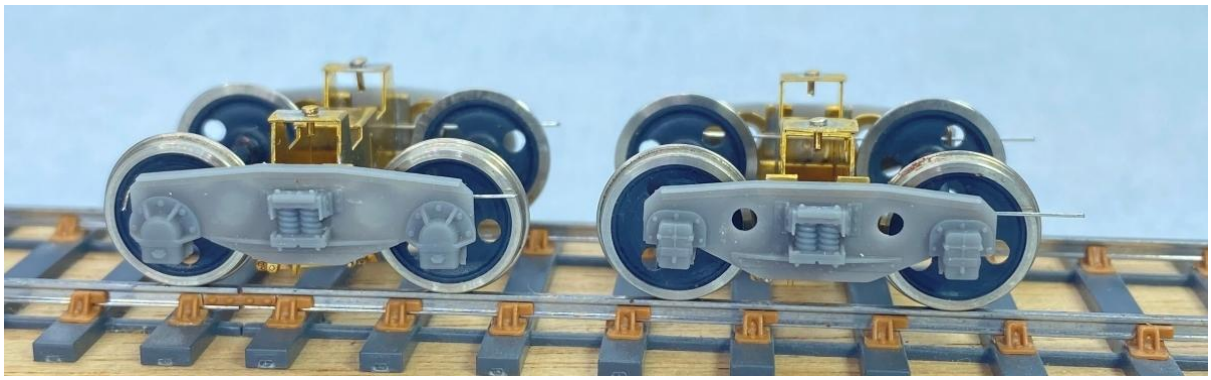
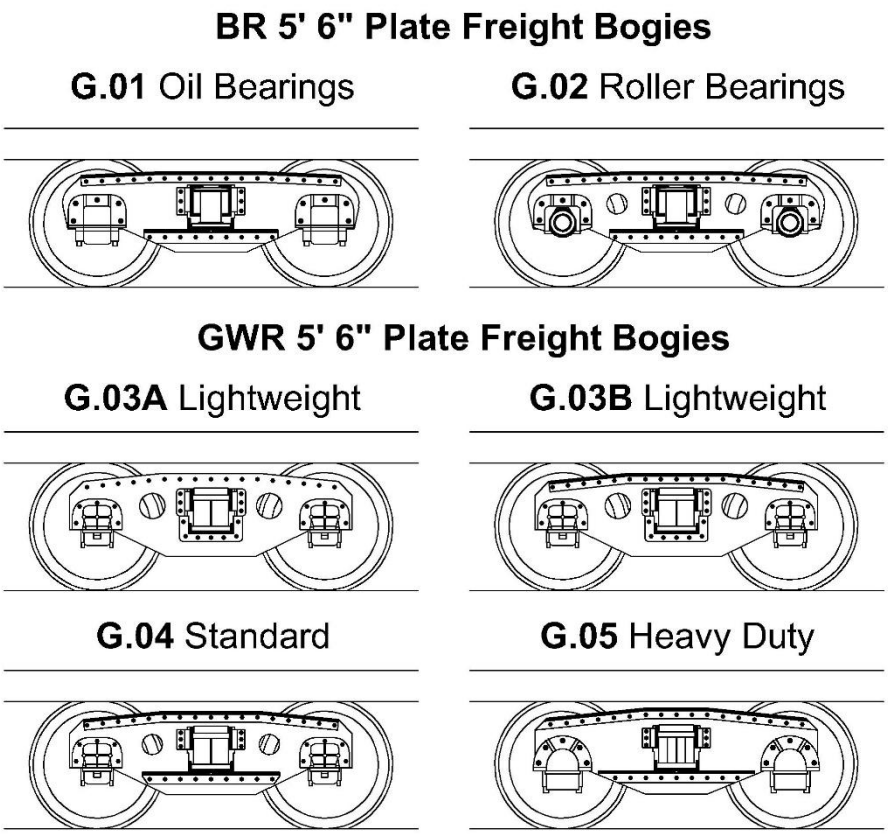
Rumney Models Plate Freight Bogies with 3D Printed Sideframes

This set of instructions covers Rumney Models kits PG.01, PG.02, PG.03A, PG.03B, PG.04 & PG.05. These kits build into accurate, sprung, 5’6” plate freight bogies covering GWR and BR prototypes. They consist of an etched bolster and sideframe backing along with cosmetic 3D printed sideframe overlays.



The bogies are designed to be built with that are sprung to the bolster. These are held in place by the spring wire and they can be easily disassembled for easy removal of the wheels should the need arise. You will need 2mm top hat bearings to complete along with your choice of 3’1” wheels. Note that waisted type bearings are not suitable for these bogies as the cosmetic 3D printed parts of the sideframes rely on the bearing to align them.

The following diagram outlines the six types covered. The basic assembly for all of them is exactly the same, the difference is entirely in the 3D printed overlays.



Construction Notes

Read through the instructions first and familiarise yourself with the components. Drawings and photographs are included to attempt to make my waffle clearer.

3D Printed Parts

This kit includes high quality 3D printed parts. They are produced using the latest stereolithography technology to cure photosensitive resin. They have been thoroughly cleaned and then cured to produce the parts you have. As they are cured by a certain wavelength of light there is the possibility that if left exposed to light for a prolonged period of time the parts may go brittle. This is not unlike some plastics. To avoid this please consider the following:

- Do not leave unpainted resin parts exposed to direct sunlight for any length of time. Store in a dark place.
- Make sure all 3d printed parts are properly primed and painted.
- If the kit is not intended to be built for a while, consider priming the printed parts before storing.

If these points are followed, then the printed parts will be fine. However, if you leave them for several years on a south facing windowsill, then you might have end up having problems with them…

The printed parts are pushing the boundaries of what is currently possible with the printing technology. Whilst they have been road tested and tweaked for strength where necessary some still feature very thin walls and should therefore be handled with care. Parts have been removed from their supports, but they will need cleaning up. When cleaning them up please note the following:

- The material files/sands and cuts with a saw blade very easily, almost too easily. Go slowly and take care. When cleaning up, wet and dry paper is recommended, preferably with a little water to contain any dust. You can also use fine files.
- The material does not cut that well with a knife blade. Whilst not so brittle that it will crack as soon as look at it, it may fracture if you try and cut it with a blade. I can't imagine why anyone would want to try and slice the prints, but I thought I'd say it anyway. You can however use a sharp scalpel blade to pare away material if needed.
- Due to the process used to produce these parts they may need fettling to fit, i.e. parts may come out slightly oversize.
- Holes will almost certainly need opening out. Use a sharp drill.

Fixing the printed parts in place can be done using either cyanoacrylate (superglue) or epoxy glue. I have used both successfully. In both cases makes sure the printed parts and what they are being attached to are free from any grease. I have found that in both cases the glues can provide a good bond with the brass parts, so much so that the parts can break rather than the joint if you try to remove them. I put this down to the surface of the parts being not entirely smooth so there is something for the glue to key to.

The printed parts need no special cleaning before painting. A wash with a cream cleaner to remove any grease will be sufficient. Like plastics avoid using things such as cellulose thinners as this may damage them. IPA will be fine as this is what is used to clean them after printing.

Etches

Check all holes before removing parts from the fret. The drawing process for etching if you use a CAD program as I do is extremely accurate but the actual etching process itself not an exact science. If the fret is slightly over etched, then there is no problem but if they are under etched the holes will need enlarging. I find that this is easiest to do before removing parts from the fret. The hole sizes will be noted at the appropriate points. Use an appropriate drill or a tapered reamer.

Remove one part at a time from the fret.

The instructions will assume that tags connecting parts to the fret will be cleaned up on removal of a part unless it is specified specifically in the instructions not to.

Very important:
All fold lines are through 90° with the fold line on the inside unless stated otherwise.

This means that when I say fold something up the folds should be made through 90° with the fold line on the inside. If the fold is to be done in any other way I will say so.

Everyone has their own soldering methods. I now use an Antex 50W temperature controlled soldering iron with predominantly 145° solder and La-Co paste flux.

Tools

The following tools may be useful when constructing the wagon:

- A selection of drill bits including 0.3mm, 0.7mm and 2mm along with something to hold them.
- A selection of tapered reamers in the range 0.3mm-1mm
- A smooth jawed vice and smooth jawed pliers
- A selection of fine needle files
- Something to remove the etches with; a piercing saw with fine blade (size 6/0 recommended) or a pair of cutters
- Wet and dry paper (800 or 1200 grade) for cleaning up the prints

Technical

The suspension is designed to use thin section steel wire (guitar strings). The exact size that you'll need will depend on the weight of the body. **0.012"** wire is included with the kits but you may wish to use a different size depending on the following information. Consider the weights as an ideal for each size of wire and adjust the wagon weight accordingly.

Wire diameter (thousands of an inch)	Wagon weight (grams)
11	50
12 (included)	**75**
13	100
14	140

Materials list

You will need a few items to complete the bogies:

- M2 bolts and nuts
- 2.5mm x 2mm tube for pivot sleeve (optional)
- Top hat pin point bearings and 3’1” wheels with pinpoint axles (do not use waisted type bearings)
- 3’1½” wheels from your favourite manufacturer along with pinpoint axles. Check your prototype for the type of wheel.

M2 nuts and bolts along with tube for the pivot sleeve can be had from Eileen’s Emporium amongst others and I’d recommend the bearings produced by Alan Gibson whatever type of wheel you use. Contact details can be found at the end of the instructions

Parts List

Etched Parts:

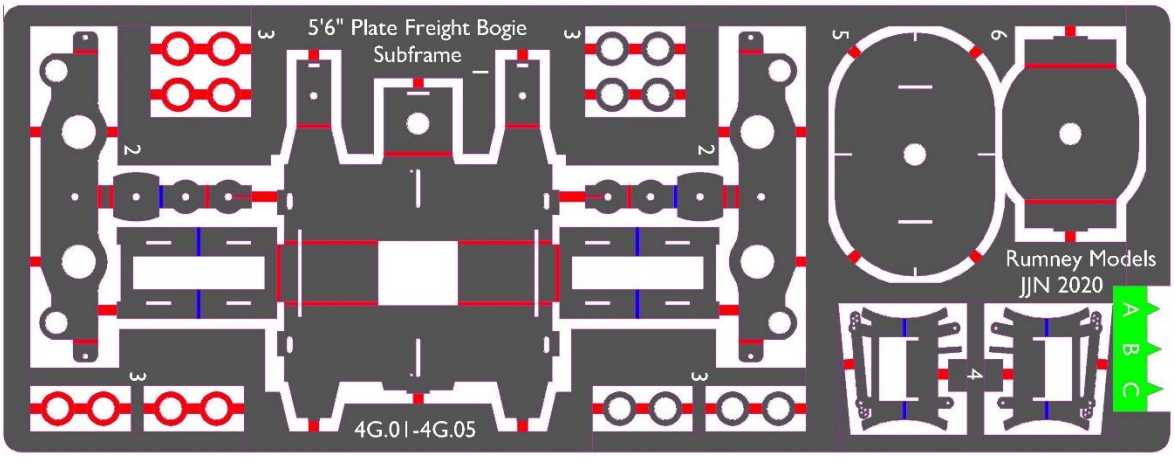
1. Bolster
2. Sideframe
3. Spacing washers (two thicknesses)
4. Brakegear detail
5. Bogie pivot base
6. Bogie pivot frame

The area shaded green on the parts diagrams is a bearing depth measuring jig for determining if the spacing washers are required and, if so, what thickness.

Other Parts:

- Spring wire (0.012”
- Lace pins
- 3D printed cosmetic sideframes

Etched Parts Diagram

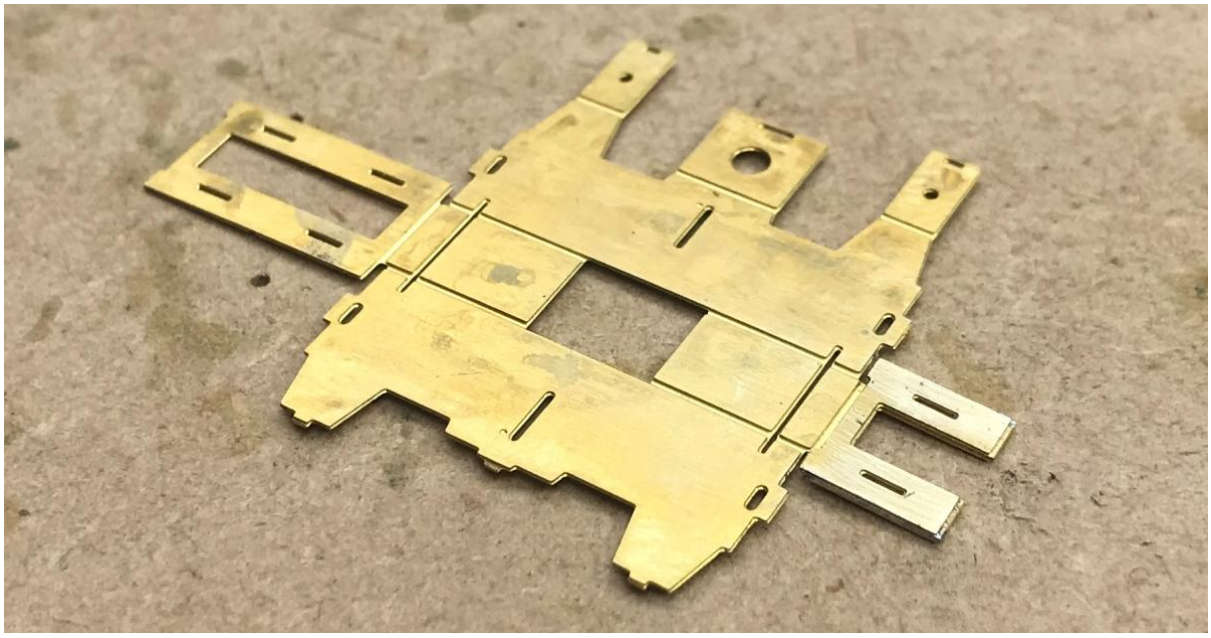


Construction

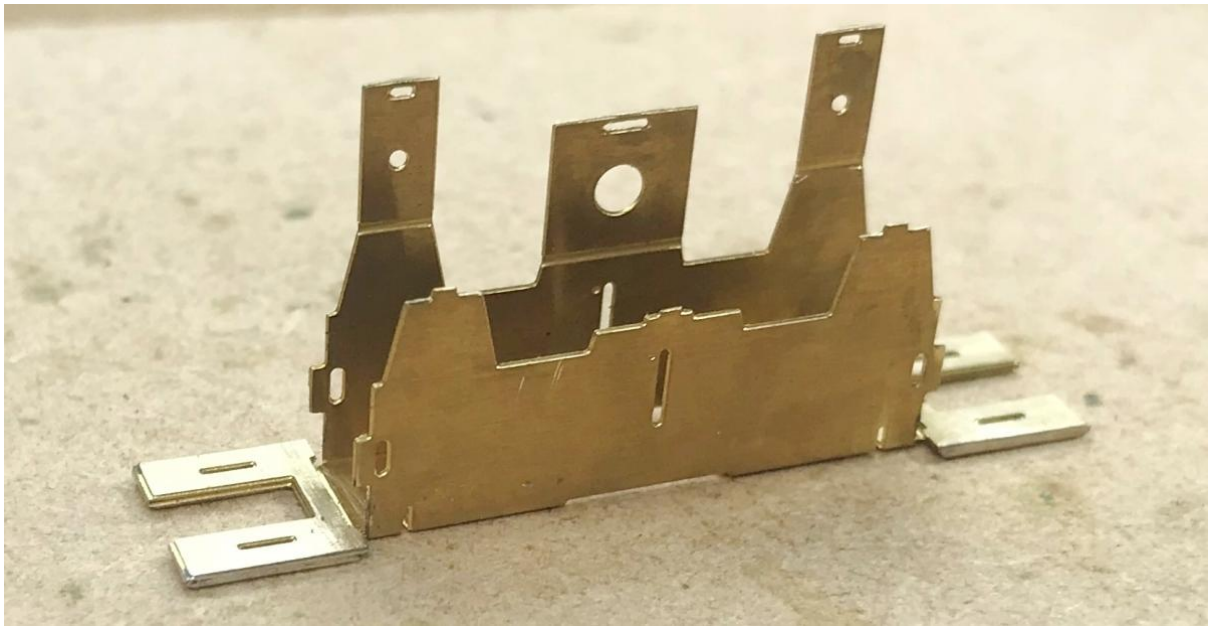
Bolster

Start with the bolster (1). Make sure that the two small holes can accept the 0.7mm shank of the lace pins and remove from the fret. Clean up any connecting tags.

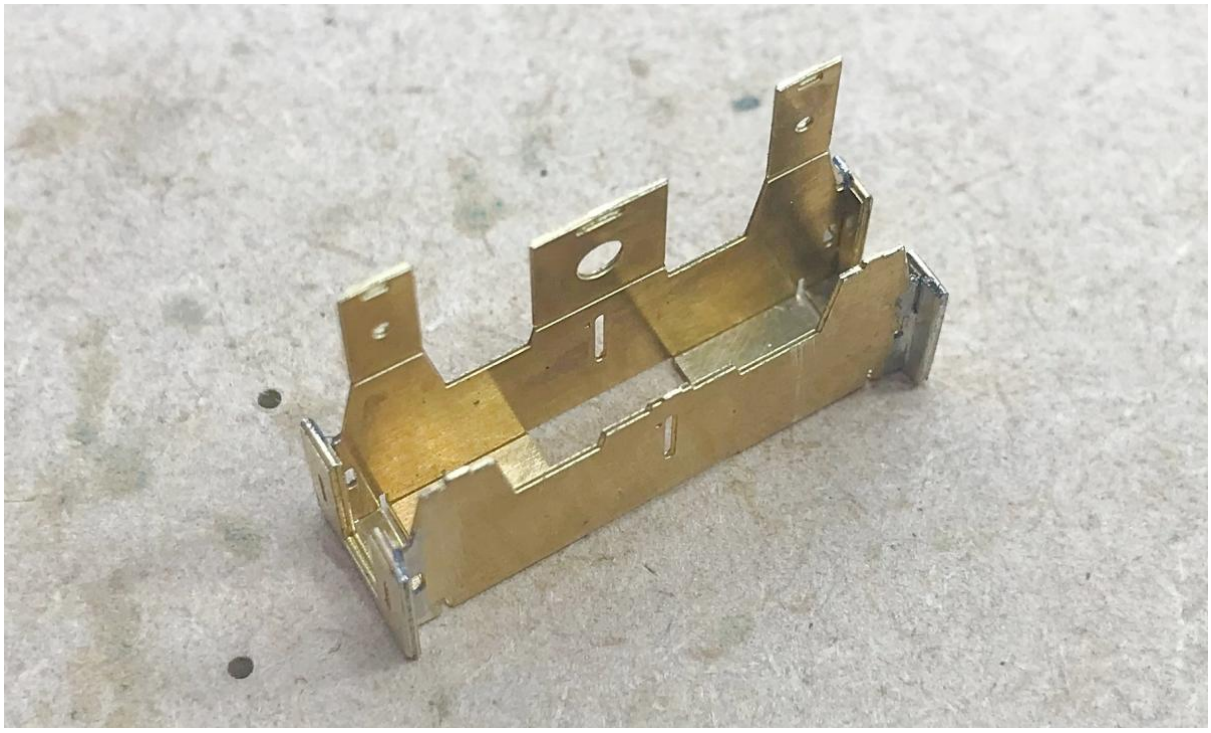
The basic idea for the interface with the sideframes is a cam (which allows for a degree of rotational movement) sliding in a slot. A degree of care will be needed when assembling these parts to get a nice working fit as both parts are made from two layers of etch. Go slowly and carefully. Fold the ends of the bolster that will make up the slot through 180° with the fold line on the outside (see following picture). Make sure that the two faces are hard up against each other (use a pair of pliers to make sure) and solder together along the outer edges. Be cautious with the amount of solder used so as not to get any in the slots for the locating tabs.



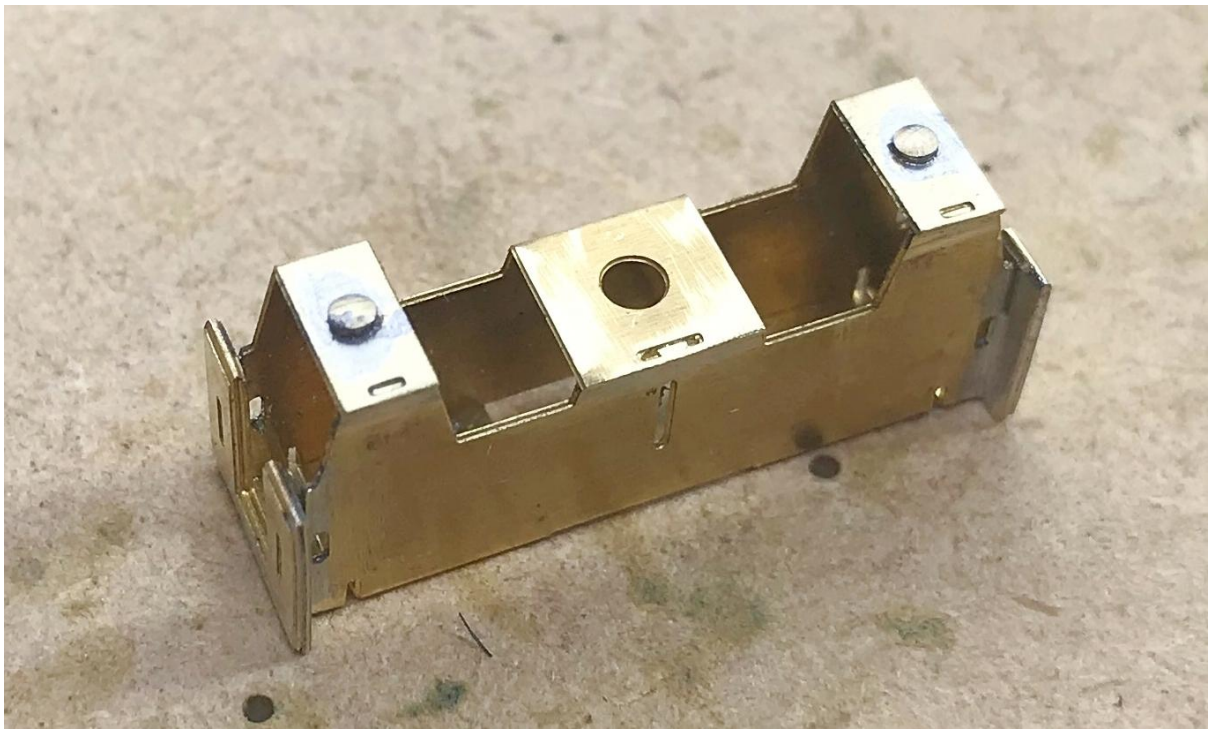
Once you are happy with both ends, fold up the sides of the bolster.



Then fold the ends up so that the slots engage with the tabs on the bolster sides. Solder the sides to the sides from the outside corner. Make sure the parts are hard up against each other and only use a little solder so you avoid getting any on the inside face of the ends between the bolster sides.

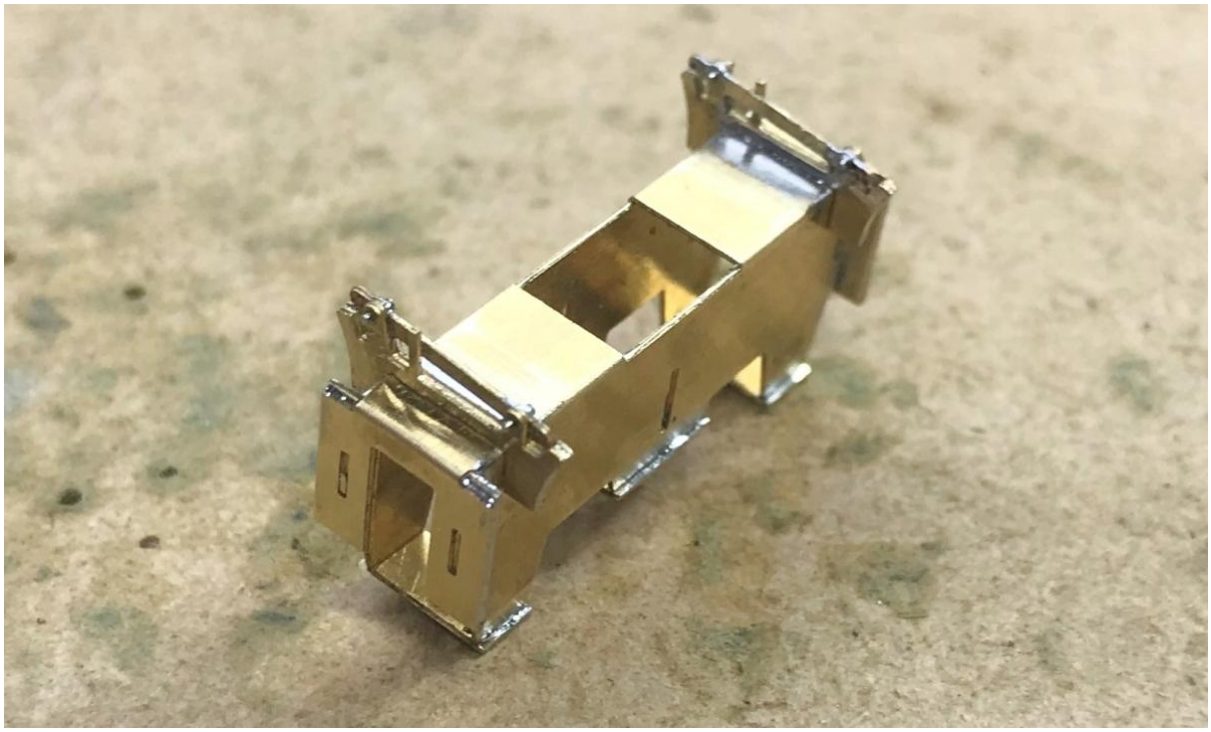


Fold over the three top parts so the tabs and slots engage, and solder in place. Solder the lace pins in place and then cut the shank of the pins so that only a little remains beneath the top. Retain the shank of the lace pins as this will be put to good use later.



The brakegear detail (4) comes as a simple fold double part. Remove from the fret and fold about the middle so that the fold is through 180° with the fold line on the outside. Use the part to drill a pair of 0.3mm holes into an off cut of wood or mdf. Insert two short lengths of 0.31mm wire into the holes and through the brakegear detail. Solder the wire in place and the two halves of the brakegear detail together. Trim the wire to resemble bolts.

Insert the brakegear detail into the slots on the underneath of the bolster. The two sets of brakegear detail for each bogie form a mirrored pair and should be arranged so that the thin push rod going between the two brake shoes is towards the outside of the bolster.



Functional Sideframes

Make sure the small holes on the sideframes (2), except those on the two small fold out tabs at the ends, can accept the shanks of the lace pins (0.7mm) and remove from the fret.

As mentioned before the functional part of the sideframes consists of a cam that fits into the slots in the sides of the bolster. The cam consists of three parts, two smaller and one larger which need to be folded up. Start with the fold line furthest from the main part of the side and fold through 180° with the fold line on the outside. Repeat for the next fold line. This will produce a sort of concertina effect. You will end up with the arrangement illustrated in the previous picture.

The next two fold lines either side of a short bar are through 90° and will trap the small parts of the cam against the sideframe.

Trim the lace pin so that it is flush with the sideframe on both sides.

You will need to make sure the slot created in the cam is free from any solder. Use some fine wet and dry paper (1200ish) folded double to remove any remnants of solder. Offer the sideframe up to the slot in the bolster to check the fit. You may need to polish the outer surface of the bolster sides and perhaps deepen the slot in the cam a little using the wet and dry paper. The cam should be able to slide freely up and down in the slot but without any slop. Take your time getting a nice fit.

One thing I found is that you tend to end up with sideframes that fit in a specific slot and maybe loose or tight in the other slot. I didn't go so far as to label each sideframe with its corresponding slot but I did take care to keep each bogie separate so as not to mix up the sideframes too much.

Fold up the two tabs at the ends which will become the fulcrum points for the spring wire.

Once you are happy with the fit of the sideframes in the bolster the top hat bearings can be fitted. When everything is assembled there should ideally be no lateral movement of the axle in the bearings and the points of the axles should run in the points of the bearings. The axles shouldn't push out the sideframes either, if they do the wheels probably won't rotate very freely and it will restrict movement of the sideframes.

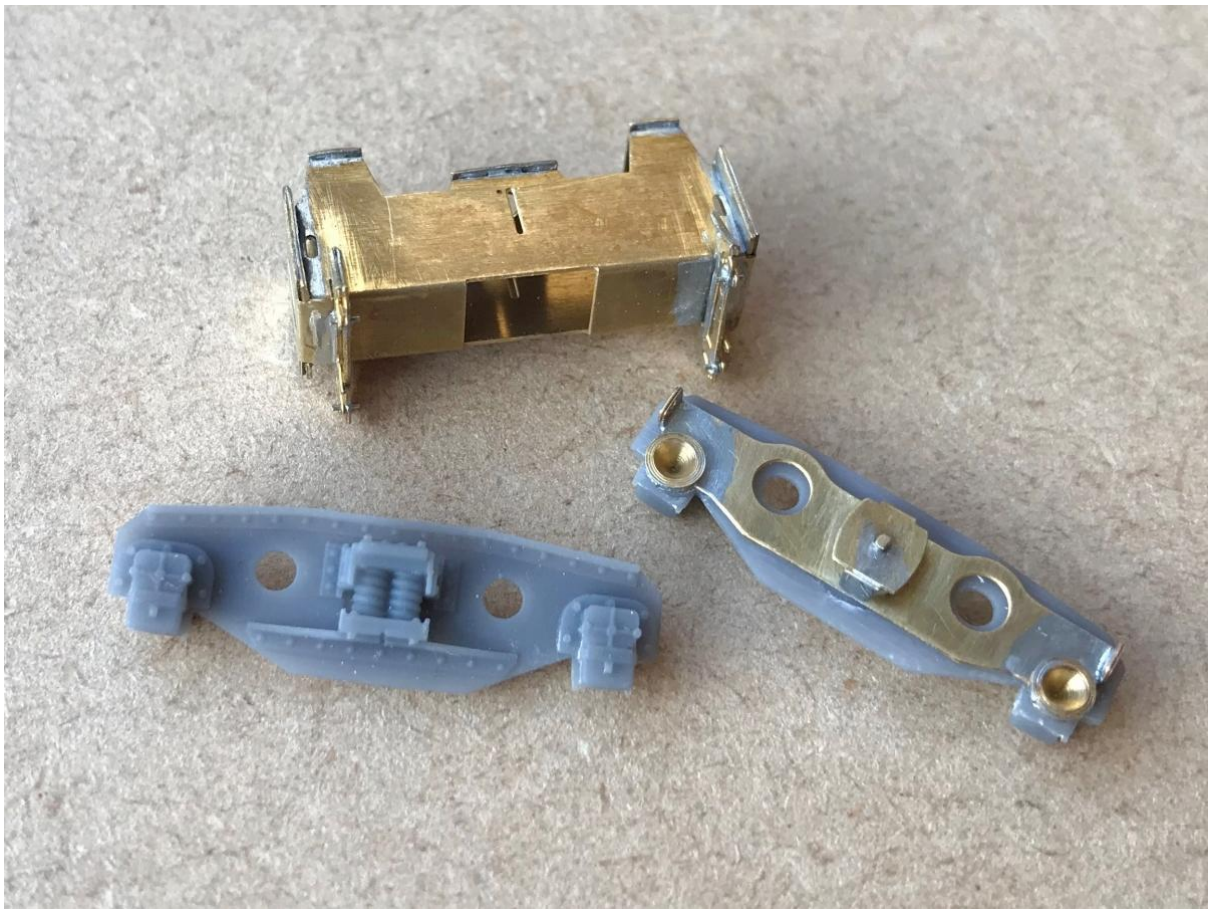
In order to gauge whether you need any spacing washers (3) to take out any slop the kit comes with a measuring jig. This is the bit shaded green on the parts diagram. There are three triangles on the jig labelled A, B and C which measure the depth of the bearing. If the depth of the bearing corresponds to A (i.e. the back of the flange on the bearing sits against the flat part of the jig connecting the three triangles) then you will need a half etched washer on each bearing. If it corresponds to setting B then you will need a full thickness spacing washer and if it corresponds to C then you'll need a full thickness and a half etched washer. Don't assume that the depth of all bearings in a packet is the same. Check each one and use the appropriate washer.

To fit the bearings in place, use one of the sideframes to drill a pair of 2mm holes in a scrap piece of wood or mdf into which the bearings can fit. Locate the bearings in place along with any washers (these should go between the bearing flange an the sideframe) and solder in place. You may want to try and fit the sideframes along with the wheels at this point to check everything is ok before proceeding. Make sure the sideframes are at the same height on both sides when you do this by pushing them fully down in the bolster slots.

3D Printed Cosmetic Sideframes

You will need to clean up the remnants of the supports generated during printing. Use a fine file or wet and dry paper to do this. Use a little water with the latter to contain any dust. You will need to make sure the holes are opened out with a 2mm drill. Check that the holes are of a sufficient depth so that the cosmetic sideframe sits over the bearings and up against the etched sideframe.

Glue in place using epoxy or superglue. Before doing this, you could consider blackening the sideframes as it is recommended not to paint the functional parts of the bogie (there is a bit on painting later in the instructions) and if you do them at this stage you don't need to worry getting blackening fluid on the 3D prints. I didn't with the test builds but probably will in future.

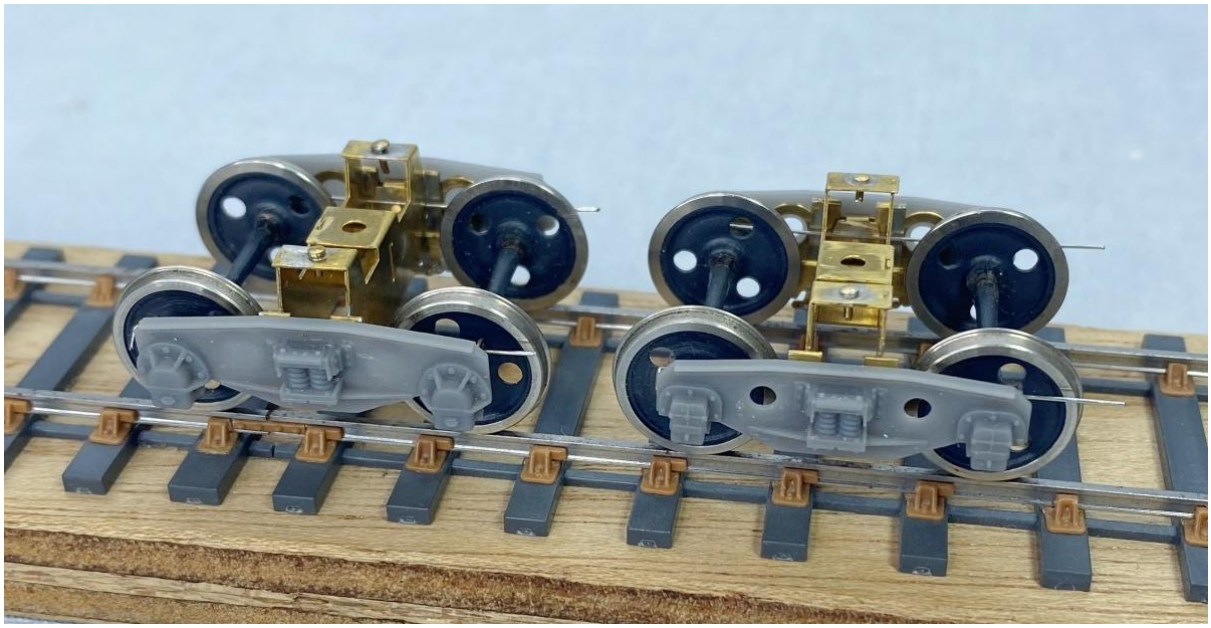


Assembly

The sideframes and bolster are held together by the spring wire. On final assembly wire should be cut and bent to form an L shaped spring approximately 27mm x 2mm. The sideframes and bolster can be assembled and then the spring wire passed through the fulcrum tabs on the sideframe and through the slots in the bolster. Once in place the other end can be folded over to retain the wire.

Before bending over the retaining wire, you may want to just try test assembling the bogie with a long piece of wire (say half of that provided) and then paint/blacken it before final assembly.

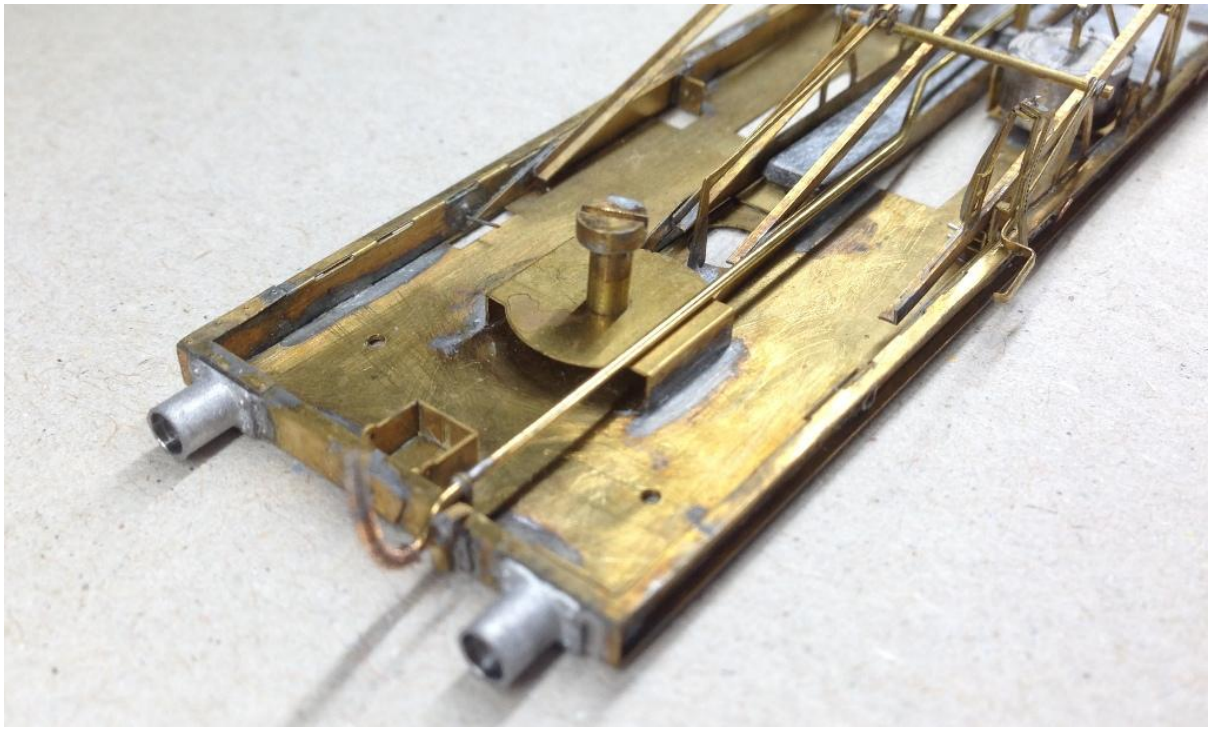
I haven't mentioned fitting the wheels yet. I fitted mine after I'd assembled the bogie with the spring wires. I did this by twisting one side as far as it would go and twisting the other in the opposite direction which gave just enough room to fit the wheels. Alternatively, you can assemble the wheels at the same time as you put the bolster together and then add the spring wire. This is a bit of a three handed job though.



Location

The bogie is designed to be retained using an M2 bolt and the fret provides for a locating plate made up of two parts: a bogie pivot base (5) and a bogie pivot frame (6). Solder an M2 nut over the hole in the bogie pivot frame on the side with the two fold lines. The bogie pivot frame can then be folded up and soldered to the bogie pivot base using the tabs and slots to locate the two parts. This unit can then be fitted to the underside of the wagon. The thread of the bolt will need to be 6mm long.

I dislike using the thread of a bolt as a bearing surface area so sleeved mine with a 4mm length of 2.5 x 2 mm tubing. If doing this, you will need to open out the hole in the top of the bolster to 2.5mm.



Ride Height

If the bogie pivot base is mounted directly to the floor then the arrangement of the bolster should leave the wagon sitting a little low. This is deliberate to allow for some leeway with different arrangements. The height can be increased by adding packing pieces above the bearing pins on the bolster. You could use plasticard or brass for this and set the height via the buffer centres. This should be about 13.8mm. Ideally the surface that the pins rest upon should be brass to reduce wear.

Couplings

Provision has been made for fitting AJs to the bogies. There is a pair of small holes etched into the bolster and a slot along the centre line. If you want working AJs then you will need to arrange the coupling so that it starts off heading towards the centre of the wagon before doubling back on itself and passing through the bolster in order to get sufficient length to allow it to uncouple.

Painting

It is recommended that the working parts of the bogie are chemically blackened rather than painted. The outside of the sideframes can then be primed (if you wish) and painted. If you wish to paint the entire bogie, then make sure you don't get any paint around the sideframe/bolster cam area.

Finally

Thanks must go to the GWS at Didcot, the East Somerset Railway and the Avon Valley Railway who have helped greatly in the preparation of these kits.

Justin Newitt - May 2022

Supplier Details

Eileen's Emporium (bolts and tubes)
Unit 19.12 Highnam Business Centre
Newent Road
Gloucester
GL2 8DN
www.eileensemporium.com

Alan Gibson (top hat bearings)
PO Box 597
Oldham
OL1 9FQ
www.alangibsonworkshop.com