



LEO

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 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. For best results, clean these with an abrasive prior to painting and rubbing down.

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 ridge off with a file, or very carefully with a knife!

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 painted to stop the hardening process.

CHASSIS

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

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

OK, let’s jump straight in!

This is a long description, but bear with me. If we can get this right, everything else will fall into place and your model will run like a dream...

Locate the two cylinder-blocks, they are marked with a “L” & “R” as they are handed due to their slight inclination. Attach the front cylinder covers, and top steam chest covers.

Attach the left-hand cylinder to one acrylic frame using two 8mm M2 screws. I have designed most of the chassis to accept the 8mm M2 screws as self-taping, some of the holes may require opening slightly to get the screw started.

Now locate the left-hand motion bracket.

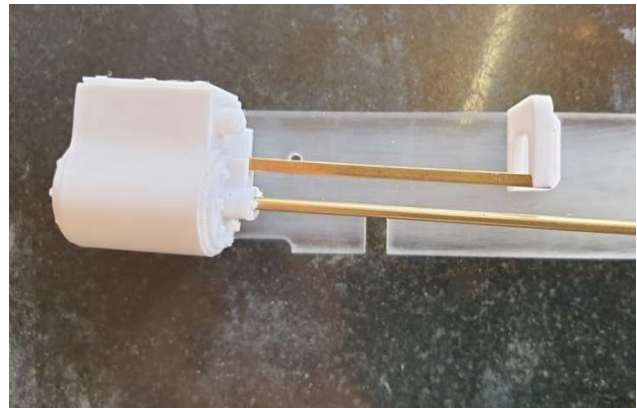
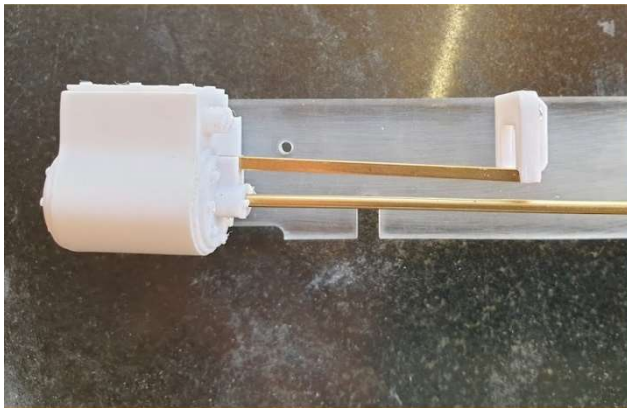
These are also handed; ensure you have the correct one. The flat (build plate) side, facing toward the front of the locomotive. The detail (recessed area) facing the rear.

You will also need the two 2mm brass square sections and the 2mm brass rod.

The brass square section needs to be approximately 50mm in length, you can trim them once you know exactly how they fit.

With the motion bracket attached to the frame, fit the slide-bar into the cylinder-block and motion bracket.

You need to ensure the cylinder-block is at the correct inclination. Slide the 2mm rod into the cylinder-block and adjust the cylinder-block (loosen the two screws) so that the rod is parallel to the bar. *(Note – images below are of our Clara kit, but the principle is the same)*



Locate the two frame stretchers and the motor-plate. The longer stretcher at the front, simulating the well-tank.

Using three 8mm M2, attach the motor-plate to the end of the rear stretcher. They only go together one way!

Now screw the motor-plate and rear stretcher to the rear of the frame and the other stretcher to the front. The front stretcher has holes to clear the cylinder-block screws.

Attach the right-hand cylinder-block & motion bracket attached to the other frame and fix the frame to the stretchers.

Looking good so far?
Let's do the wheels!

There are eight printed inserts for the Binnie wheels, two inserts for each wheel, one with a hole for the crankpin and the other, a counterbalance weight. The inserts push into the wheel from the front and are a good tight fit, but not so tight as to push the wheel out of shape! I found the best way to fit the inserts is to offer them both to the wheel (they have very slight tapers to help you get started).

With the two inserts in position, place the wheel and inserts into a vice and squeeze the whole assembly together.

Do this for all four wheels. You may wish to tidy the wheels a little at this stage. Binnie wheels tend to have slight flash marks on the flanges, part of the injection process. I use a file to tidy up the wheels.

Next, add the crankpins. There are six conehead screws in total, 2x 16mm, 2x 12mm & 2x 10mm.

The 16mm screws for the rear wheels (for connecting & coupling rods).

The 12mm screws for the front wheels (coupling rods only).

The 10mm screws for the crossheads.

Do the rear wheelset first.

You will need two wheels, two 16mm conehead screws, the $\frac{1}{8}$ inch axle with the gear and two brass top-hat bushes.

Screw the 16mm into each insert.

Slide a bush onto the axle, the lip of the top hat towards the outside, or wheel.

Next, start pushing a wheel onto the axle. *I use my taper reamer to open the hole in the wheel very slightly, to create an easier start.*

Repeat for the other side, then using your vice, squeeze the two wheels on the axle.

We are looking for a "back-to-back" measurement of 28-29mm. *This means the distance between the back of the two wheels.*

Now do the front wheelset. Remember, the 12mm conehead screws, and you should have the $\frac{1}{8}$ inch axle with no gear. Don't forget the bushes.

Good.

Let's quarter the wheels.

This is easy, don't get worked up over it...

Locomotive driving wheels are quartered. That's to say, the cranks are at 90° to each other. Both wheelsets must be quartered identically to each other. Here's how we are going to do it.

Although the wheels are tight on the axles, they can be twisted. Try it.

Move the wheels around so they are approximately 90° to each other.

Now place one wheelset in the vice so that the jaws grip the edges of the inserts. The rest of the wheelset pointing upwards.

Ensure that whatever you do, repeat for both wheelsets...

I placed my wheelset in the vice, jaws gripping the inserts and the lower crank towards my left, then I twisted the top wheel around so that it's crank was at the top of furthest away from me.

With the lower wheel firmly in the vice it is easy to look over the top and see if the top wheel is at 90° to the bottom!

That's it, repeat for both wheelsets. Check your back-to-backs, and then your quartering again.

The wheelsets will now drop into your chassis.

The lip of the bush should sit outside the frame and is kept place between the wheel & the frame.

Locate the printed retaining plate. This plate will may require cleaning to fit?

It sits in between the frames and screws to the bottom of the stretchers. The plate follows the shape of the frames, and its purpose is to keep the wheelsets in place, pushing up against the bushes.

Once you have ensured a comfortable fit and fixed it into place, try your chassis for free running.

We're on the home stretch now!

Let's fit the motion.

We have supplied a few extra parts in your kit, I found the crosshead can split, so you have spares and I've included a spare set of coupling rods.

You need two coupling rods (couples the wheelsets), two connecting rods (connects the wheel to the piston rod), & two crossheads. The crossheads are paired, make sure you identify a pair!

Technically, these are not crossheads as the loco only has one slide-bar, but...

You will need two M2 half nuts, 10mm conehead screws & steel washers.

Start by screwing the 10mm conehead screws into the connecting rod, there is a countersink printed into the rod. With the screw in place clean the printed area around the screw. This part fits into 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 35mm lengths. Make sure the end of the rod is nice and clean.

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.

With the piston rod in place, push the connecting rod into the crosshead and using a washer and nut, tighten the whole assembly.

You should find that the rod and crosshead remain nice and loose, but firmly attached to each other? Repeat for the other side.

Nearly there, one last fiddly bit!

Locate the four ABS crankpin sleeves. These have been cut to the correct length for your crankpins, there are two 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.

An M2 washer fits on the end of the sleeve and 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.

The piston rod will need pushing into the cylinder and the assembly rotating until the crosshead lines up with the slide-bar.

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

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

Possibly the quartering, or is something fowling, or is one of your spacer tubes too short and causing an issue?

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

Try and allow a little play between the worm and gear. Do not push them too tightly together as this will wear the worm down. A little play here is a good thing.

Having said that, if the two are too far apart the gear will strip the worm...

BODY

It's all straight forward from here on in...

Seriously, you've done the hard part.

The cab is built up from the cab sides, rear sheet, front sheet & floor.

The rear sheet fits into the floor. However, the front and sides locate over the floor, the sides over the floor being to the inside of the cab sheets.

I placed the holes for the switch in the floor on the left of the locomotive and hide the switch the printed bunker.

There is a tiny hole in the front cab sheet, this needs to be on the right-hand side of the engine.

There are five pieces of 1mm acrylic beading that attach to the rear cab sheet, the sides & front. See images.

There are two printed window frames, these push into the front cab sheet from the outside, and two 1mm acrylic window glasses, that fit up to the window frames from the inside of the cab.

The cab is screwed to the rear stretcher using 2x M2 8mm screws.

The roof is formed of the printed frame and the 0.5mm styrene sheet. I suggest gluing these two together prior to fixing the cab. The roof was the last part I added to the production model!

The buffers are mounted onto the buffer-beams with two M2 screws that tap into the stretchers.

The boiler and smokebox are a one-piece print, that will (with a little cleaning) fit into the firebox.

The firebox is attached to the chassis with a M3 screw from below. The screw self-taps into the firebox. There are two water gauges & a fire hole door to detail the firebox.

The boiler & smokebox are fitted to the chassis with another M3 screw. This screws up from underneath again, through the stretcher, smokebox saddle and finally taps into the smokebox.

Other detail includes a smokebox door & dart, water tank fillers (*one either side of the frames, this is a well tank locomotive, the water is stored between the frames*), two leaf springs for the front wheelset (*the original engines had three springs, two on the front axle, and a single transvers spring on the rear*), a chimney, dome & steam pipe assembly. I wrapped twine around the steam pipes to denote lagging!

There is a length of 1.5mm brass rod to attach the regulator and reach back to the cab, remember the small hole in the cab sheet.

A PDF copy of this document can be downloaded from – www.bootlane.org.uk/instructions

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I have added a whole range of images below, it seemed easier than trying to place them in the text?

