



## LILIBET

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.*

*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.*

### ***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***

## 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...

*IF YOU HAVE PREVIOUSLY BUILT A CLARA OR LEO FROM BOOT LANE WORKS – NOTE THAT THERE ARE A FEW SUBTLE DESIGN ALTERATIONS WITH THIS KIT*

Locate the two 2mm acrylic frames. Be careful with these frames, the strength comes from the frame stretchers.

Locate two 2mm acrylic motion brackets and using liquid or super glue, attach the brackets to the frames. Use a square to ensure the bracket is 90° to the frame.

**ENSURE YOU HAVE ONE LEFT & ONE RIGHT FRAME WHEN COMPLETE.**

Now locate the two cylinder-blocks, they are marked with a “L” & “R” as they are handed due to their shapes.

*Ensure the 2mm brass rod will slide freely into the block - run a 2.5mm drill down the piston-rod hole to ensure there are no obstruction and the brass rod runs freely in the bore.*

Attach the front cylinder covers to the cylinder blocks.

Attach left cylinder-blocks to the left 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.

Repeat for the right-hand side.

You will also need the 2mm brass square sections.

The brass square section needs to be approximately 50mm in length, you can trim them once you know exactly how they fit, although there is plenty of excess space in the cylinder block to accept any spare brass rod.

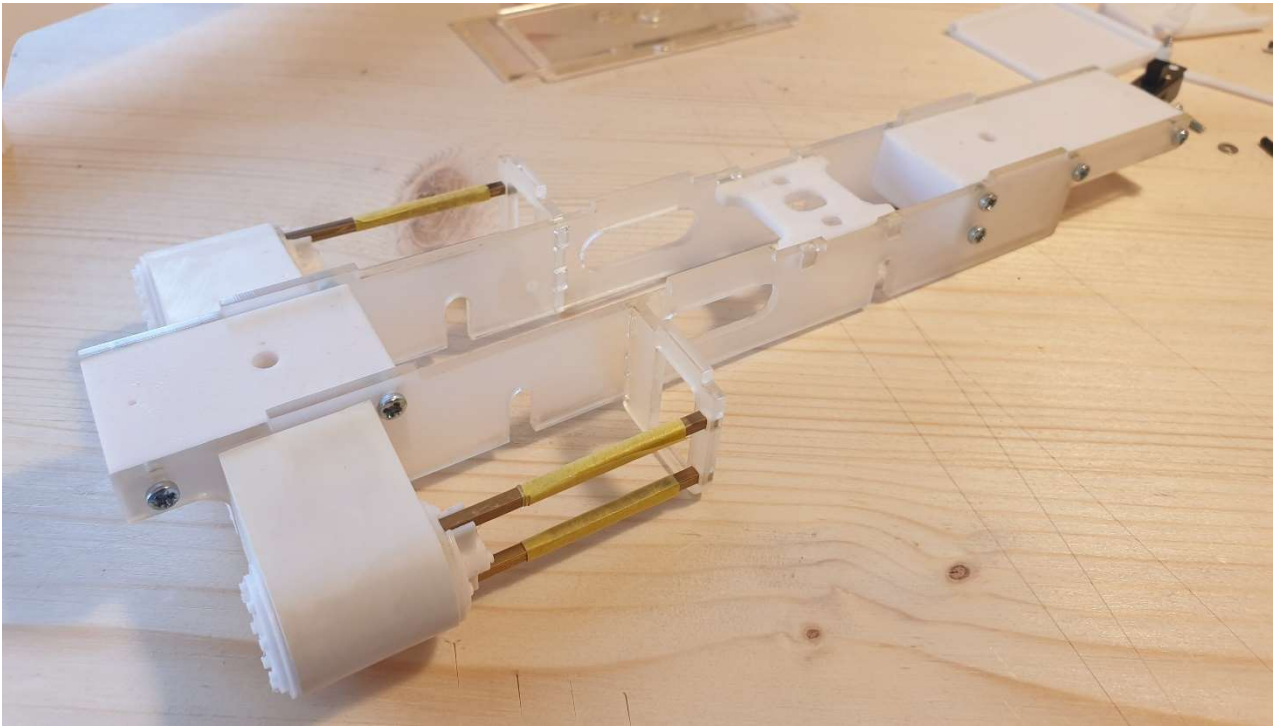
With the motion bracket attached to the frame, fit the slide-bars into the cylinder-block and motion bracket. Ensure the cylinder-block and slide bars are parallel to the frame. Loosen the cylinder screws slightly, if necessary to create a good alignment.

Locate the two frame stretchers and the motor-plate. The longer stretcher at the rear.

In a slight departure from CLARA & LEO, the motor-plate is now sandwiched between the frames and located using lugs & holes.

Attach one of the frame & cylinder-block assemblies, to the front stretcher, and then repeat with the rear. Once you are happy that everything is square, attach the other frame & cylinder-block assembly.

Don’t forget to sandwich the motor-plate between the frames, the slot on the face is to clear the drive gear on the wheel axle and should face the axle.



*This image is of DRAGONFLY'S chassis with frames, cylinders, slide-bars (2mm square rod), motion brackets, stretchers & motor-plate. But the construction of LILIBET is almost identical.*

**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 its 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 should 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 and a spare connecting rod.

Mostly because the rods are very fine...

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 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 25mm 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.

Once you are happy that all is free running, add a tiny amount of super-glue or Loctite to the ends of all four crankpins to ensure they cannot come loose in operation.

Next 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 to tightly together as this will wear the worm done. 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 DETAIL**

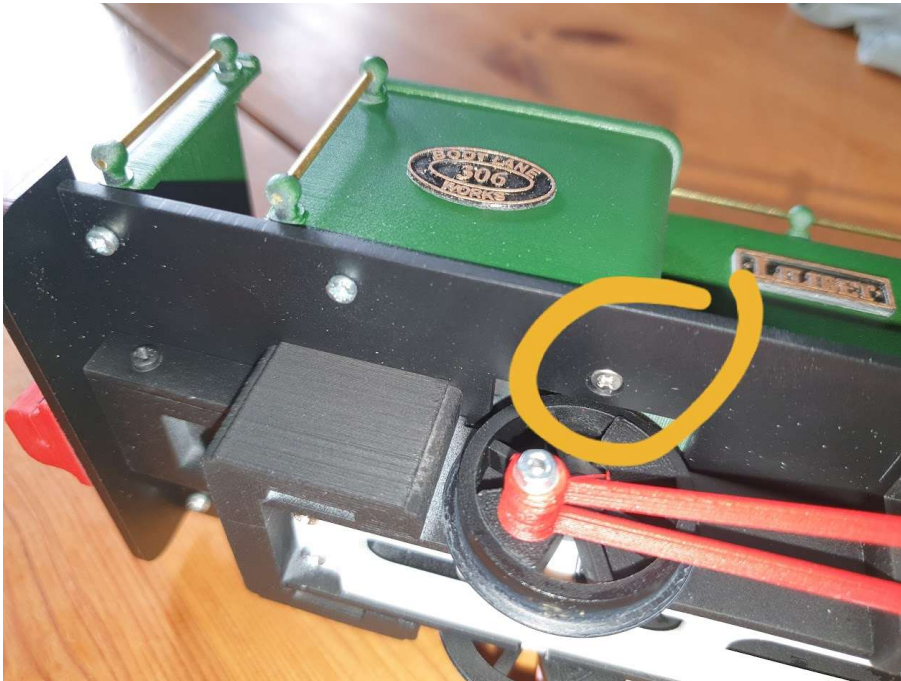
*LILIBET is inspired by the early Manning Wardle and Neilson Company locomotive builders, there is no specific prototype.*

*We have attempted to create a narrow-gauge locomotive from the 1860s period.*



## FOOTPLATE

The footplate is cut from one-piece 2mm acrylic and locates on the frames and stretchers. There are holes and slot to attach the included switch, should you desire.



The footplate will require two holes to be countersunk. The two foremost holes that attach the leading edges of the bunkers will need countersinking to accept the two 10mm conehead M2 screws.

This countersink allows for the rod bearings to clear the footplate. A panhead screws used on the rear of the bunkers and rear cab-sheet, would foul the rod ends

## BOILER

The boiler is built up from three parts, the smokebox, barrel & firebox. The topside of the barrel is clear for your electronic equipment (as is the saddle-tank).

The smokebox & firebox are the main fixing points for the boiler.

Two M3 16mm screws come up from underneath and tap into the smokebox and firebox.

A smokebox door has been supplied, in keeping with the 1860s feel of the model.

The firebox is detailed with a regulator, firehole door & gauge glass. While a small safety valve sits on top of the firebox.

The models' frames run the length of the engine and we have supplied a false lower firebox. This is printed in such a way as to just sit over the frames.

## TANK & CABSHEETS

The saddle-tank locates over the boiler barrel and has a locating lug at the rear to keep it from moving during operation. It should be easily removable to allow easy access. It has holes to take the water filler and six handrail knobs.

*The handrail knobs are resin printed and accept the 1.5mm brass rod supplied.*

The rear cab-sheet and bunkers also have handrails (& knobs) and are secured in place from the underside of the footplate with four M2 8mm panhead screws and two M2 10mm conehead screws as described earlier in the text.

NOTE – The bunkers are handed, the left-hand bunker has a hole in the base to allow for the switch. The switch will need to be fitted to the lefthand side of the model.



## DETAILS

The chimney is obvious (I hope?)

Two wheel-splashes are supplied for the front wheels, the two rear splashes are part of the bunker print.

The buffer-beams are cut from 2mm acrylic and are held in place by the buffers which are secured to the stretchers with four (two each end) M2 8mm panhead screws.

My own personal choice of paint is Halfords rattle cans, use a primer and a topcoat. Be sure to prepare the surfaces, wet & dry is great when used with water on the filament printed areas. The chimney can be easily mounted in a small lathe (if you have access to one) and lightly cleaned with wet & dry, prior to painting.

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

A PDF copy of this document can be downloaded from –  
[www.bootlane.org.uk/instructions](http://www.bootlane.org.uk/instructions)

*Andrew & Jacqui*

*[www.bootlane.org.uk](http://www.bootlane.org.uk)*

*[sales@bootlane.org.uk](mailto:sales@bootlane.org.uk)*

*Find us on Facebook – Boot Lane Works Community*

