply holding the base in one hand and the file in the other works very nicely.

Remove burrs and finish off with very fine grade wet and dry.

Using the Association Crossing Filing Jigs (Part nos 1-205 to 1-209 for angles 1 in 5 to 1 in 10)

These jigs are for filing the point and the splice rails and for soldering them together. They are not suitable for switch tapers. The current version is only suitable for BH rail, but an FB version is planned.

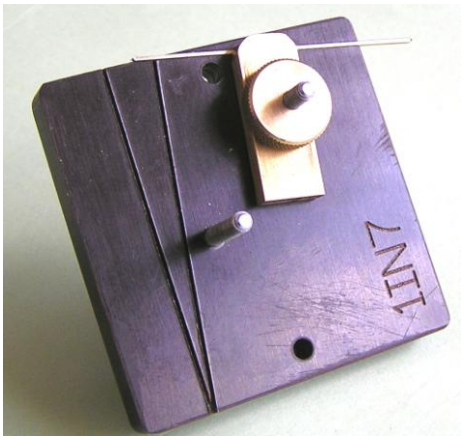

Fig 13 Association crossing filing jig

Put a length of rail in the slot as shown in the fig 13 so that it just protrudes above the edge of the block. The thumb wheel tightens down on to the brass block to clamp the rail for filing.

File it down to a taper that just cuts into the web. You may have to experiment a little until you get just enough rail showing to do this.

Take the rail off the jig and using flat nose pliers bend the taper that you have just filed so that it is straight with the rail. The bend should be at the point where the taper starts in the head and foot of the rail, or where it starts in the head for FB rail.

Replace the rail in the jig with the unfiled side uppermost and file a taper on that side until you have a fine point. It will usually be right if the end of the rail just reaches the very end of the slope of the slot on the top surface.

Remove burrs and finish off with very fine grade wet and dry.

As with all the simple jigs of this type some slight movement of the rail in its slot is possible. In this case it can lead to a slightly skew taper if the rail tips under pressure from the file. If this occurs you may be able to prevent it by putting a slip of paper between the rail and the jig. See fig 14.

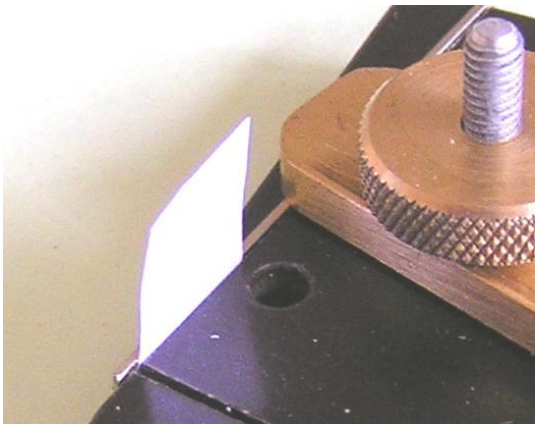

Fig 14 Packing below the rail in the filing jig to prevent tipping

Soldering Crossing Vees

When soldering crossing vees it is very important to position the two rails correctly. In fig 15 the top vee (A) is ideally formed with the running edge of the splice rail leading smoothly into the taper on the point rail. In B and C there will be a jolt when a wheel travels over them. The example C is particularly likely to occur if the splice rail is not filed to a fine enough point. In both these cases you may also have trouble getting the vee to fit correctly into the crossing assembly jig. Example D is not perfect but is very likely to occur as it is difficult to file a taper to a very fine point. It is unlikely to cause problems as the wheel path is correctly aligned.

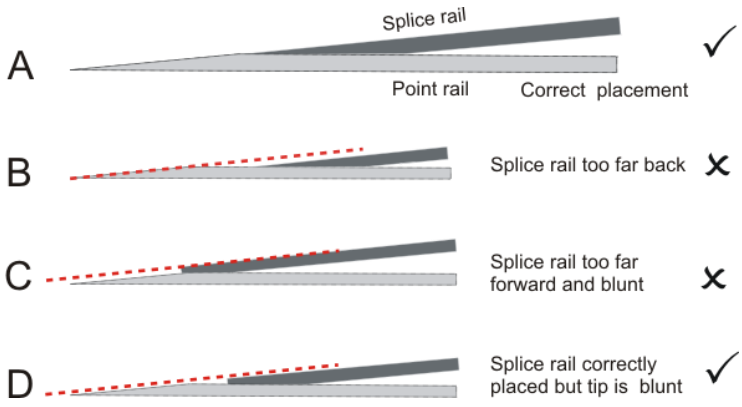

Fig 15 Crossing vee correct and incorrect alignments

The Association Filing Jigs for Crossings (1-205 to 1-209) can also be used for soldering the vees. The procedure is very simple: tin the tapered area of the splice rail, put two filed rails into the slots in the jig with flux in the join line up carefully by eye and apply the soldering iron.

To solder a vee without an Association jig you need either a template which shows the vee, together with several pins, or, preferably, a very simple vee shaped former at least 1mm thick in metal or a heatproof plastic such as Tufnol. This and the two rails can be pinned to a soft baseboard of Sundeala or balsa wood, and soldered, fig 16.

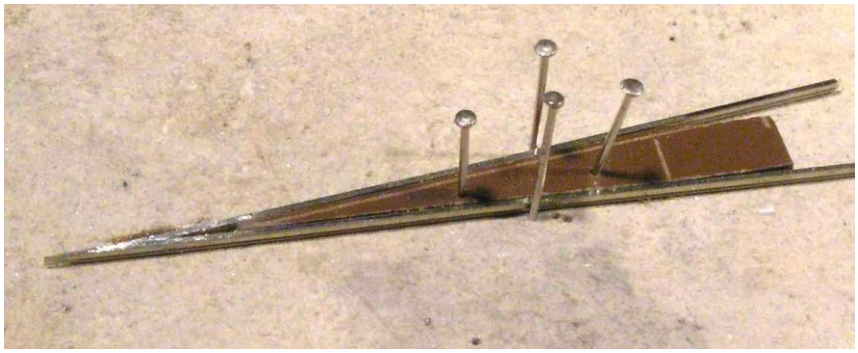

Fig 16 Soldering a vee with a simple former. Two holes in the former pin it to the base making it easier to align the rails. This example will need a little cleaning up to remove the excess solder.

When you have soldered a vee by any method check it very carefully with a straight edge to ensure that there is a straight line from the taper on the point rail through to the splice rail. Neither of the methods described above guarantees this.

Using the Common Crossing Assembly Jig (Part nos 1-210 to 1-214)

These jigs can be used to solder complete crossing assemblies with BH or FB rail

It is very important that you set the bends in the wing rails at exactly the correct point in the jig. Because of the very wide angle in the wing rails they do not locate themselves accurately enough and you will find that they can move at least 1mm in each direction. This is not a fault in the jig. You need to ensure that you place the wing rails accurately. The method is described in paragraph 3 below. We recommend that you find the position on the jig where

the centre of the knuckle will be and scribe a line across the jig so that you can locate the wing rails more easily. The centre point is easily identified as the centre of the little diamond where the knuckle will be. Future production of this jig are planned to include an engraved line at this point. A scribed line (labelled "centre line") is visible in fig 17 below.

1. Insert the vee and locate it properly. If it will not fit into the jig this may be because the splice rail has been soldered too close to the nose or too far away. The splice rail can be too close particularly if it does not taper to a feather end. See fig 15 above. A serious excess of solder can also prevent the vee fitting properly.

2. Bend the wing rails.

3. Insert the wing rails and very carefully centre the knuckle on the centre line of the jig. Make sure the rail is the right way up - don't forget you are working upside down with this jig. You will find that the wing rails can wobble a little in their slots. This is inevitable as there must be enough clearance for you to be able to get the rails in and out. However, it can lead to an out of gauge crossing as the rails tend to tip inwards as you press down when you solder. You can prevent this either by laying a strip of adhesive tape over the rails before you solder, or by putting slips of paper between the rails and the jig see fig 17.

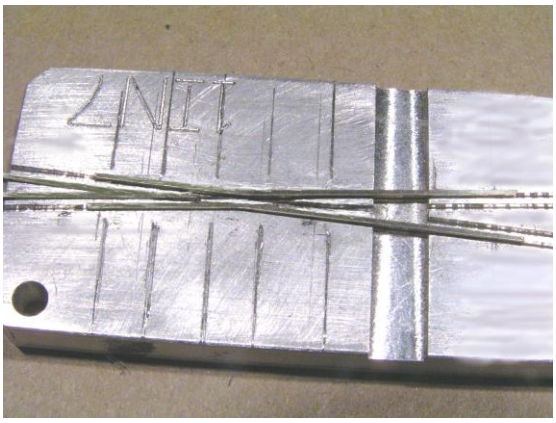

Fig 16 The Common Crossing Assembly Jig

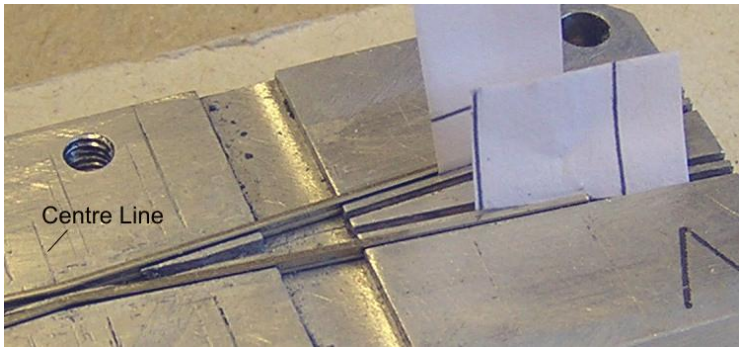

Fig 17 Packing out the wing rails with slips of paper to prevent them tipping during soldering. Note that the slips of paper are arranged to push the rails away from each other so that the gap at the knuckle is as wide as the jig will allow. This view also shows a scribed in line, labelled Centre Line, to indicate the centre of the knuckle for aligning the wing rails. (The other scribed lines on this jig were experimental)

4. Now solder some Versaline chairplates across the rails to hold them together. Use chairplates that are just long enough and tin the chairplates not the rail. There are plenty on any of the Versaline turnout etches. You can use strips of 0.25 brass or nickel silver from etched kit surrounds if you don't have the chairplates. For rail soldered direct to timbers the chairplates or strips should be aligned between the timber positions on the template. For Easitrac and Versaline they should be aligned with the timbers as they will be used to secure the crossing to them. Four chairplates are sufficient: under the nose and the knuckle and one further out at each end.

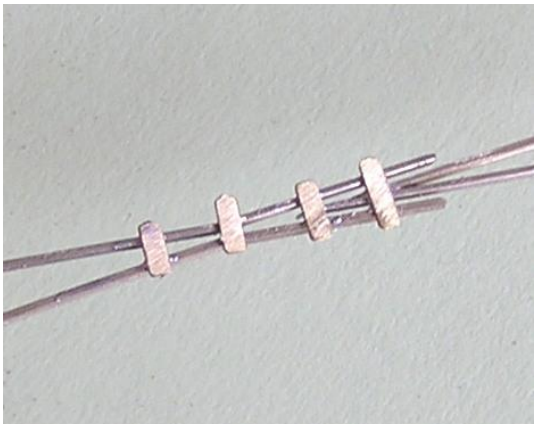

Fig 18 Crossing assembly. The bottoms of the chairplates have been cleaned but they still need trimming to length.

The aluminium of the jig does absorb quite a lot of heat so use the largest soldering iron that you have. With a small iron use large bit, or turn up the temperature on a controlled iron. You may need to dwell for a while with the iron. (Some early versions of this jig were made without a heat relieving slot along the back. If you have one of these you can send it back to Shop 1 to have a slot milled. There is no charge.) If you are building the turnout using the Versaline system make sure that you use the correct chairplates for the crossing. If you are using any other system you should trim the chairplates level with the rails when you remove the crossing from the jig.

5. Run a fairly coarse file or sanding block across the bottoms of the chairplates to remove any surplus solder before you remove the crossing from the jig. The chairplates will be used to fix the crossing to the timbers so must be flat and smooth.

6. Carefully remove the crossing from the jig.