

## PO WAGON SPRINGING AND UNDERFRAME DETAILING KIT FOR GLOUCESTER WAGONS AND OTHER BUILDERS WAGONS

Based on an original design by Martin Finney

### INTRODUCTION

These subframes have been designed to fit under Slaters, Cambrian and Parkside pre-1923 private owner wagons although they may be used for other manufacturers' and scratchbuilt PO wagons (Brassmasters produce further subframes for post-1923 PO wagons). They provide an easy to assemble sprung subframe and include full single-sided or independent double-sided brakes with a choice of brake levers and brake lever guides. **They are not intended for wagons with a cross shaft between the V hangers.** Also included for the body are coupling hooks, coupling hook plates and washers for the outer ends of the buffer housings (who hasn't managed to lose these from the plastic kits!).

When building private owner wagons, reference to 'The 4mm Coal Wagon' by John Hayes, published by Wild Swan and still available (September 2018), is always useful.

### CONSTRUCTION

Open out all holes to the required size as shown in these instructions. For small components this is often easier to do before removing the component from the fret.

Some embossing of rivets is required and again for small components do this before they are removed from the fret.

Most folds are through 90° and always with the etched fold line on the inside of the bend.

### WAGON BODY



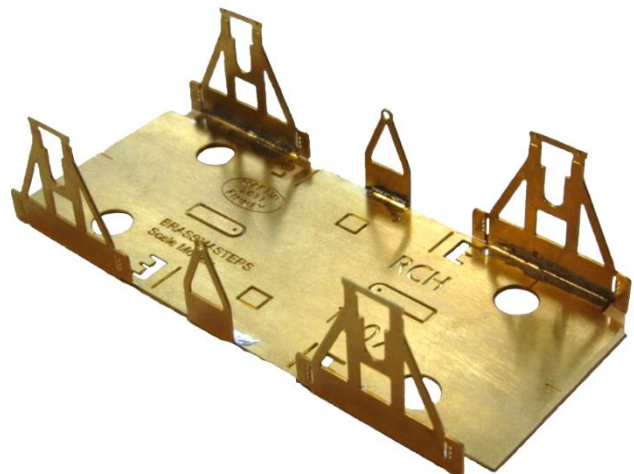
The underside of the wagon floor **must be flat**. For Slaters and Cambrian wagons this means removing all the moulded frames from the floor moulding. If building a new kit an alternative is to turn the floor moulding upside down or replace the floor with a new one from plastic card and don't attach the solebars until the subframes have been bent up to be used as a spacer. The solebars should be modified either by carefully removing the spring and axlebox moulding along with the 'W' irons, leaving the spring saddles in place on the solebar. Store the removed parts for use later.

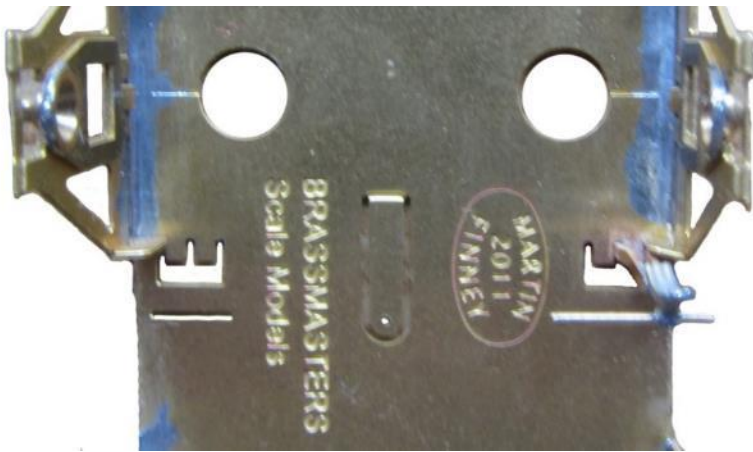
### UNDERFRAME

Before starting, decide if your wagon will have brakes on one side only or on both sides. Also, if only one side, determine which end will have the brake handle (on wagons with end doors, it is normally the end with **no** door, but there are exceptions – check photos if possible). If building a wagon with only one side brakes **DO NOT** break off the unwanted brake shaft V hanger until the brakes are completed.

Using a 0.35mm drill open out the holes for the suspension spring wires in the subframe [U1]. If you use Alex Jackson couplings similarly open out the holes in the fold up the brackets in the middle of the subframe. Open up the holes in the brake shaft V hangers to clear 0.8mm brass wire.

Fold up the W-irons and both brake shaft V hangers on the subframe [U1] and check they are at right angles to the base. Strengthen the fold with a fillet of solder. Fold over the W-iron keeper plates at the bottom of each W-iron.





Fold the eight suspension brackets at right angles to the W-irons. Where the brackets are adjacent to a brake hanger position they will need to be bent a little further (see photograph). If appropriate fold the Alex Jackson coupling brackets and strengthen with solder.

Take the bearing carriers [U2] and solder in the four waisted bearings. Make a slight bend in the centre 'finger' of the bearing carriers shown in the photograph. Cut the spring wire to a length of 15mm and solder in place. (The spring wire may need reducing at one side of the carrier later to clear the back of the sprung buffers, if fitted.)

Now assemble the bearing carriers and wheel sets as shown and check the suspension works freely. There are three holes in each suspension spring bracket to enable the final ride height to be adjusted. Nominally this is the centre hole, but this can be adjusted the wagon is completed and weighted.



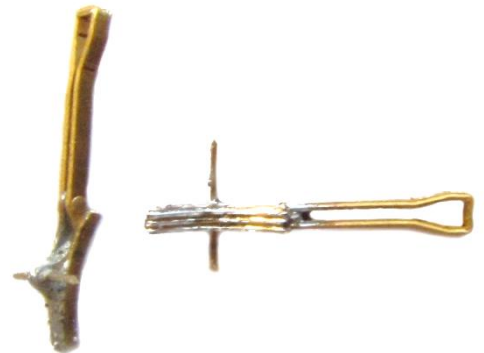
## BRAKES

Depending whether you are building the wagon with brakes on one side only or both sides take two or four of the brake block and hanger etches [U3], drill out the holes in the centre of the brake blocks 0.35mm and push through the half-etched holes at the joint between the brake hanger and brake block. Then open out the hole in two or four brake block centres [U4] to 0.35mm.

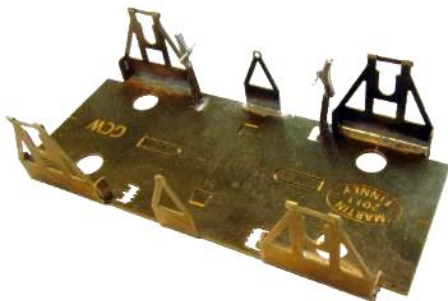
Carefully bend the brake hangers, as shown in the photo, at the half-etched marks on the inside and outside of the etch. It is essential that when a piece of 0.3mm brass wire is passed through the two holes in the middle of brake block it is parallel to the top, so don't be afraid to persevere until it is.



Mount a brake block centre [U4] between the brake blocks with a piece of 0.3 wire protruding from both sides, align the brake block centre with the brake blocks and solder together. Leave the wire protruding from each side. Repeat for the other brake block hanger assemblies.



Solder the brake hanger assemblies in place in the 'E' shaped openings in the subframe floor, the outer slots for P4 and EM, the inner ones for 00. The floor will now need to be recessed to clear the brake hangers where they protrude above the subframe floor. This is done using a large drill rotated in the fingers.



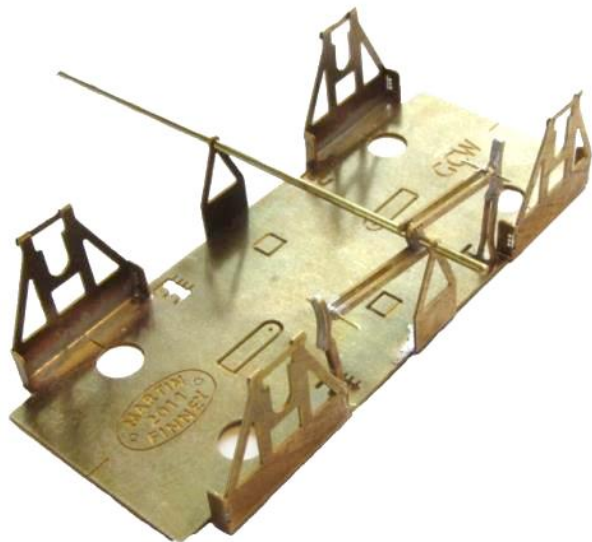
Open out the holes in the end of the push rods [U5 and U6] to 0.35 mm and the hole in the centre to 0.8 mm. One pair of push rods are required for a wagon with brakes on one side, two pairs for a wagon with brakes on both sides. Open out the holes in two of the brake shaft levers [U7] (four for a wagon with brakes on both sides).



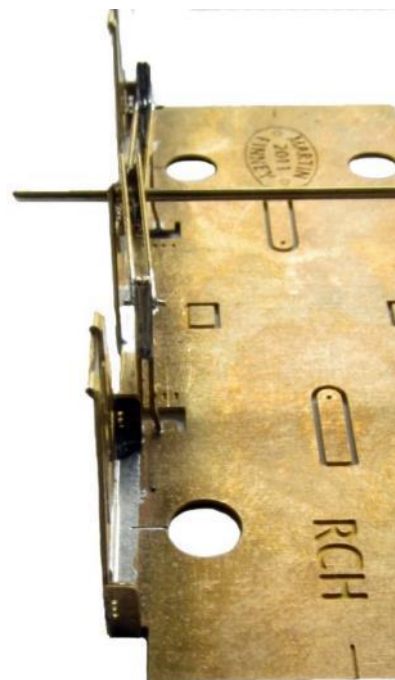
Careful thought now needs to be given to the assembly of the brake gear to ensure that it would actually work if fitted to the prototype. This means that, when looking from the side, the right-hand push rod is above the brake shaft and the left-hand pushrod is below the brake shaft. This is correct for both sides of the wagon if fitting double sided independent brakes and **not for brakes with a cross shaft**

A trial assembly of the brake work is now required.

Take the outer push rod [U5] and bend in the centre, keeping both push rods straight, to form a shallow 'V'. The 'V' should be towards the outside of the wagon. Repeat for the inner push rod [U6]. Push a piece of 0.8mm brass wire through the brake 'V' hanger from one side, then through the inside push rod [U6], then through two brake shaft levers [U7], then through the outer push rod and finally through the other 'V' hanger. Turn the push rods about the brake shaft wire and engage the holes in the end of the push rods over the wire in the brake hangers (it may be necessary to bend the brake block hangers to allow this to happen). The length of the push rods ensure that the brake blocks clear the wheels sufficiently to prevent shorting.



Adjust the bend in the outer push rod so that it just clears the inside of the 'V' hanger, then adjust the bend in the inner push rod to match. Repeat for the other side if fitting double sided brakes. When satisfied, holding the two push rods tight to the brake blocks at one end, solder the push rods to the brake blocks. Repeat for the other end. For double sided brakes, repeat for the opposite side. Finally, push the 0.8mm wire through the 'V' hanger next to the brake push rods so that at least 8mm protrudes beyond the 'V' hanger (on both sides for double sided brakes) then, making sure the two brake shaft levers line up with the half-etched levers on the pushrods, solder the push rods and levers to the brake shaft.



The wire between the 'V' hangers now needs to be removed. For single-sided brakes, snip off the 0.8mm wire just behind the pull rods. **FOR INDEPENDENT DOUBLE-SIDED BRAKES DO NOT CUT THE WIRE WITH SNIPS** as it will distort the 'V' hangers – make the first cut with a saw. The second cut can be made with snips. Again, the wire should be cut back to just behind the push rods.

Finally, cut the 0.31mm wire back to just clear the faces of the push rods.

### SAFETY LOOPS

Earlier wagons were fitted with safety loops of two different lengths, a shorter one at the end where the push rod is above the brake shaft and a longer one at the end with the push rod below the brake shaft. Later wagons had equal length safety loops and also safety loops that were inclined towards the brake shaft. The safety loops provided in the kit cover all these possibilities.



For different length safety loops take one or two safety short loops [U8] and bend at right angles at the two half etched marks in the centre of the loop. Hold one leg of the safety loop below the half-etched mark on the leg in a pair of pliers and twist the leg above the pliers through 90 degrees. Repeat for the other leg. Repeat for the longer length safety loop(s) [U9].

Looking from the side the longer safety loop is fitted to the left-hand push rod, the shorter one to the right-hand push rod. The legs on the long safety loop need to be 10.5 mm long and those on the short safety loop, 10 mm long. Cut the legs to the appropriate length. Solder the safety loops into the slots in the subframe base, towards the outer end for P4 and EM, at the inner end for 00.

For wagons fitted with inclined safety loops, the incline only starts from the twist which is located level with the bottom of the solebar. Bend up the safety loops as before into a 'U' shape and then determine the length of the inclined section. Twist the legs of the loop and then bend them to the required angle. Cut the legs to 4mm from the bend and then solder into the slot in the subframe floor, with the first part vertical.

If fitting sprung buffers to the wagon, now is the time to fit them. It may be necessary trim the spring wires/buffer tails so that the buffer tails do not catch on the spring wire.

Attach the subframe to the bottom of the wagon using epoxy, ensuring that the verticals of the 'W' irons line up with crown plates on the solebars (the upside down 'U' pieces).



The outside 'V' hangers can be attached to the solebars by simply attaching with epoxy or cyanoacrylate. The joints can be strengthened with pieces of wire if required. Take the 'V' hanger [U10] and either push through the rivets using the half-etched holes or, if strengthening the joint with wire, drill out the half-etched holes 0.4mm. Attach the outside V hangers [U10] over the end of the brake shaft and attach to the solebars with epoxy cyanoacrylate glue. If reinforcing the joint with wire, drill through the solebar 0.4mm, insert a piece of 0.4mm wire and trim just proud of the 'V' hanger to represent the fixing bolts.



### BRAKE LEVERS AND GUIDES

There are three types of brake lever on the etch, short standard [U11], long standard [U12] and cranked [U13]. Take the appropriate lever(s) and bend to shape as shown in the diagram, using the half etch lines and dots as a guide.

Decide which type of brake lever guide is required, pin type [U14] or ratchet type [U15]. Bend to shape as shown in the photo using the half-etched marks. The bottom bend of the pin type should be bent first round a piece of scrap etch.



Cut the brake lever guide jig [U16] from the side of the etch. The point at the end may need to be removed for some wagons. Open out the large hole to clear the brake shaft and the small hole 0.5mm. place the jig over the brake shaft, align the etched line on the jig with the bottom of the solebar and spot through the 0.5mm hole with a 0.5mm drill. Drill through the sole bar 0.5mm.

Drill through the sole bar 0.5mm.

Push the brake lever through the brake lever guide, mount the brake lever on the brake shaft and then attach the brake lever guide to the solebar with epoxy or cyanoacrylate glue. Solder the brake lever to the brake shaft.



### AXLEBOXES & SPRINGS

It is necessary to open up the back of the moulded axlebox to allow the bearing to move up and down in the 'W' iron. For a new wagon it is better, if the wheelbase of the plastic solebars is exactly 9' (36mm), to leave the axleboxes and springs as part of

the solebar. Carefully cut away the 'W' iron from around the axleboxes and then carve away the remains from the rear of the axlebox and solebar to leave a flat surface. Opening up the back of the axlebox can then be done by carving out with a scalpel and file or by using a bur in a slow running mini drill. If converting an already built wagon, it is easier to remove the axlebox and spring from the solebar by cutting diagonally through each end of the spring next to the spring shoe on the solebar and then cutting through the vertical parts of the 'W' iron next to the solebar. Again, the remains of the 'W' iron need to be carved away from the back of the solebar and the axleboxes and springs. Push the axle box and spring face down into a piece of Blu-Tac before attempting to carve out the back.



Attach the axleboxes and springs with epoxy or cyanoacrylate.



## DOOR BANGS, COUPLINGS AND BUFFER HOUSING NOSE RINGS

The other parts included on the etch are door bangs [U17] coupling hooks [U18 and U19], coupling hook faceplates [U20] and buffer housing nose rings [U21].

There are a multitude of types of door bangs fitted to private owner wagons including various types of wooden block, curved metal stop and spring stops. The type included in the kit can be used for the simple curved type as used by Gloucester C&W or, shortened, by other companies. In the same way as the 'V' hangers, the door ban [U17] can have rivets pushed through using the half-etched indentation or drilled out 0.4 mm. For the Gloucester type bend as shown in the photo around a 6 mm or ¼" drill.



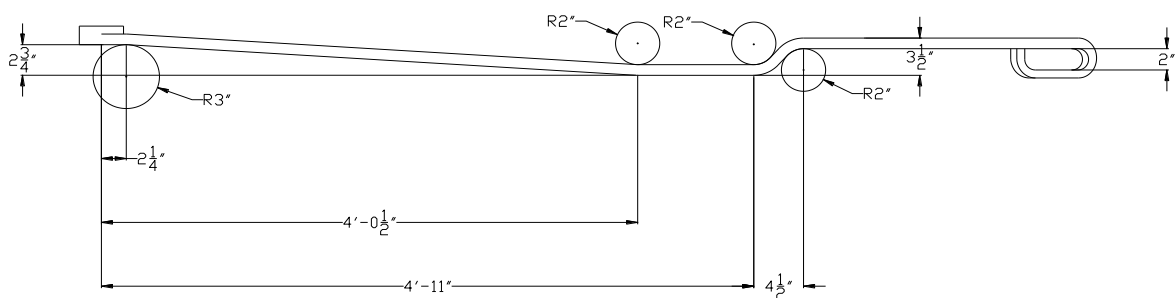
To use the coupling hooks, take one of each hand [U18, U19], bend slightly along the half-etched line and solder together with the half-etched line on the outside. Round the edges of the hook with a file and taper the point of the hook towards the tip. Bend the bent parts back straight and pass the tail of the hook through the coupling hook plate [U20] with the slot towards the bottom of the plate, and solder together. Push the tail of the coupling through a 1.35 mm dia. hole/1.2 mm x 0.6 mm slot in the wagon headstock, bend over the tabs and secure with epoxy or cyanoacrylate. Fit the coupling chain of your choice through the slot in the coupling hook.

The buffer housing rings are to replace any missing rings from plastic kits. Take two of the rings [U21], drill through the centre hole to clear 1.0mm and solder together. Push the assembly onto the end of a rat-tailed file and round the edges of the rings. Mount on the end of the buffer housings with epoxy or cyanoacrylate.

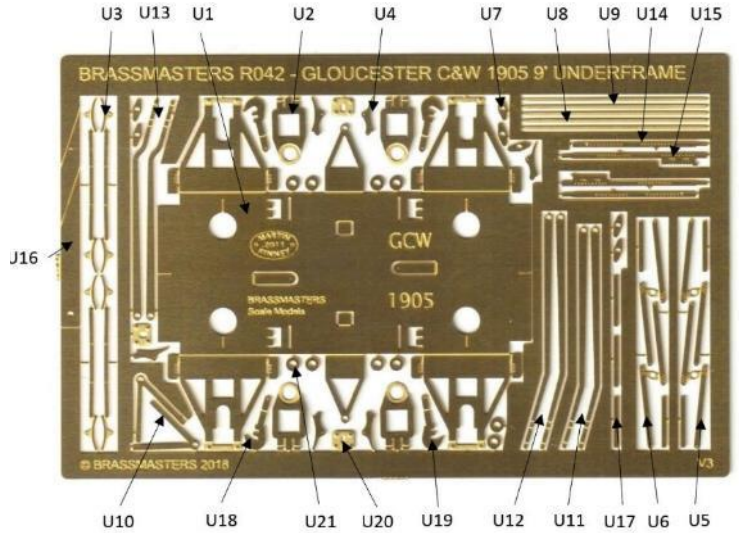
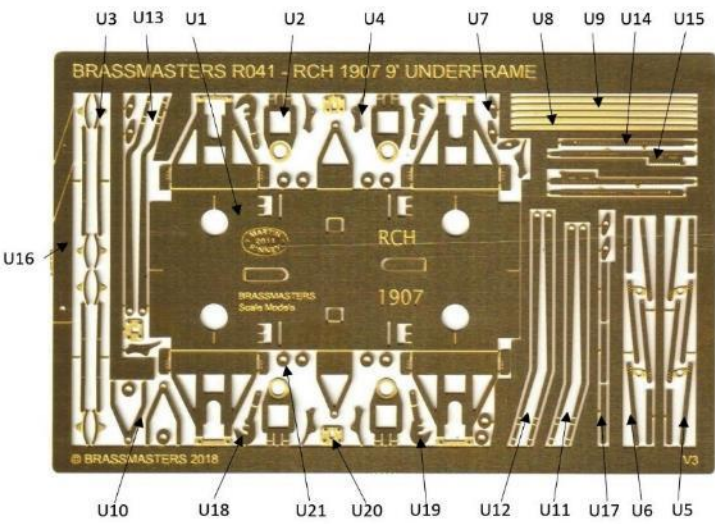
### WEIGHTING

This sub-frame allows plenty of space for weighting the wagon. If Code 4 lead (1.8mm thick) is used, there is space for two thicknesses to be fitted to the underside of the wagon without it being seen. For P4, two pieces 16mm x 54mm give a total wagon weight without load of approximately 50 grams. For EM, two pieces 15mm x 54mm give a total wagon weight without load of approximately 48 grams. For OO, two pieces 14mm x 54mm give a total wagon weight without load of approximately 46 grams. Adjust the size accordingly for loaded wagons.

### Brake lever diagram



For bending we used a 1mm drill and a 0.6mm drill



### ETCHED COMPONENTS

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>U1. Underframe</li> <li>U2. Bearing carrier – (4)</li> <li>U3. Brake block and hanger – (4)</li> <li>U4. Brake block centre – (4)</li> <li>U5. Push rods outer – (2)</li> <li>U6. Push rod inner – (2)</li> <li>U7. Brake shaft levers – (4)</li> <li>U8. Safety loop short – (2)</li> <li>U9. Safety loop long – (2)</li> <li>U10. 'V' hanger – (2)</li> <li>U11. Brake lever short standard – (2)</li> </ul> | <ul style="list-style-type: none"> <li>U12. Brake lever long standard - (2)</li> <li>U13. Brake lever cranked - (2)</li> <li>U14. Brake lever guide – pin type – (2)</li> <li>U15. Brake lever guide – ratchet type – (2)</li> <li>U16. Brake lever guide jig – (1)</li> <li>U17. Door bangs- (2)</li> <li>U18. Coupling hook left hand– (2)</li> <li>U19. Coupling hook right hand – (2)</li> <li>U20. Coupling hook face plate – (2)</li> <li>U21. Buffer body rings</li> </ul> |
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### Other components

- Waisted pin-point bearings – (4)
- 0.2mm steel spring wire
- 0.3mm wire for the brake blocks
- 0.8mm wire for brake shaft

### Components not supplied

- Wheels – 3'1½" split spoke with 26mm axles
- Coupling chain

