



HEIDI

Thank you for buying this locomotive kit from Boot Lane Works, please read all the instructions carefully before assembly.

Tools & Adhesives

I recommend a few tools to help you assemble your kit –

- Small Bench Vice
- Modelling Knife (*I use a scalpel*)
- Tweezers, Pliers, etc...
- Needle Files, various shapes
- Wet & Dry abrasive paper (*the mixed selection from Halfords is very good*)
- Selection of small twist drills, including 1.5mm & 2mm diameter - **A COUNTERSINK DRILL**
- A 90-degree angle (*I use a set block, but a small set square will work well*)
- Personally, can't manage without my small, tapered reamer, look for them on eBay!
TAKE CARE WITH THE REAMER - MAKE A SMALL CUT, TRY, AND CUT AGAIN

I also recommend the following adhesives –

- Super Glue
I use Gorilla Super Glue
- Dichloromethane, A liquid solvent for the acrylic
I use E.M.A. Model Supplies "Plastic Weld"

A little about the printing process.

The printer extrudes a filament of plastic, layer by layer, to create an object. As it does so, it can leave tiny ridges along the object.

The printer can also leave a bit of a "squish" from the build-plate and there is usually a tiny "ridge" around the flat surface of the object that was attached to the build-plate.

For best results, clean the ridges off with a file.

THE RESIN PARTS ARE BRITTLE AND MUST BE HANDLED WITH CARE

The resin is hardened by an ultraviolet light process but continues to adsorb the light after the process. Please ensure the resin is thoroughly painted to stop the hardening process.

THE ACRYLIC IS ALSO BRITTLE, CARE SHOULD BE TAKEN DURING CONSTRUCTION

***** **IMPORTANT** *****

Please bear in mind that this kit, although intended for garden use, is a reasonably small power unit, designed for hauling a handful of wagons or a couple of carriages.

We DO NOT guarantee this model if used for “Heavy Haulage”!

HIEDI started out as nothing more than a test rig for 3D printed wheels.

Initially, we wanted to print wheels for a FR Double Fairlie wheel, and a suitable vehicle was created to test a printed wheel. It seemed a little crazy to test two power bogies, so a simple Single Fairlie was built. Issues with rigidity resulted in tanks being added, and then a boiler to carry extra weight. The locomotive evolved from there.

The keen eyed will notice a close similarity to James Spooner as built in the tanks, boiler & smokebox.

Tests with the wheels took most of the summer (2024), and the “Single Fairlie” could be seen out and about at several garden railways, undergoing trials.

One of the issues with the four wheeled power bogie was its lack of hauling power, and a six wheeled variant (very similar to that of Moel Tryfan) was conceived.

This model also represents Boot Lane Works first venture into a six coupled power chassis.

Following pressure from friends & customers alike, it was decided to release the “Single Fairlie” as a kit.

We hope you enjoy the model as much as we have designing it?



The original model on test at David Mees', Wigfa & Llanrwst Light Railway, summer 2024.

Note the four-wheel power bogie under the locomotive.

RIGHT, LETS JUMP IN AND BUILD THE POWER BOGIE.

There are included within the kit, a couple of jigs to enable a reasonably easy build.

Locate the six printed wheel.

We seriously recommend painting these prior to assembly. We could have printed these black, but we have discovered that painted printed wheels work much better than unpainted.

Unpainted, the prints seem to collect muck and grim from the rails, painted wheels seem to be more resistant to the garden detritus...

The wheels need pressing onto the 1/8" axles.

Before we do that, we need to screw crankpins into the wheels. ***We thoroughly recommend that you tap each hole with an M2 tap, it's not completely necessary as the screws will self-tap into the plastic, but the use of a tap makes it much easier to assemble.***

Two of the wheels require M2 16mm conehead screws, the other four require M2 12mm conehead screws. Screw the M2 screws into the rear of the wheel and into the countersink in the wheel.

You have six axles in total, two are longer than the others, the two longer axles are for the rear bogie.

Take the three shorter axles, one has a drive gear already driven onto it.

Before we press the wheels on, we need the top-hat brass bushes, and the metal washers from the screw-bag. The washers act as a boss to the rear of the wheel.

Push a top-hat bush onto the axle with the grey drive gear, then a washer. The lip of the top-hat bush should be on the outside next the washer. As in the photo below.

Push the two wheels with the longer M2 16mm screws into the ends of the axle with the grey drive gear, they should start onto the axle easily.

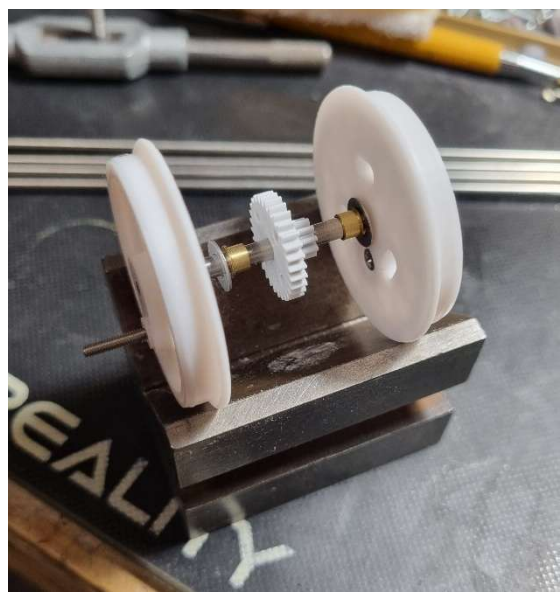
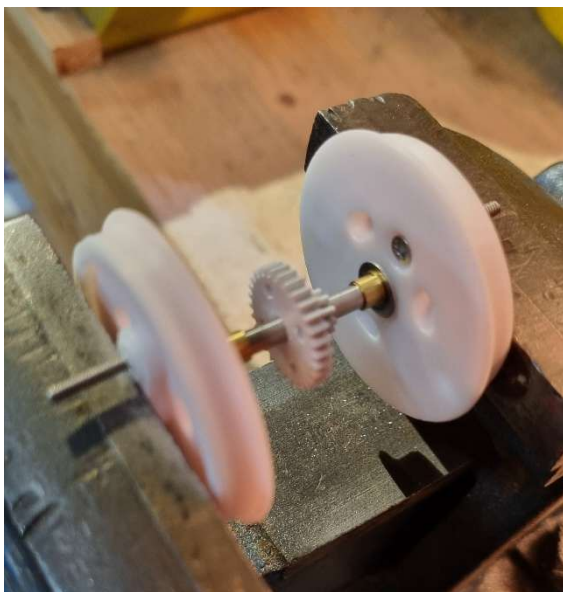
Place both crankpins along the same degrees. We will quarter the wheels shortly.

Care needs to be taken here, a great deal of experimentation has led us to the perfect size bore in the wheel, with the perfect lead taper. PLEASE DO NOT ALTER THE BORE IN THE WHEEL.

The whole assembly should now be placed into a vice and lined up so that the wheels are at 90° to the axle, both while looking from the top and the sides.

Ensure that the jaws of the vice are only touching the wheel centres, and not the raised bosses of the crankpins.

When you are happy, close the vice until the jaws push up against the axle.



Unpainted (for photos only) wheelset in the vice (left), and ready to be quartered (right).

Do the same for the other two driving wheelsets, just no grey drive gear and the shorter crankpins.

Locate the two, wheel quartering jigs, they are two square prints, with the wheel shape recessed into the block.

Quartering is a simple matter of dropping the jigs over the wheels and turning one jig so that it is at 90° to the other. Place the whole assembly on a flat surface to check that they are at 90°.

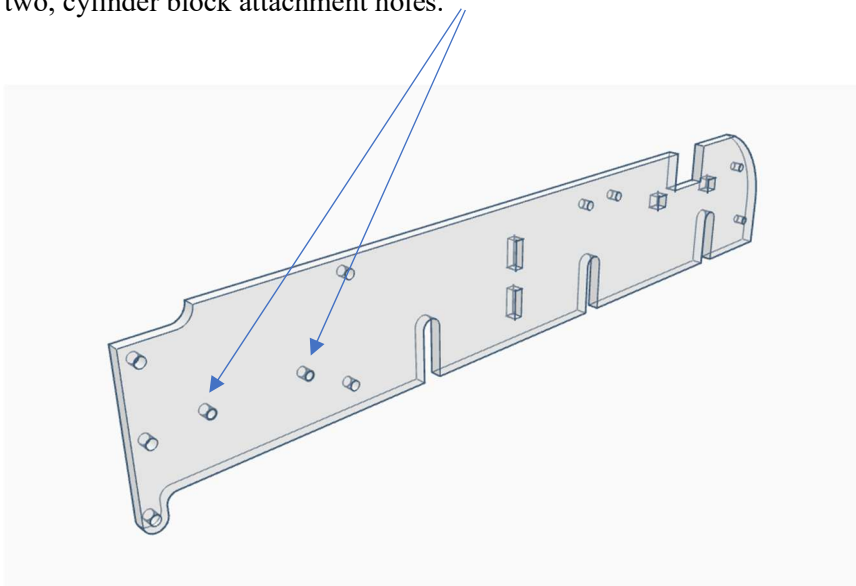
CARE – do not excessively twist the wheels on the axles. If possible, do the process in one smooth movement, then leave alone. Excessive twisting can loosen the wheels.

You should now have three wheelsets.

Let's build the chassis block.

Locate the two 2mm thick acrylic frame plates, and the two 2mm acrylic motion brackets.

You will need to countersink all the 2mm holes on one side of each frameplate, DO NOT countersink the two, cylinder block attachment holes.



WE WANT TO HAVE ALL THE COUNTERSINKS ON THE SAME SIDE AS THE CYLINDER AND MOTION BRACKET.

Attach the cylinders using M2 8mm panhead screws.

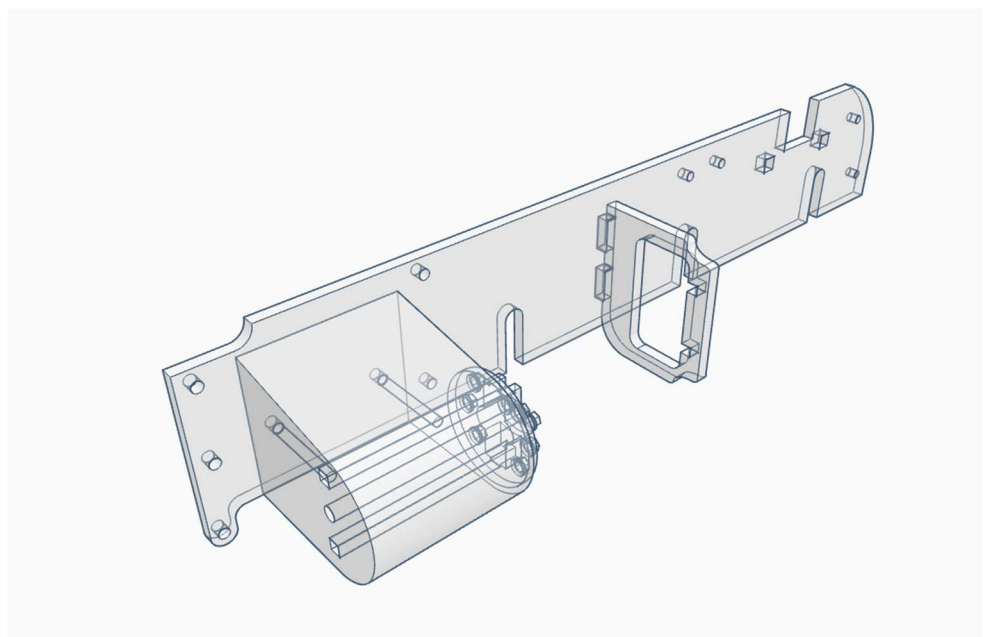
The slope of the cylinder is to the top, the underside, flat.

The cylinders are mirrored, ensure you get the correct cylinder on each frameplate.

Glue (use a liquid glue) the motion bracket to a frameplate. Ensure the motion bracket is the correct way up (see image)

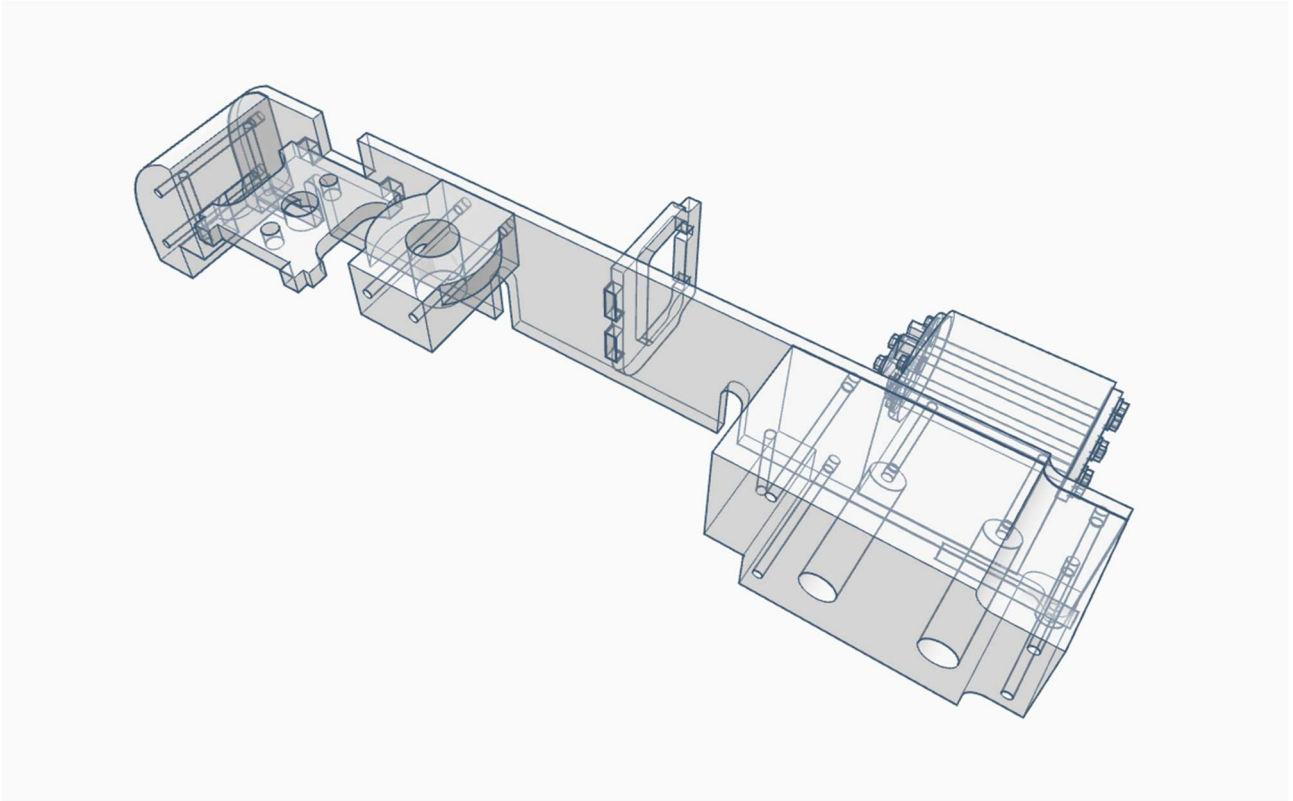
Ensure a 90° angle between the motion bracket and the frameplate.

Do the same for the other side, remember to “mirror” the two frameplates.



Next, we need to attach the stretchers, motor mount plate and the centre (pivot) stretcher.

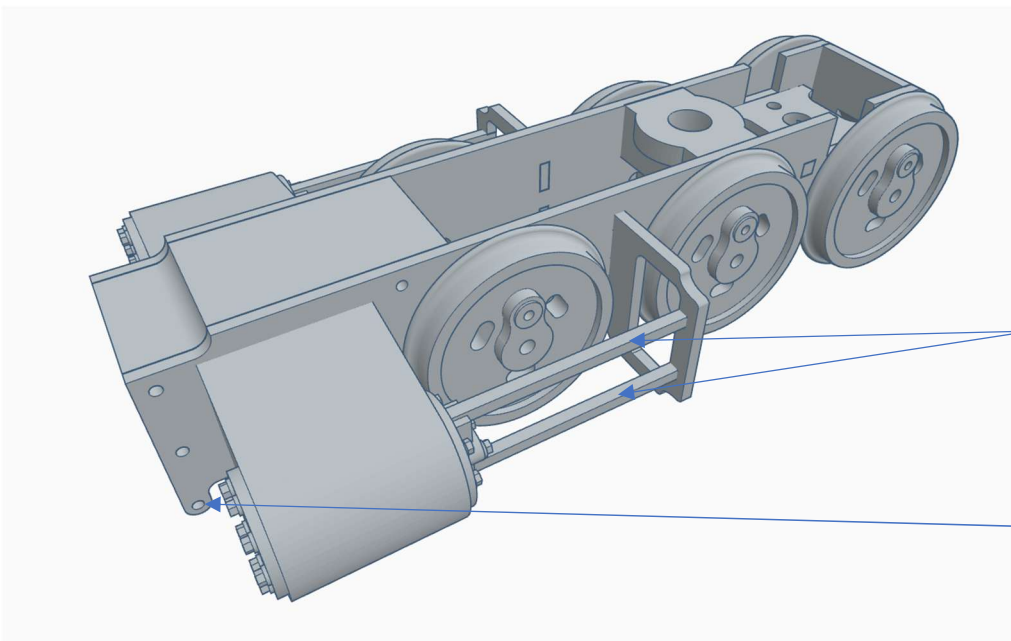
The stretchers are all attached using M2 8mm conehead screws. They need to be countersunk into the frameplates to allow the wheels to clear the screwheads. They don't all need countersinking, but it seemed easier to countersink them all that identify those that do!



Attach one plateframe first, then the other.

NOTE – the motor mount plate is simply captured between the frameplates and does not require any screws. The motor mount plate has a slot on one face, this should be placed downward, as it allows the grey drive gear (on the rear wheelset) to clear the motor mount plate.

With the chassis block assembled, the wheelsets can be dropped into place. The lip of the top-hat bushes siting between the washer and the outside of the frameplate.



The retaining plate will hold the wheelsets in place. Use M2 8mm panhead screws to hold the retaining plate

Cut the 2mm square brass rod into 50mm lengths and push each 50mm length into the cylinders to create the slidebars.

You can fit a length of 2mm round brass through the frames at the front of the bogie, if you wish.

Let's fit the motion.

You need two coupling rods (couples the wheelsets), two connecting rods (connects the wheel to the piston rod), & two crossheads.

You will need two M2 nuts, 8mm conehead screws & steel washers.

Start by screwing the 8mm conehead screws into the connecting rod, there is a countersink printed into the rod. This part fits into the back of the crosshead and should be a nice loose fit.

Opening the hole in the crosshead accept the 2mm brass piston rod. The rod will need cutting into two 30mm lengths. Make sure the end of the rod is nice and clean with no sharp edges.

I opened the hole in the crosshead with a 2mm drill bit. Push the rod in as far as you can. But do not obstruct the bore for the connecting rod.

Nearly there, one last fiddly bit!

Locate the six ABS crankpin sleeves. These have been cut to the correct length for your crankpins, there are two different lengths, the short ones are for the short crankpins, the longer ones for the long crankpins!

The sleeve fits over the crankpin, and the rod fits over the sleeve.

The M2 nut captivates the rod while allowing it to move freely on the sleeve.

The bore holes on the rods are reasonably loose on the sleeves, to allow for inaccuracies in the quartering. But still tight enough to give smooth operation.

The sleeve acts as a spacer on the crankpins, and in a moment, you will be able to tighten the nuts against the tubes but allow the rods to remain free.

Offer the coupling rod to all the crankpins on one side of the bogie.

Personally, I add the ABS bush, M2 washer & nut, and tighten the front one first, as it is less accessible under the slidebars.

Annoyingly, on this bogie kit, you will need to place the crosshead onto the slidebars and push the piston rod into the cylinder block; offer the connecting rod up through the motion bracket and attach with a M2 nut...

Do the middle crankpin, then attach the rear of the connecting rod onto the rear crankpin and fix with a M2 washer & nut on top of the coupling rod.

Repeat for the other side.

With all the rods on, you should now have a free running chassis?

If not, try and locate where there is a bind.

Usually it's the quartering, opening out the holes in the rods a little will cure this.

If your chassis is running freely, then attach the motor. There are two 5mm M3 screws to fit the motor.

After much experimentation, I have eliminated the adjustment of the motor relevant to the gears. Just screw the motor to the motor plate and away you go!

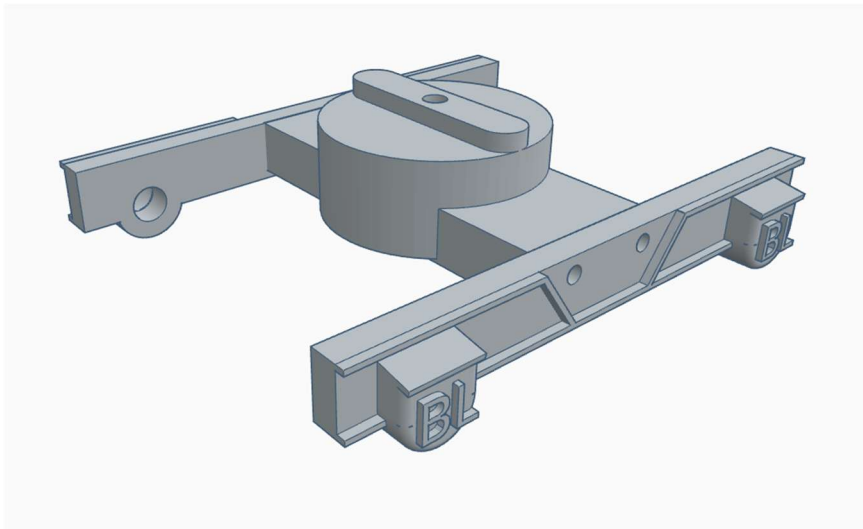
There are two M2.5 5mm screws that should already be in your motor.

The motor is 3-6V and is adequate for "Light Haulage"

A LITTLE OIL ON THE GEARS AND ALL BEARINGS WILL WORK WONDERS FOR THE MODEL LOCOMOTIVE – BOTH FOR SMOOTH RUNNING AND LONGEVITY OF THE GEARS, ETC.

WHILE WE ARE BUILDING BOGIES, LET'S BUILD THE REAR BOGIE

The rear bogie has four top-hat bushes, four Peter Binnie 20mm wheels, three printed parts and two axles.



Press the wheels onto the axles, you need a back-to-back measurement of 28mm (32mm gauge) or 40mm (45mm gauge) between the wheels, and an equal amount of axle showing at each end.

The two frameplates are attached to the crosspiece with four M2 8mm panhead screws.

The top-hat bushes push into the holes on the frameplates.

THE BODY

The locomotive body is broken down into several parts, that primarily all screw together. All these parts can be painted individually, prior to finally assembly.

The Running Plate.

This is a critical aspect of the locomotive, and one that gave me the initial issues when I tried to build a test vehicle.

The primary issue was one of strength from a structure that had a “set” in it.

The end result is almost certainly overkill, with the rear subframe, the boiler and the tanks all adding a structural element to the model

First locate the two 2mm acrylic front footplate parts.

These need to be glued together (liquid glue), the short straight edge needs to be flush, while the other edges need equal overlap all around. If the two do not align perfectly, turn one of them over, the laser cutter struggles to create a perfect 90° angle.

Second is the rear footplate, this will need holes countersunk, on both sides.

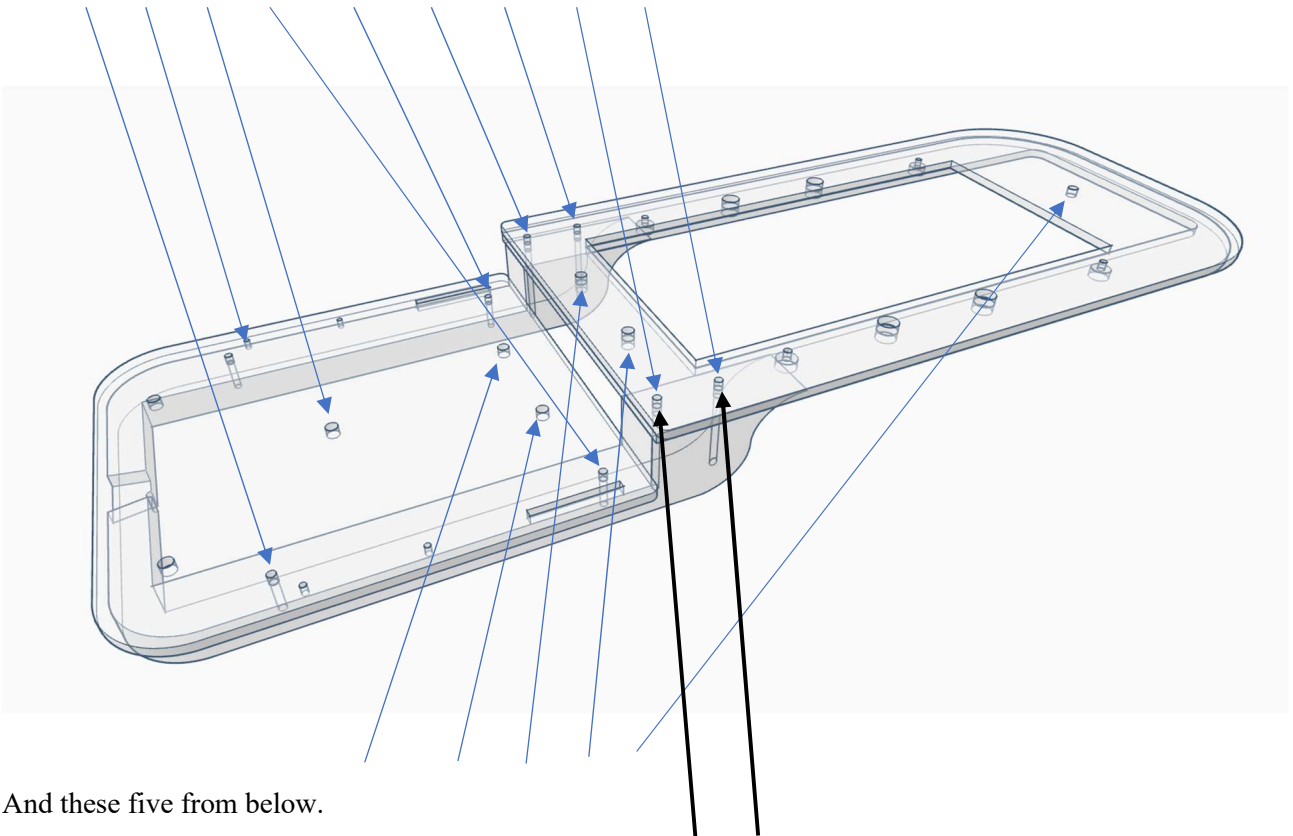
Finally, the rear subframe.

The rear subframe is attached to the rear footplate with M2 8mm conehead screws, through the footplate and into the subframe underneath.

We also need to countersink some of the holes on the front footplate, all these countersink holes are indicated on the image below.

You'll notice the use of conehead screws to ensure clearance of other parts.

Countersink all these holes from above.



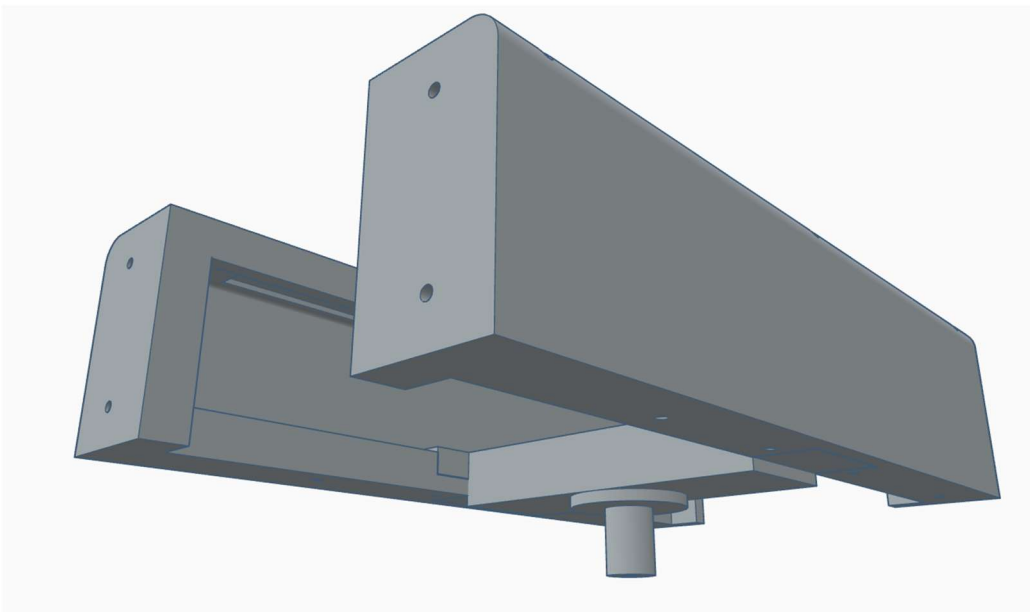
And these five from below.

THE REAR SUBFRAME IS SECURED TO THE FRONT FOOTPLATE FROM THE TOP OF THE MODEL THROUGH THE FOOTPLATE INTO THE SUBFRAME USING x4 M2 16MM CONEHEAD

OK, That's the tough part!

The tanks first, these are secured to the running plate with M2 8mm panhead screws.

The tanks also hold the bogie carrier plate in situ, the carrier plate is attached with M2 8mm panhead screws and are driven up from underneath through the tanks and into the carrier plate.



The tanks have holes in the top for tank fillers at the front, and a switch on the left tank top at the rear.

The right tank has a hole for a battery charger, if you choose to fit one.

The holes in the rear are to attach the cab and are fitted from the cab prior the fitting the bunker.

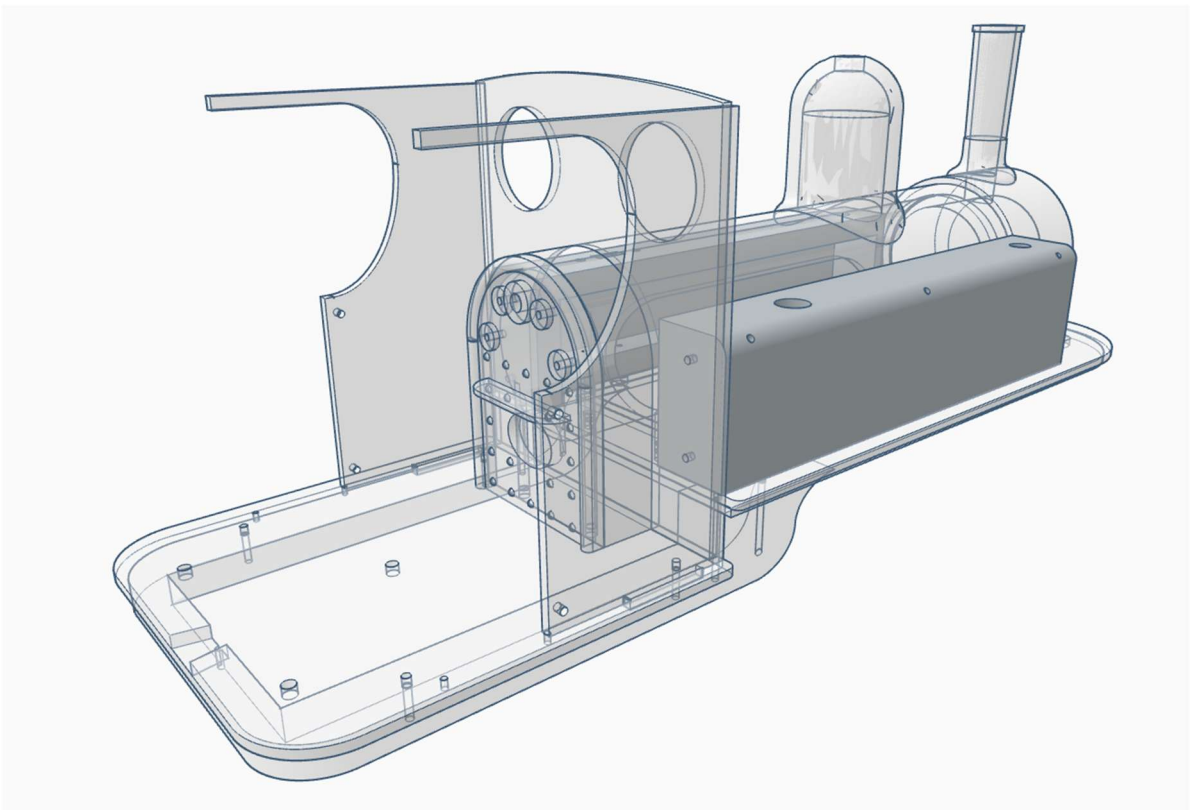
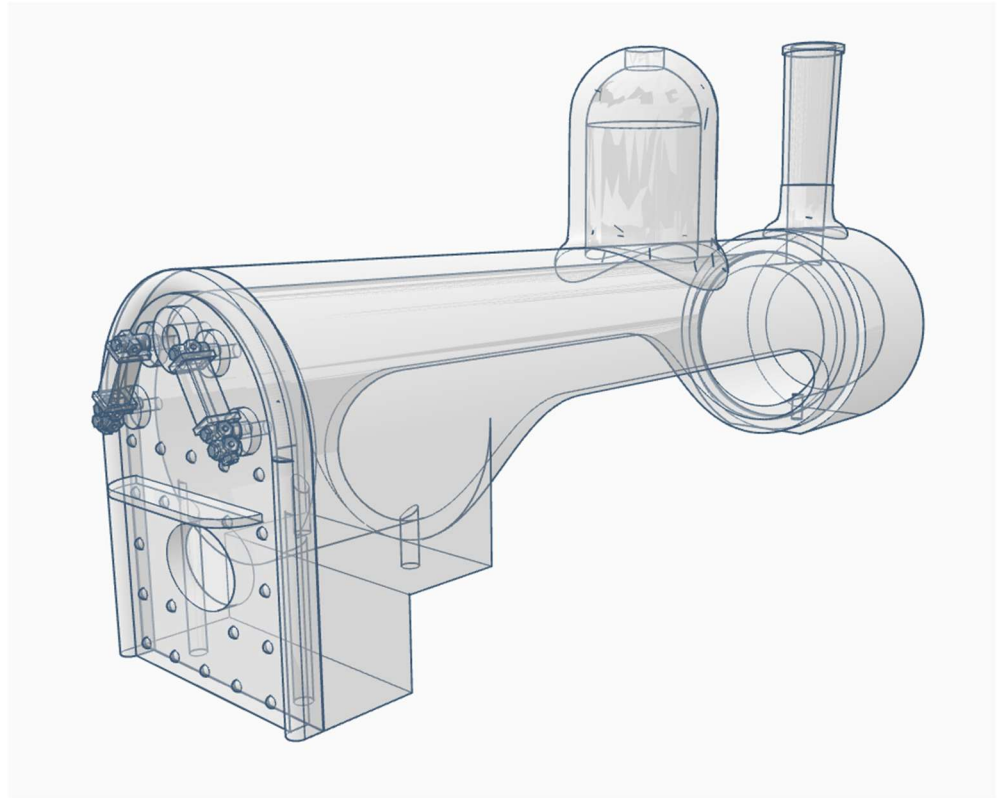
THE BOILER

The boiler is in a few parts, primarily the barrel and smokebox.

There is also a rear firebox part, and a surround, for the firebox. It has been printed separately so you can paint the parts separately.

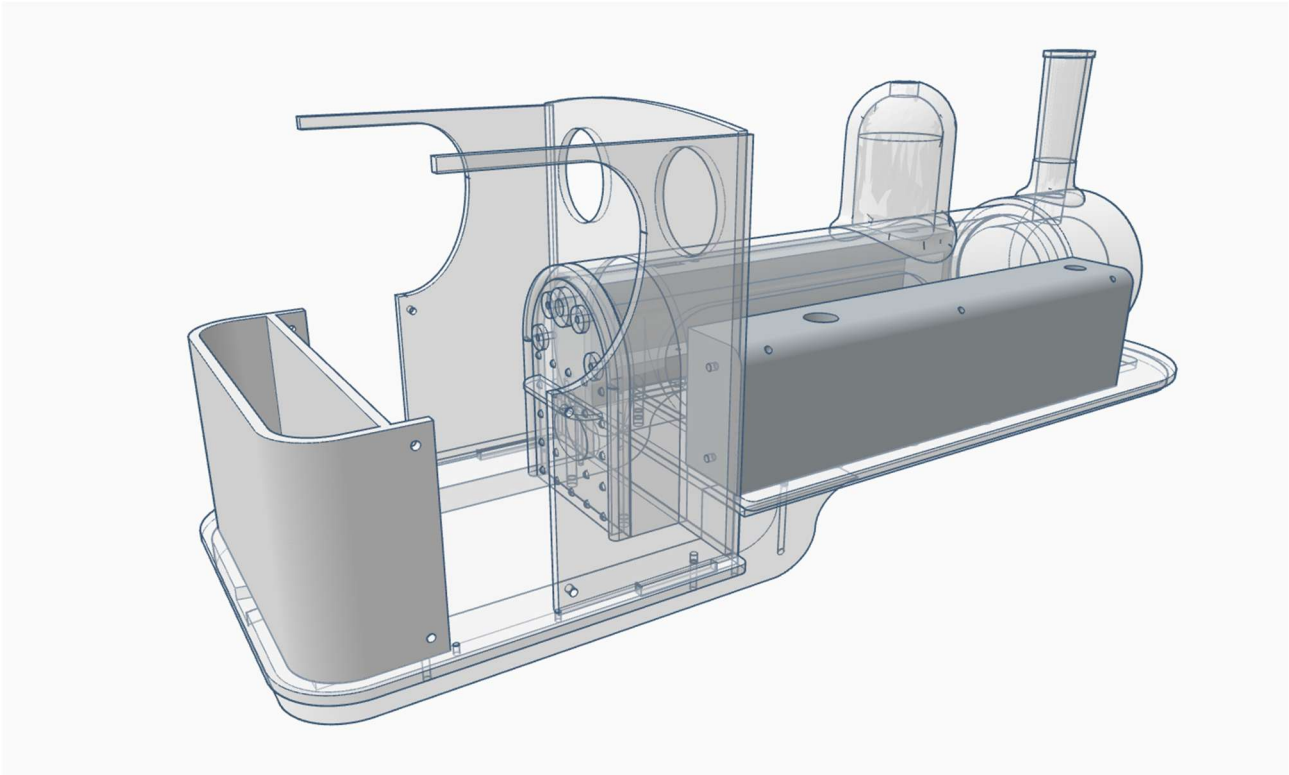
The barrel and smokebox are a push, and both are attached to the running board from underneath using M3 10mm conehead screws.

The image also shows the two, gauge glasses on the rear of the firebox.



The cab is built up from three pieces of 2mm acrylic and locates into the rear footplate.

It is secured to the rear of the tanks with M2 8mm panhead screws.



The coal bunker is attached from below the rear footplate using two M3 10mm panhead screws, it should be the final part of the body to be assembled as you can't reach the cab screws with the bunker in place, and the cab needs to go on after the boiler and tanks are in situ.

The rear bogie is attached with a M3 10mm conehead screw.

The power bogie is attached with a M3 10mm panhead screw from underneath the locomotive. There is a large, printed washer that needs to go on the screw first.

Sorry, it's a real pain to get in, the central axle is in the way!

THE CAB ROOF

The cab roof is built up from a filament printed frame, and a 0.5mm piece of cut styrene.

The two should be glued together, I usually support the outside edges on a couple of strips of wood and use a weight in the centre to get the shape while the glue sets.

Two rain strips are created by using the length of 1mm styrene strip provided. Attach along the outside edge of the roof.

OTHER DETAILS

Other details include a smokebox door & handle. Two FR style sandpots. Chimney & dome.

Two toolboxes, one fits over the switch and slides along the tank!

Cab detail, firehole door, gauge glasses, regulator, reversing lever & handbrake screw.

Cab beading and coal bunker beading.

Windows and window frames.

There are also a number of resin printed handrail knobs.

There are two long handrails along the tank tops, FR Fairlie style. And two each side of the cab.

There is enough 1.5mm brass rod for all these handrails.

There is a resin printed buffer for the front bogie, and two halves of a rear buffer/coupler.

Glue these together and slide into the slot in the rear subframe at the rear of the model.

An electronic copy of these instructions can be found at -
www.bootlane.org.uk

Andrew & Jacqui

www.bootlane.org.uk

sales@bootlane.org.uk

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