



MasterClass-2002

Build a 2-6-6T / 0-6-6T Mason Bogie

An Adventure in 1:20.3

By David Fletcher

Chapter 3 / Part 3 - Mr. Mason, Bogies & Boilers.

Background – Construction

Making the Classic Colorado 23" Box Headlight

First some info from our Historic Advisor, Jim Wilke.....

Headlamps were supplied by large railway supply companies, usually located along the eastern seaboard but sometimes also in the Midwest.

The Williams Head Lamp Co. in Utica, NY is a typical example - it made lamps from the 1850s to the early 1900s, was considered a significant maker, and was favored by the master mechanics of several large railroads.

When a railroad ordered a locomotive, it had two options: purchase the lamp separately, or have the locomotive builder install the lamp at the factory. Baldwin records sometimes specify "Williams Lamp" or "23-inch reflector" or "to be furnished by RR Co."

Engineers sometimes purchased lamps from supply houses themselves, installing it on the engines in their charge. Usually this was a given type that fitted the runner's requirements for distance of light thrown ahead, etc.

Nearly every make, style and patent thingamajig on a lamp was used to advertise it as the best and most universally satisfactory - the types of burners, quality of reflectors, brightness of light, etc. were hotly competitive. After 1880 illuminated number boards placed upon the top of the lamp allowed large roads like the Union Pacific better accounting of their engines by showing the numbers at night. Several different types of illuminated board were used and each had its supporters.

They looked on these lamps as high technology, and they were. Specialized equipment and dedicated factory space were needed to produce a quality lamp; it also made sense to buy a better quality product from a firm that made its reputation making high quality lamps, and by the thousands.

The quality of reflector, and burner were usually beyond the grasp of the common tinsmith. Lamps were not made by local tinsmiths until much, much later, on isolated narrow gauge lines in the early 1900s.

Lamp cases were entirely sheet iron, hammered and stamped into shape over wooden molds. The lamp base is nearly always wood; I've never seen an original box headlamp that did not have a wooden base!

The lamp rim is sheet iron as well. A lot of model manufacturers put a brass rim on for looks - don't always trust the large shiny plastic thing on the hobby shop shelf - "shelf appeal" in other words. For an accurate appearance, it should be painted iron.

As an accessory, lamps were not always the same color as the locomotive. Salesman sample lamps at the B&O museum are painted a neutral black, with gold striping and scrollwork, and the maker name in gold on the chimney guard. Other lamps were painted in colours, probably wine, Tuscan, dark green or Lake (in the 1870s). This can be a nice detail that adds contrast to a bogie - say, dark green with a wine lamp. Landscapes were common in the 1870s, usually generic mountain lakes instead of barroom nudes.

Lamps that were delivered with an engine from the factory, such as Baldwin, were painted to match the rest of the machine.

Have fun,

Jim

Making the Headlight

Many of you are building pre 1883 versions of the Mason Bogie, and as such the really big Headlight is not necessary on your model. As stated in Chapter 1, the Hartland trains Box headlight is a perfect option to represent the smaller box headlights, such as those used in Options 1, 2 and 5. Beyond that, there is no reasons why you cannot use the commercial box headlight on what ever options you are building.

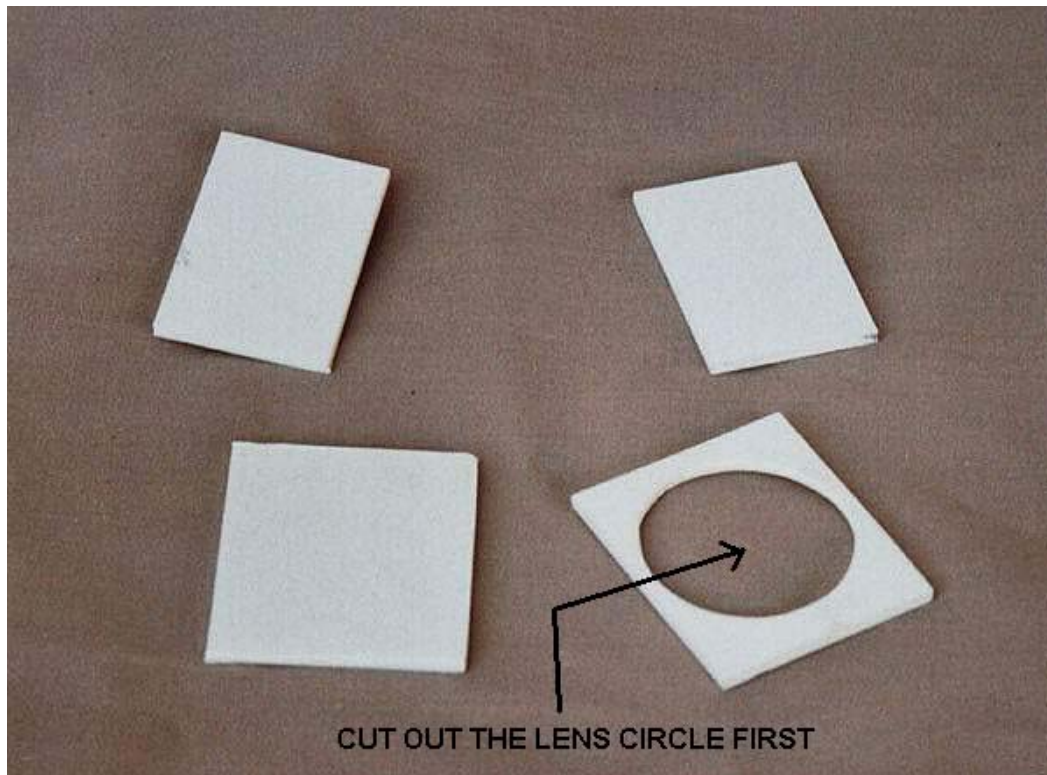
Be that as it may, the reality is that these Mason Bogies received some pretty darn huge box headlights in the early 1880s and retained them to retirement. With the enlarged headlamps came the changed headlight brackets as shown on the 2-6-6T option 3, 4, and 6 drawings. This section is devoted to making your own huge 23" headlight at 1:20.3 scale. If you're not making this headlight, go forward to the next section and we'll meet you there. For the rest of us, you'll discover that this box headlight isn't that hard to make, and you might even considered making a couple more to replace those piss weak little headlights provided with the Bachmann 4-4-0, 2-6-0 etc!

Also note our MC2002 introduction of a commercial 23" headlight soon to be offered by Fall River Productions.

Step 1 - Making the Box

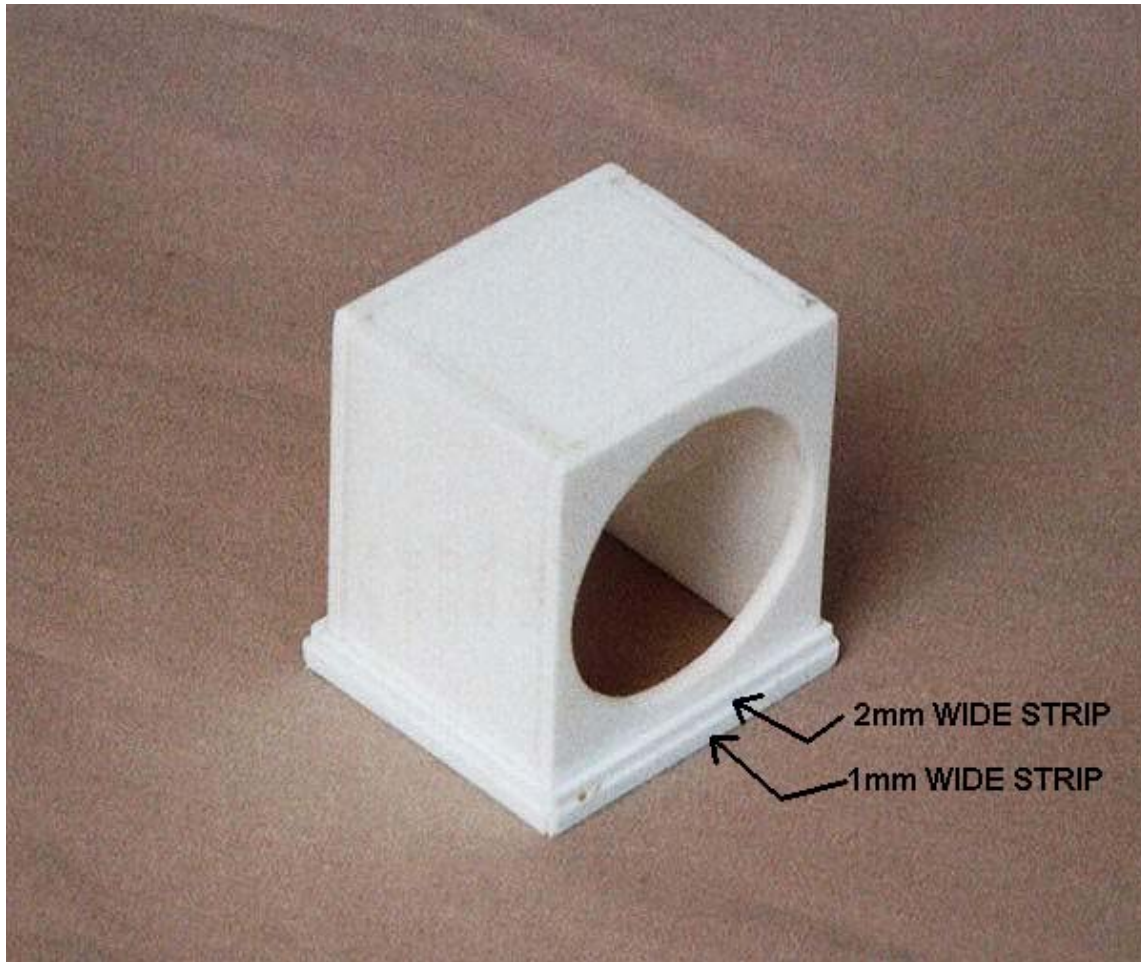
(Refer the PDF page entitled "The Colorado 23" Box Headlight")

Cut out the 4 sides and top of the box following the templates. A word of advice, it is best to cut out the big lens circle first, and then cutting the rest of the panel around that hole. All of these parts are to be cut from 2mm thick styrene. The cut parts should look like this:



Assemble the 4 walls of the headlight using welder cement. Note that the front and back walls are cut to the full width of the headlight, and as such the side wall butt into the rear faces of these. Insert and weld the top panel into place, such that it is flush with the top of the walls.

Next cut a 2mm wide strip of 0.5mm thick styrene. Wrap this styrene strip all the way around the base. You can cut the strip at the corners if you wish, just make sure the joints are clean. Then cut a 1mm wide strip of 0.5mm styrene, and apply that over the 2mm wide strip. Align both strips along the very base of the lamp. This procedure provides the bottom edge molding of the lamp. It should look something like this:



The side access doors - These doors were used to access the headlight innards in the old days. Some have doors to both sides that opened, others opened only from one side. The doors are cut from 2mm thick styrene. Chamfer the edges to all 4 sides to a 45 degree angle, then weld the doors clean in the centre of the box sides as shown on the PDF drawing.

The lens rim - Cut a 5mm wide length of 0.5mm styrene. Wrap this strip around the inside edge of the lens opening in your lamp, so that the back edge of the strip is flush with the inside face of the lamp wall. Trim the strip where it meets up with itself around the full circle - this is the lens rim! You can leave it like this, or you can apply a second rim wrapped around the outer surface of the first. the second rim should step in slightly, so make it 2mm wide. Stagger the joints in your rims strips, but I recommend ensuring that the strip joints are near the bottom of the lens (A less visible place).

Step 2 - Making the Headlight Crown.

This is the reason why most folks don't make their own box headlights - the ornate crown is too difficult!!

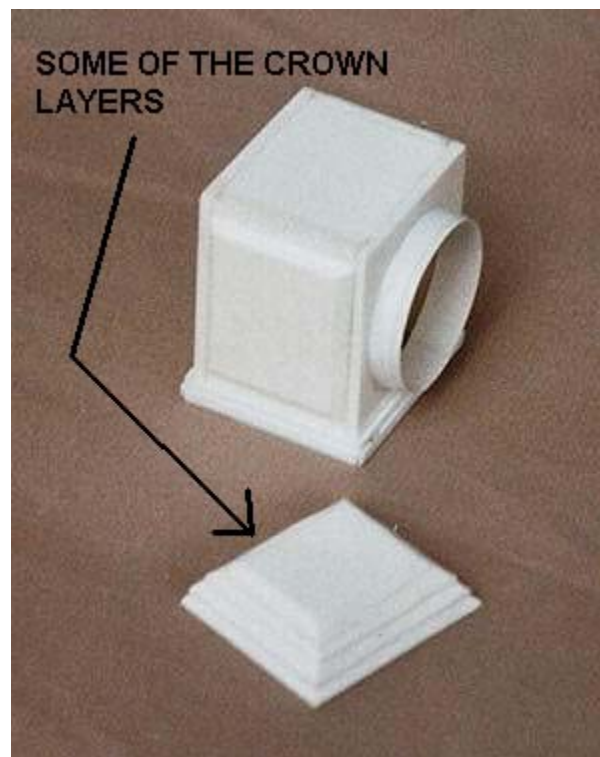
There are ways...and at this point I'll indicate three ways, and demo one of them:

Option 1 - make the crown using a modeling polymer clay such as 'FIMO' or Sculpy, as available from artsy stores. The Fimo is a type of plastic material that you can carve into shape, bake in the oven for 20 minutes, and thus produce a hard plastic component. Super-glue bonds it extremely well.

Option 2 - make the top as a plain 4 sided pyramid from flat planes of 1mm styrene sheet.(see wimp's way crown on the PDF page).

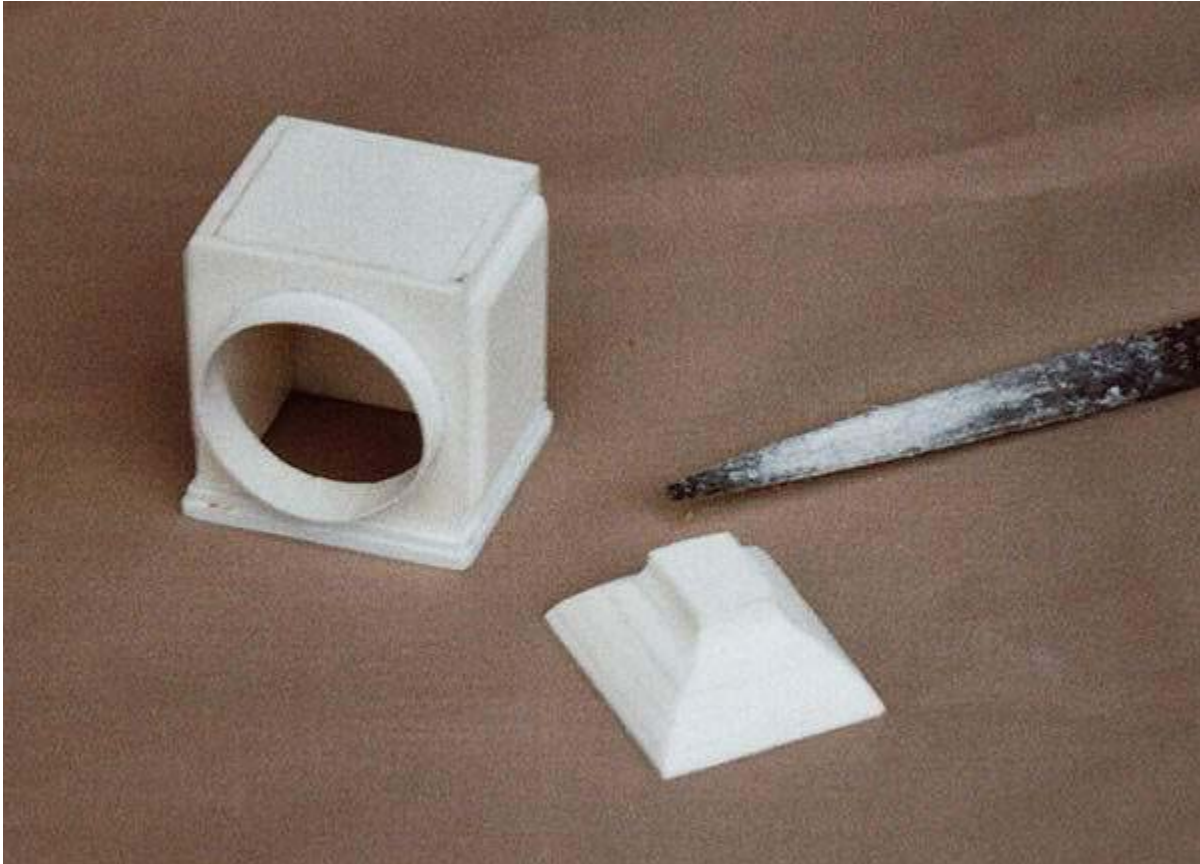
Option 3 - Build up the crown in layers of 2mm styrene, and form the profile this way. This is what I'll demo, and provide templates for in the PDF drawing. This technique has evolved from one of the methods wooden model boat builders use to form the complex curves of the model hulls. Layer by layer, you build up the profile like a contour map.

Cut out all 6 crown templates, these are an ascending order of 2mm styrene rectangles. Carefully chamfer the edges of each rectangle to a 45 degree angle using your modeler's knife. This is done to remove much of the unwanted meat in the layers before you get into hard sanding. Build up the crown separately from the rest of the headlight. Install each layer exactly centered over the last, so that a kinda stepped pyramid builds up. The building up of the layers should start to look like this:



Once all layers are in place, its time to get sanding. I found the use of a metal file to be most productive. Use one that has a convex face on one side and is flat on the other. You will use the convex filing surface to sand out the concave curves near the top of the crown. The lower area is easily sanded with sand papers and flat files.

The sanded crown will look something like this:



Step 3 - The Headlight Vent

Atop of the crown is an ornate vent where the heat and fumes of the oil burner escaped. The vent had a roof over to keep water out of the lamp.

We begin by making the vent base. This is a 10mm x 17mm rectangle of 1mm thick styrene sheet, per the PDF. Weld this central over the top of the crown. Next cut a 5mm length of your Plastruct 4.6mmx 4.6mm Square Hollow Section. Weld this section central over the crown. The headlight will look like this:



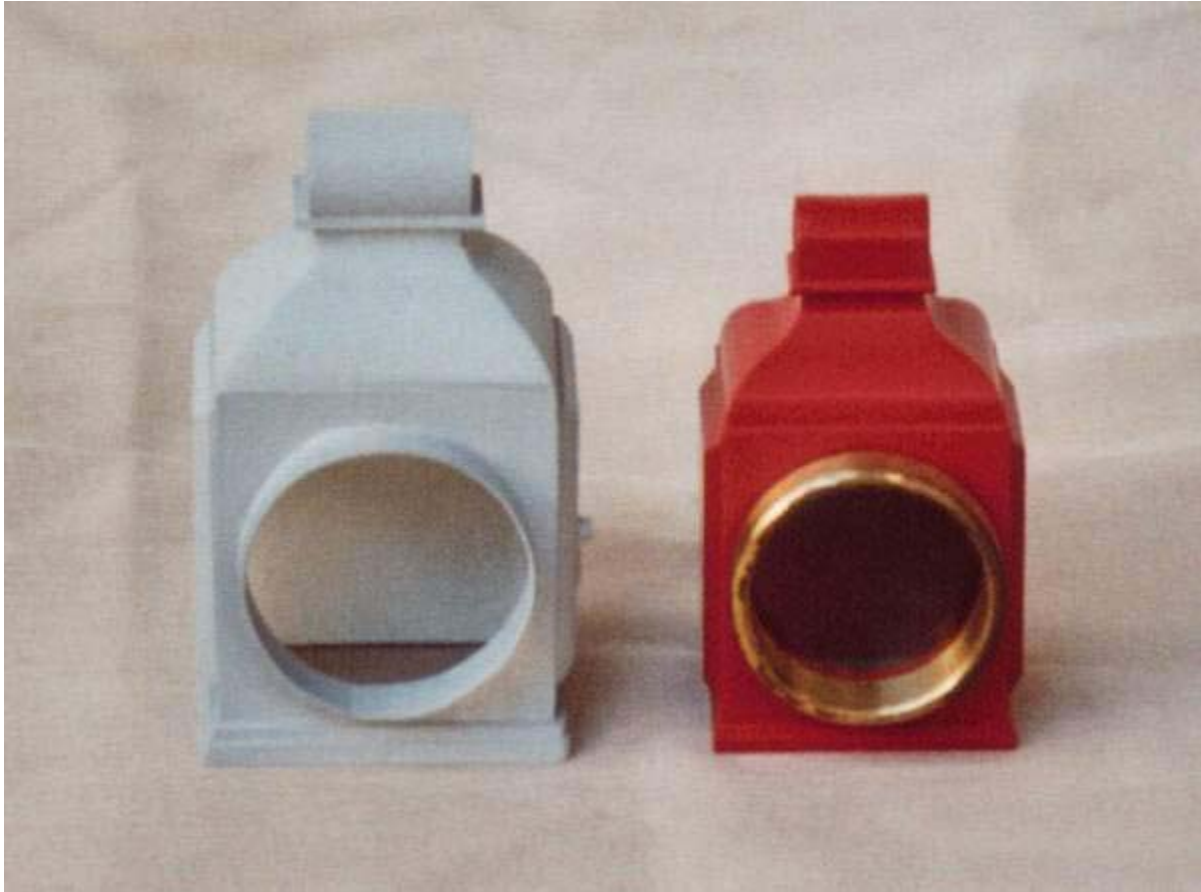
Finally cut a 15mm length of your 12mm diameter Evergreen tube, this will form the vent roof. Slice off one side so that the tube looks like that seen in the above picture. Slightly narrow the tube by pressing it between your fingers so that it sits comfortably inside the extent of the vent base. The height of the rounded roof should be about 8mm tall. Weld the roof atop the whole headlight...it will look like this:



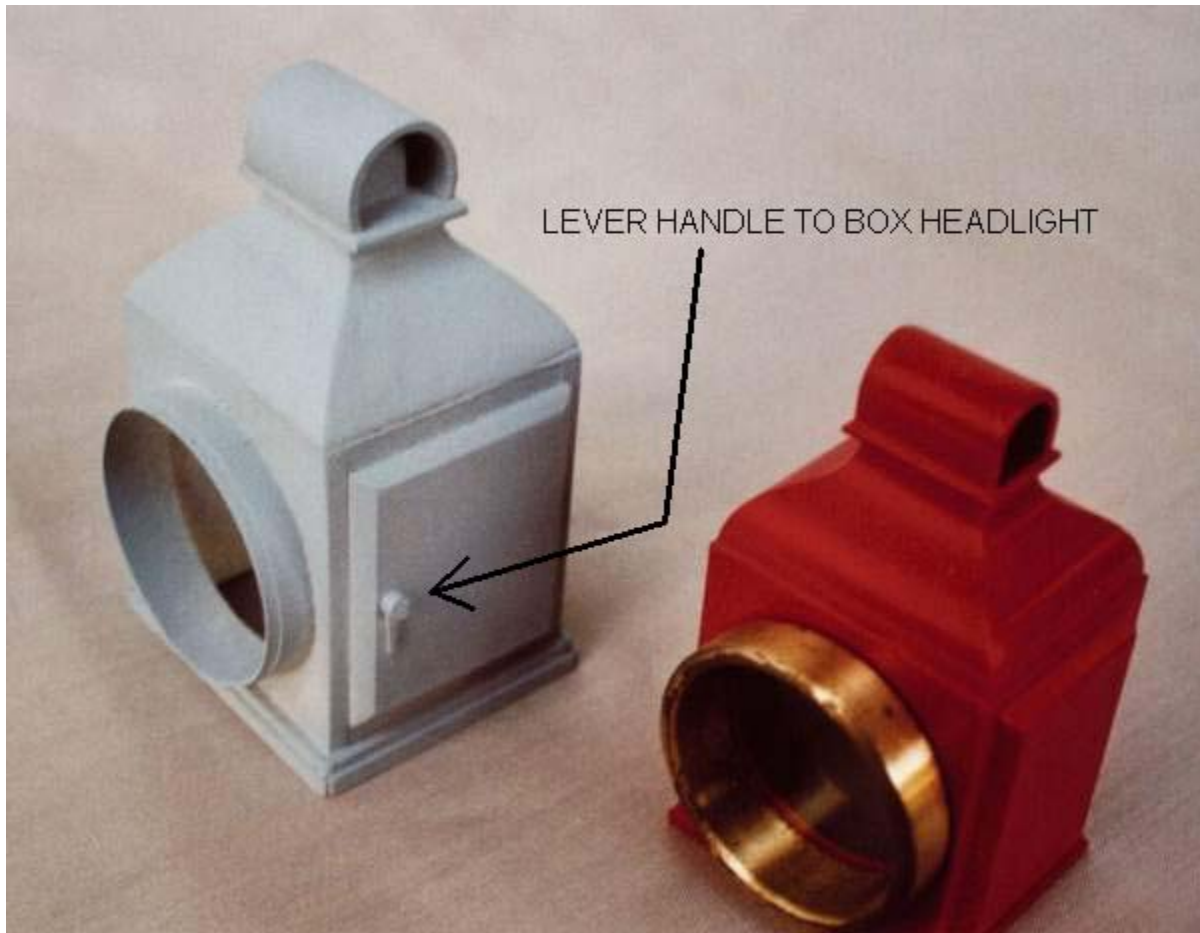
The layers of the crown evident in this unpainted headlight. Note the vent roof fixed into place.

There are options for headlight vent roofs. Many of the prototype lamps had square tops to the roof, other had angular ends. Check the PDF drawing for some of the vent roof styles possible.

For a quick comparison, here is the H-L-W 1:24 scale box headlight next to a similar type, now scratch made in 1:20.3 scale. The 1:24 scale headlight is still very useful in the pre 1880s versions of our loco.



To the side door of the box headlight you might like to add an access handle. This was a 90 degree turn brass lever. Where only one door opened, most of my photos indicate the lamp opening from the fireman's side. Thus I added the lever to that side only. The lever is made from a tiny 4mm long strip of 0.5mm styrene, with a sliver of 1.5mm styrene rod as the pivot. The lever handle on the lamp looks like this:



Step 4 - Painting the Headlight

Right-oh, it's time to paint your headlight, and place it aside for later installation. You will later build the innards of the lamp, including the reflector and installing the light bulb, but that is all later. At this time I hope you've decided what colors your loco will wear.

Spray paint the box headlight with a primer first, this helps to provide a good smooth and binding paint coat for your finish color. If the primer coat reveals lines in the layers of the crown, you might consider sanding a little more, or you might like to grease a very thin layer of epoxy over the crown, wipe the epoxy clear of the outer edges, leaving the epoxy in the cracks only. Then do a final sand, and apply the primer again.

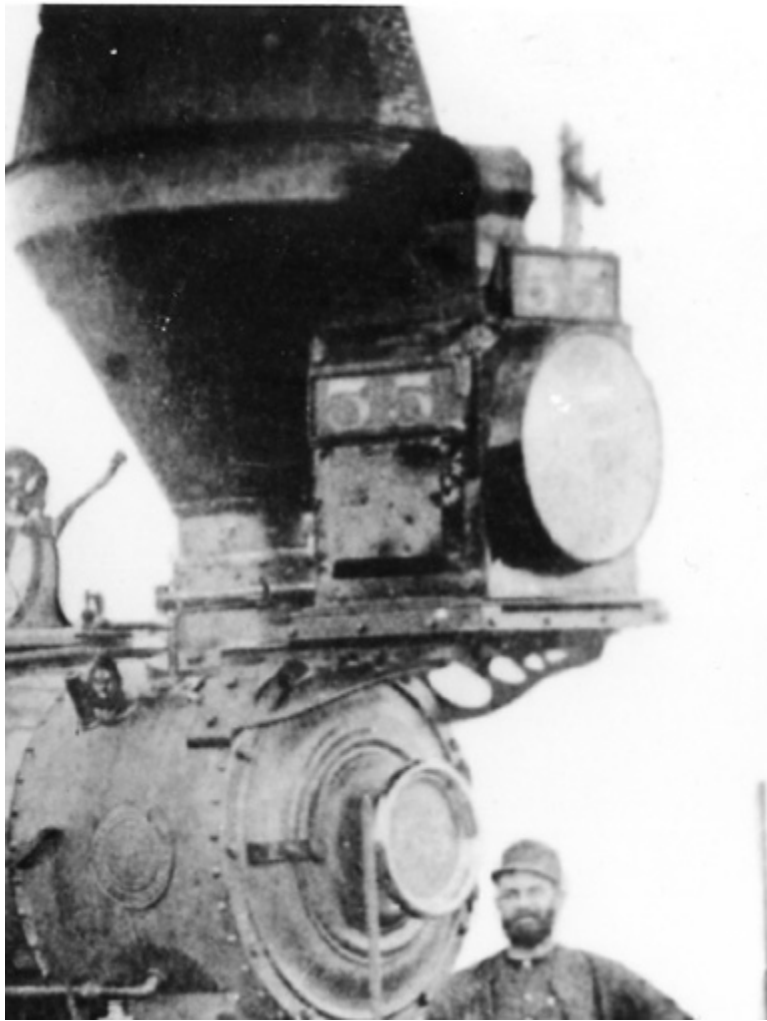
I painted the box headlight black to match the generally black look of my 1885 DSP&P Mason #42. I used Tamiya spray cans, 'Semi-gloss black'. I later touched up the door handle with brass paint. The finished box headlight looks like this:



Important Note - I have painted the rim of the lamp brass. Jim Wilke, our color advisor, has since advised that these rims should be painted in a like color to the lamp - black in my case, so I have to paint the rim black again! It shall be done.

Options for Lamp Mounted Number boards.

You will notice in the collection of South Park bogie photos that later era, post 1885 locos, had number boards added to the top sides of the box headlight and to the front of the crown. Traditionally these were literally glass plates, painted black with clear numbers within. Rectangular holes were cut into the box sides, and the reflector within the headlight had slots cut in to allow light to shine through the number boards. If you have the desire to have working number boards, go ahead and cut out the holes in the box headlight, about a 1mm size smaller than the number boards to be installed (shown 1:1 scale for the model in the PDF drawing). Then make the number boards from 1mm thick clear plastic sheet. Install a rim of 0.20x0.30 rod around the perimeter of the plate, weld the rim onto the face of the board, abutting the edge. You will need decals to install on the boards, with the numbers within to finish off the plate. Some will come with white numbers, some with clear numbers. depending on the decal type, the white numbers are better because they will show up with the lamp turned off, and light will also shine through them when the loco is running.



If you don't need the number boards to be working (as per most LS model locos!), but want the number board style, then repeat the steps above but use plain 1mm styrene sheet to make the boards in lieu of the clear stuff. Weld them to the sides of the box headlight (no cutting into the box required), and then spray paint the boards along with the headlight. At the end of the project you can insert some white decal numbers.

The Headlight Bracket

(Refer PDF pages entitled " Headlight Brackets, types 1, 2, 3, 4, 5 and 6" (6 pages in all))

There are times in this project where you will say...."is this guy nuts...I can't do that" and some of you will find out that I am indeed nuts and this step is too hard, and others will rise up to the challenge. This will occur only occasionally in this project, when making such things as the Valve Gear, bell rig, fancy optional hand rail stanchions and the headlight bracket! Fortunately there are easier options to use, but to make your model as close to accurate as possible, some harder steps are necessary.

The headlight bracket can be broken down into 4 basic style. One of them is a killer, the 2nd one is difficult but doable, the 3rd one is generally easy, and the 4th is piss easy. The 4 types also relate to the changes that occurred over time to the headlight brackets, leading from the original ornate Mason built casting, to the fairly basic replacement unit made by the South Park.

Check your options drawings from Chapter 1 and you will see the general changes from option 1 through to 4. There are two additional styles that you might consider.

The 6 basic styles are as follows:

Type 1- As built 1878. - This bracket, built at the Mason Machine works, had a decorative cast iron triangular lower portion that bolted directly to the smokebox front. Atop this bracket were 4 ornate stubby columns that supported the headlight platform above. This 1878 type was designed to carry a smaller box headlight, raised up on the stubby columns. Bully Boy, as built, had the exact same type of bracket from 1877. Use this bracket on option 1, some of 2, and 5.

Type 2 - As built, modified, 1878-1880. -This bracket was the original Mason bracket modified to suit the installation of a larger box headlight. Again the ornate cast iron bracket was bolted to the smokebox front, but the 4 stubby columns are removed and the larger headlight platform lowered to sit directly on top of the cast bracket. This lowered the headlight somewhat, but enabled a larger headlight to fit without snagging the large smoke stack! This bracket type should be used on option 2 type locos, along with the unaltered Mason bracket described above.

Type 3 - DSP&P Installed retro-fit #1 - This headlight bracket was installed by the South Park, designed to support the large headlight platform for a large box headlight. The design of the bracket is almost identical to the cast iron types commonly used on Baldwin and Cooke locos in the early 1880s. Perhaps these brackets were provided by either company when the South Park took delivery of their first 2-8-0s from Baldwin and Cooke in 1880-1884. Unlike the Mason bracket, this type of bracket was bolted to the smokebox side, and was restricted to the upper smokebox area. This left most of the smokebox front clear for fitment of marker lights.

Option 3, 'Lake City' uses this bracket. But you will also find examples of option 2, such as Oro City with Nesmith stack, using this bracket as well. This type of bracket seems to have been used on Bully Boy later in life -- use it on Mason Option 6.

Type 4 - DSP&P Installed Retro-fit #2 - This type of bracket was developed for the South Park, and is a style synonymous with the South Park and later the Colorado & Southern. The bracket is bolted to the smokebox sides, and is fairly industrial in its styling. Made from cast iron, these brackets would become standard on all C&S locos in later years. Check a C&S 2-6-0 or 2-8-0, and you will find this bracket. It is also the easiest bracket to model. This bracket is used on Option 4.

Type 5 - The Odd bracket for DSP&P #46. I know not the origins of this bracket. It appears to be unique on the South Park roster. The Original Mason bracket, as described above, has a style consistent with most Mason locomotives dating back to times well before the Mason Bogie. The type of bracket used on #46 appears to be a bash from the later Mason bracket type used on the heavy 2-6-6T locos. You can see in the builder's photo of Breckenridge a very ornate bracket of a style not used on the Light 2-6-6T locos. My Guess is that the bracket of #46 is kitbashed from one of those later brackets. The lower areas of the bracket has been cut off to make the thing fit on a narrower boiler and to enable fitment of marker lights.

Type 6 - I've also provided the bracket type as used on the Breckenridge and the big 2-8-6Ts. I know you guys like this bracket, but it will not fit on the narrow boilers of our light 2-6-6Ts...Keep to the styles outlined above! Type 6 bracket is for the big 2-8-6T and the heavy 2-6-6Ts.

Making the Headlight Brackets

With all bracket types, take extra care to ensure your bracket is level and installed symmetrically over the smokebox top. Measure from your upper datum line to both bracket sides to ensure they are placed equally about the boiler datum line. You do not want the headlight to be off vertical. Take care. If needed, you can add tiny styrene shims to help level the lamp platform above the brackets.

Making the type 1 and 2 brackets -As Built types.

Cut out the two triangular bracket sides from 1mm thick styrene sheet, or brass sheet, Use the PDF template. You then need to bend the brackets to the boiler curvature, and nearer the top of the bracket, bend it to the vertical. The front view on the PDF page shows the end profile of the brackets. Now comes the hard part. These 1mm thick brackets are too weak to support the lamp platform and headlight adequately, nor is there any bearing surface to support the stub columns required to the top of the Type 1 bracket. If building in brass, this won't be a problem, but if building in styrene we need to find a way to support the headlight without placing load on the brackets themselves. We do this by making a fake inner bracket using 1.5mm brass rod.

Bend the two brass rods to the profile shown in the PDF page, insert the brass rods into the smokebox front (allow clearance for the thickness of the boiler tube), Behind the smokebox front, the rods will be bent down hard and flat against the rear of the smokebox front. There you will secure them with some epoxy glue. At this point you have a stable rod bracket that can support the headlight.

For Type 2 Brackets - At this point you can make bracket Type 2 just by cutting out the lamp platform from 2mm styrene and applying it on top of the brass rod bracket (Use a sparing amount of epoxy glue). Next simply apply the Mason styrene bracket parts to the side of the brass rod. Use welder cement to fix the bracket to the smokebox, and use a thin line of epoxy where the bracket runs along the brass rod in the horizontal, under the headlight platform.

For type 1 Brackets - you need to do another step before applying the platform. Using 0.75mm brass wire, bend two lengths of wire into the 'U' shape shown on the PDF for this bracket type. Solder this 'U' profile in a vertical position to the top surface of the 1.5mm brass rod support. Next insert 4 brass or plastic beads onto the 0.75mm wire up-stands. Next cut out the lamp platform from the PDF and drill four 0.75mm holes as shown to match the location of the 4 wire upstands. Insert the platform to the top of the 0.75mm brass wire upstands, such that the platform rests on the 4 beads. You now have the platform resting on the Mason stub columns! Next simply apply the Mason styrene bracket parts to the side of the brass rod, same as for type 2. Use welder cement to fix the bracket to the smokebox, and use a thin line of epoxy where the bracket runs along the brass rod in the horizontal. Brass beads might be gizmos that come in a pack like these:

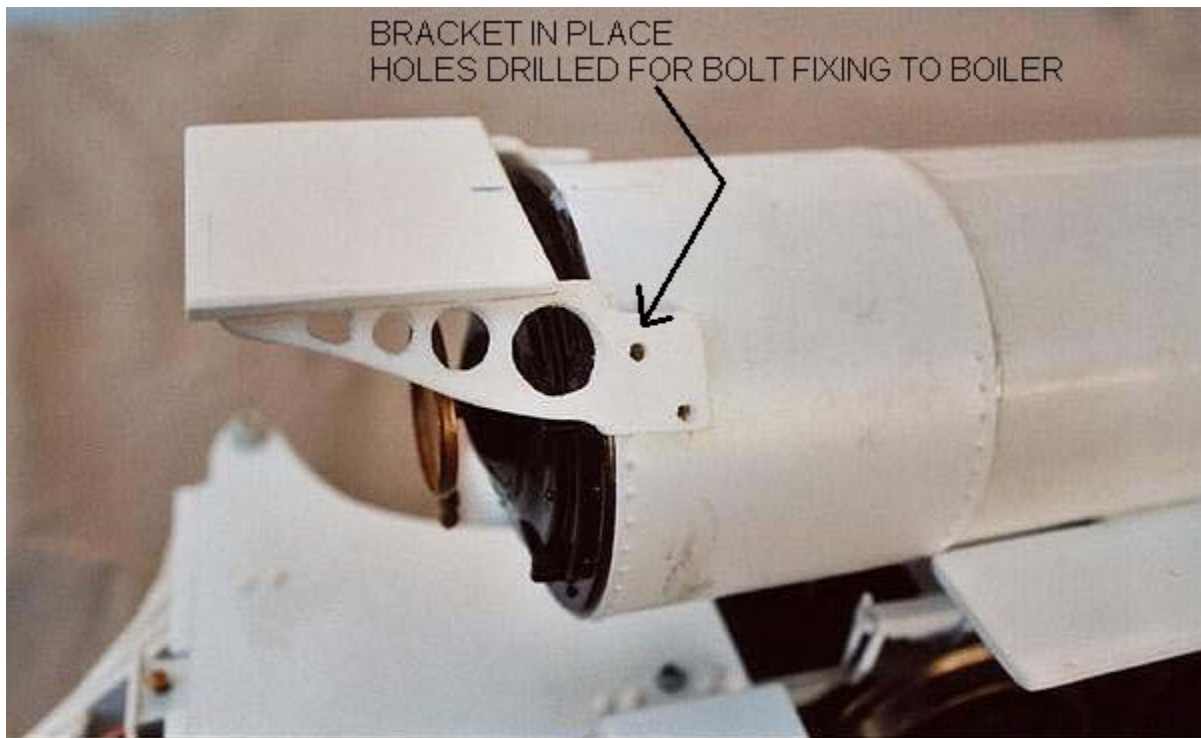


For both brackets type 1 and 2, the brackets were cast iron in reality, so think about painting them black, graphite or green etc to match the color of your locomotive. They were not polished brass.

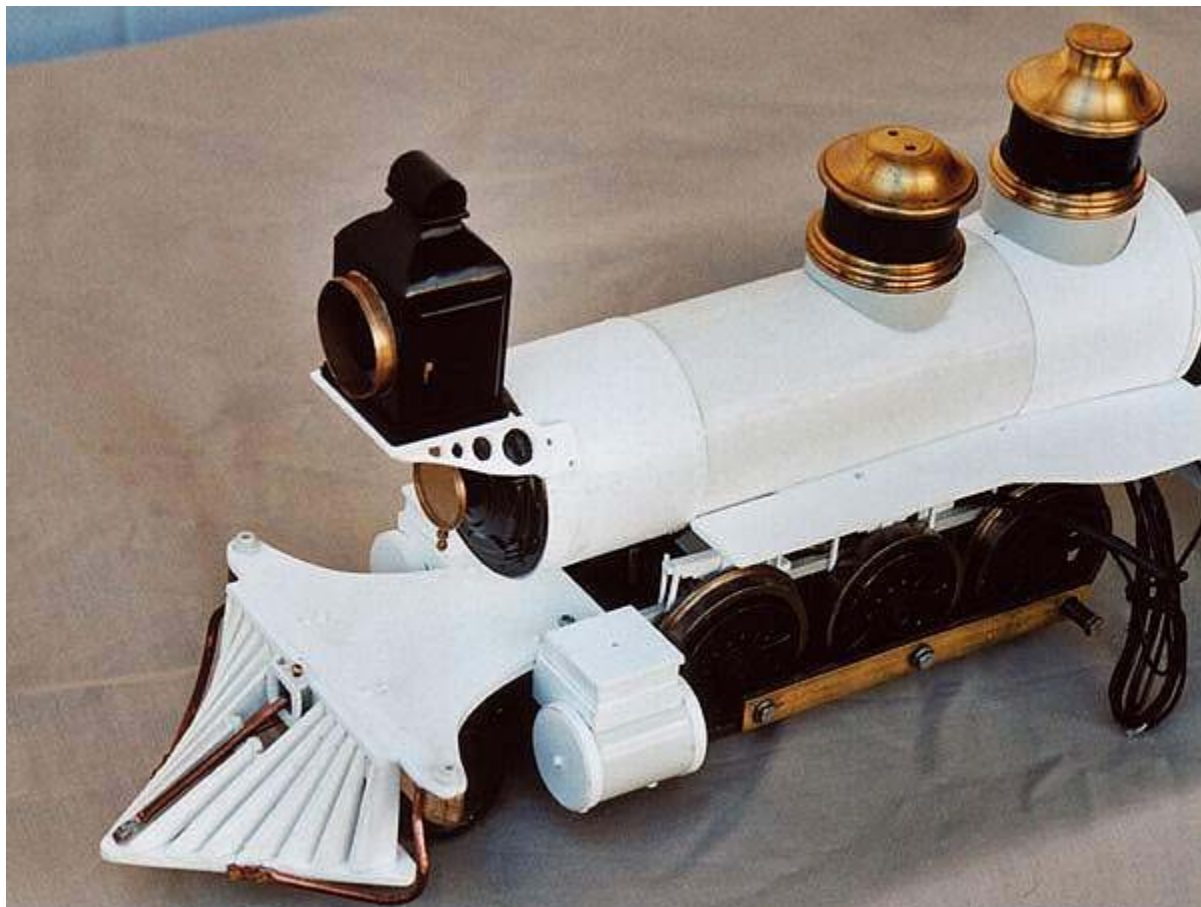
Making the type 3 and 4 brackets - Retro-fit Brackets

For type 3 and 4, things are much easier. You need only trace the bracket PDF profiles onto 2mm styrene sheet. Next drill out the internal holes in the bracket before cutting out the profile itself. Thus for option 4, drill out the four holes, using drills to the correct size and location. After the internal areas are cut out, trim to the outer profile of the bracket, and free the bracket part from the 2mm styrene sheet. Use fine sand paper and metal files to clean up the edges of the brackets. Note the angled top edge of the styrene brackets, sand the top edges to a 45 degree angle such that the lamp platform can sit hard on the angled top edge of the bracket.

Next cut out the lamp platform from 2mm styrene sheet. Now comes the hard part - applying the bracket to the smokebox. I found the easiest way was to weld the bracket arms to the underside of the platform first...the brackets will angle outward as shown on the PDF front profile (Hence the angled top edge to the brackets). When the welder has hardened, rest the completed bracket onto the smokebox, centre it about the boiler upper datum. Use a spot of welder cement under the bracket fixing points, and hold in place. When the welder has hardened, drill out the two fixing holes in each bracket arm, right through into the boiler pipe. Then install 10BA or smaller brass bolts, and tighten. You now have a really strong bracket that was easy to make.



The above view shows the classic DSP&P retro-fit (type 4) bracket welded into place. Brass bolts to be installed in the bracket will fix it in place.



The headlight bracket in place, with the lamp resting above. The headlight fixing and headlight interior will be done in a coming chapter.

Do not glue your headlight in place! You will be providing a screw fixed installation in a future chapter, including the fabrication of the lamp interior and installation of light bulb.

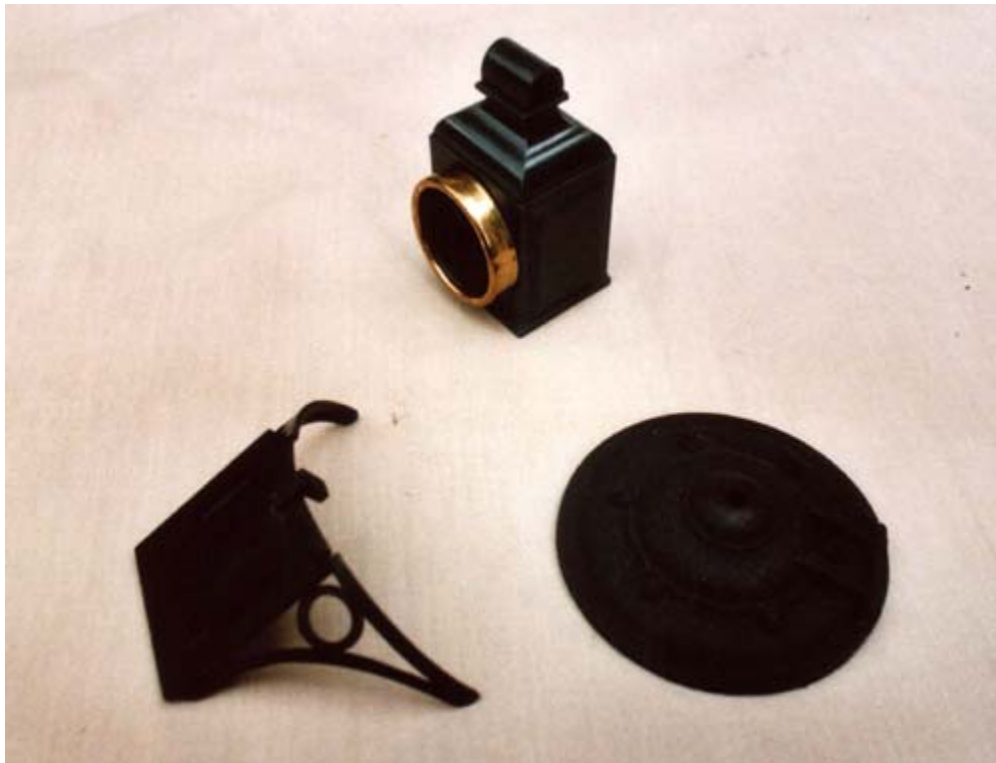
For those using the smaller H-L-W box headlight, you will notice these lamps come with a silver painted lamp insert. You can now install the silver lamp insert directly onto the lamp platform. Drill three holes into the lamp platform, two to match the H-L-W insert fixing points, and a central hole for the lamp wire to run.

The Wimp's Way Bracket

The H-L-W Bracket.

Thank God there is a Wimp's way! H-L-W make a very stylish, Mason like bracket. Cost is about \$5, and it will simply clip onto your smokebox front at the top, and weld into place around the smokebox edges. The H-L-W headlight will screw into place by inserting the screws into the holes provided. While not styled correctly, it will amply provide the character, robustness and general feel appropriate to this model.

The Wimp's Way H-L-W bracket and lamp kit, which snaps onto the H-L-W smoke box, looks like this:





The Trackside Details Bracket.

Trackside details make a brass bracket very similar to bracket type 4. The Trackside unit however is undersized, having been cast for 1:24 scale models. When used with the 2mm thick styrene lamp platform, this bracket can be used to provide a good overall look, without all the fuss out lined above. Part number is as listed in Chapter 1.

The Accucraft headlight and Bracket.

Some limited number of you will have been lucky enough to obtain one of these after Chapter 1 was published. The Accucraft headlight and bracket is a 1:20.3 casting developed for their 1880s C-16 2-8-0 models. It is perfect for Option 3, Lake City models, including the Baldwin style type 3 bracket. Use it if you have one, its not really a Wimp's Way, as it is sized and styled perfectly for this model. You also get out of making the big 23" box headlight!

Introducing the New Fall River Productions Box headlights.

As mentioned at the start of this chapter, Fall River Productions are at the advanced stages in developing a fabulous 23" style box headlight. This headlight is completely appropriate for the class and when the first become available, I will be installing this lamp onto my Mason. Go to the FRP web site, you will also notice the NPC #12 'Sonoma' headlight being offered. The Sonoma headlight is the same size as the H-L-W box headlight. This is a very stylish headlight, and well worth considering for smaller headlight options (Options 1, 2 and 5).

<http://www.fallriverproductions.com/>

Here is John's Computer rendered 3D views of the lamps in question. To the far left is the big 23" headlight, required for Options 2 (some), 3, 4 and 6. To the far right is the smaller 'Sonoma' headlight, which is similar sized to the H-L-W headlight. In the middle is the tiny headlight used on the Bachmann 4-4-0 and 2-6-0. Lamps...damn stylish all! Keep an eye out on the MLS MC2002 forum to get updates about these lamps, costs and delivery.

The Fall River Productions 23" box headlight.





The smaller, ornate, Sonoma Headlight.

The Smokebox Saddle

(Please refer to the PDF Pages "Smokebox Saddle")

The next part is uniquely Mason! We make the saddle under the smokebox through which the steam exhaust pipes from the cylinders ran. On traditional locos, the saddle was part of a huge and complex casting incorporating the cylinders, steam chests and saddle all in a two part casting. On the Mason Bogie, the saddle moves relative to the cylinders due to the articulated chassis. The Mason saddle was a carefully sealed slot that allowed the exhaust steam pipes to run vertically into the base of the smokebox, allowing the smokebox and cylinders to move relative to each other. We do not have to model the actual slot, or steam pipe, because the lateral play of our chassis is much greater than the prototype saddle allowed for, but we still make the visible part of the saddle. For those building their models to run on 2ft radius curves, take note, this saddle will bind with the steam chests. Please follow the 2ft radius alternative for your saddle. This will have the lower portion removed.

For the benefit of the model makers and understanding of the actual Mason design, I have included some views of what the actual saddle looked like, including the smokebox mounted casting, and the steam exhaust pipe casting from the chassis deck. The saddle is complex, awkward and above all, fragile on our model. The prototype system had the steam pipe casting gripped inside the saddle casting. The lateral play in the system was quite minimal. There was almost no vertical play allowed between the smokebox and chassis at all. In the PDF drawing I show the deck mounted steam pipe casting and the saddle separately, then together in a form of x-ray view. To the side of that you can see the two components together in their most lateral position. Our model will pivot a great deal more than that.

The upper 'saddle' part is hollow, with much of the bottom surface open, where the steam pipe penetrates and slides from side to side.

On the model not only will any deck mounted steam pipe sway well outside the boundaries of the saddle, but on irregular track, the saddle will snag the steam pipe, derailing the loco, and worse, wiping out the steam pipe, and opening up the saddle assembly like a tin can...I know, cause I tried it! There will be times when the saddle alone will strike the pilot deck when the loco is in motion. My proposal is this:

For anyone who's building a static model, show model, or is running on 12ft radius curves, build the saddle per the prototype PDF drawings. Best to do it in brass so that the two halves don't tear each other apart when you lift the loco off the rails!

For those who want the saddle looking right, want it strong, and capable of hitting steam chests, and deck alike without it splitting apart, follow along the model saddle templates. This model saddle is basically the top half of the system only, and will not have a steam pipe at all. This leaves the deck area clear for the loco to pivot unobstructed. The saddle is made as a 'solid' in that we do not introduce the large opening in the underside of the unit. We do this to make the bottom edges strong, and self supporting, strong enough to take the knocks from the pilot deck. In the shadows under the saddle it will be difficult to see that a slot does not exist there. We make the saddle 'solid' since we're only making the top half. Without the steam pipe half inserted into the saddle, the 'hollow' type saddle will look empty and wrong. The whole assembly should look dark, and closed.

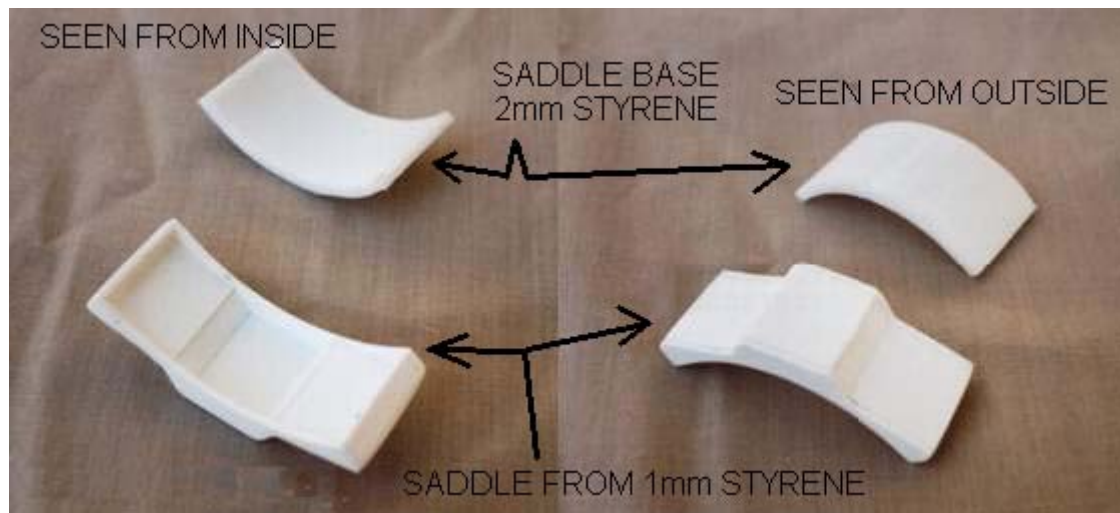
Essentially this design is the same as that used on many brass Mason models over the years. Made to be functional and aesthetically appropriate. But the final version is up to you.

Step 1 - Making the Model Smokebox saddle.

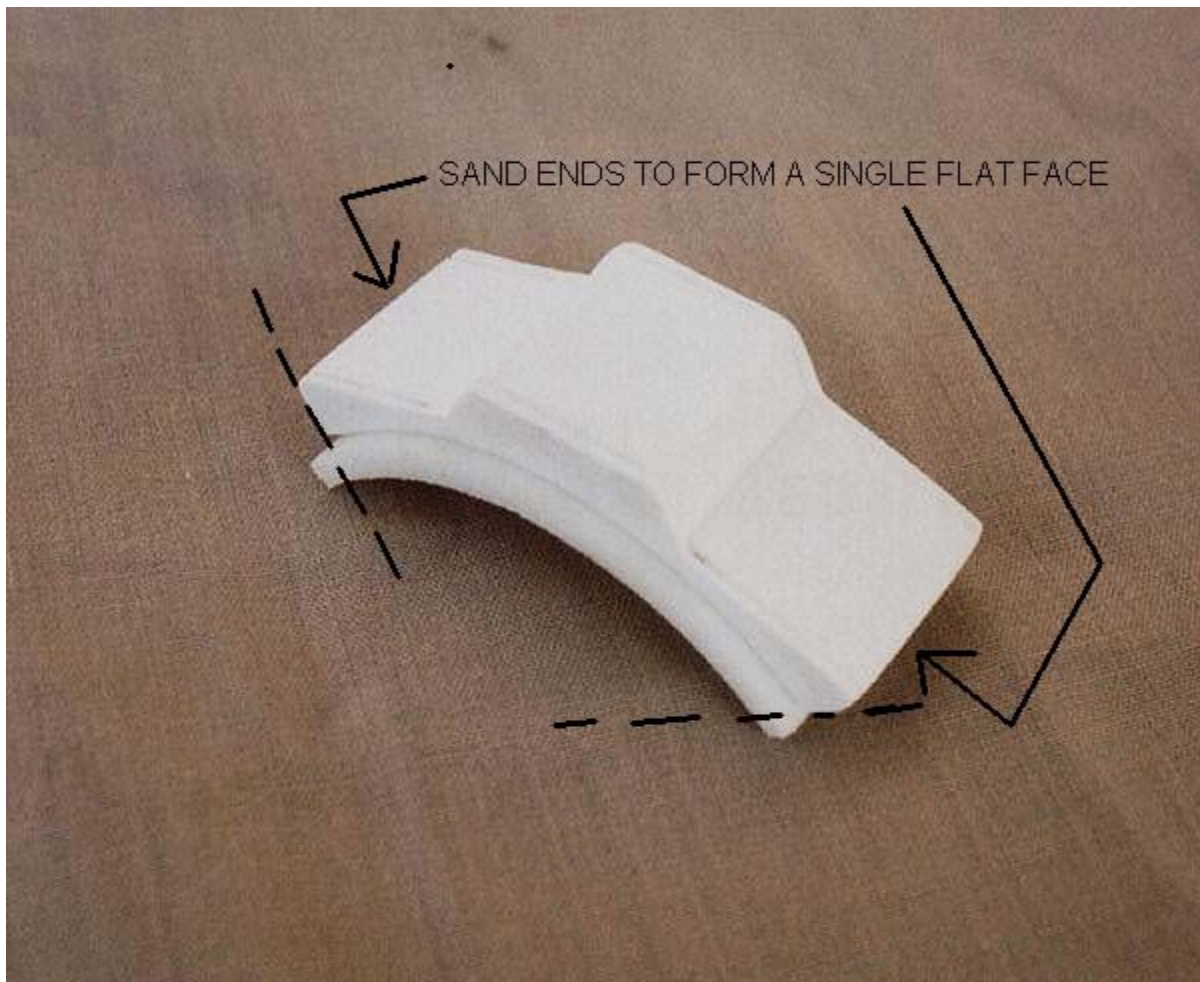
Cut out the front and back profiles of the saddle in 1mm thick styrene, following the PDF drawing. Next insert a series of seven 1mm thick rectangles of styrene between the front and back wall to form the external bottom face of the saddle. Carefully sand the joints between all the parts, as this is to represent a single casting!

Following the PDF, cut out the Saddle base from 2mm thick styrene. Warm up the part in your hands, or even assist the warming by holding it over a stove -- do not over cook it! When its warmed up a bit, curve the saddle base to the exact curvature of the smokebox/boiler diameter.

The saddle and saddle base will look like this, as seen from both sides.:

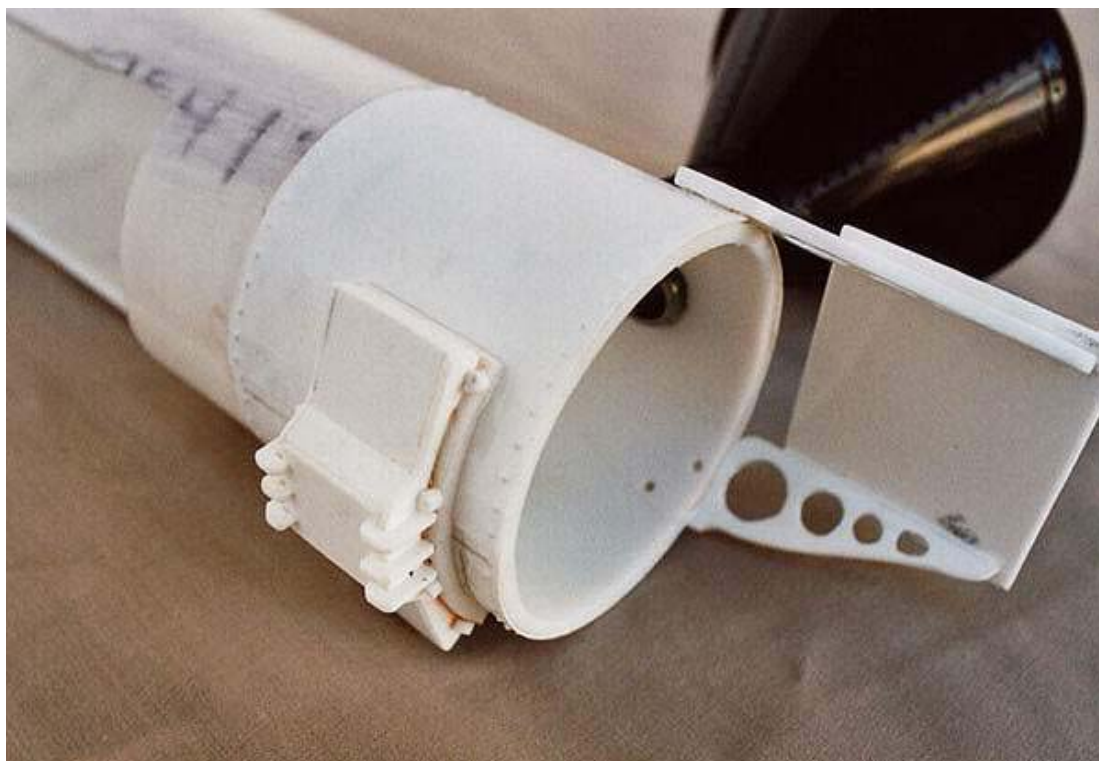
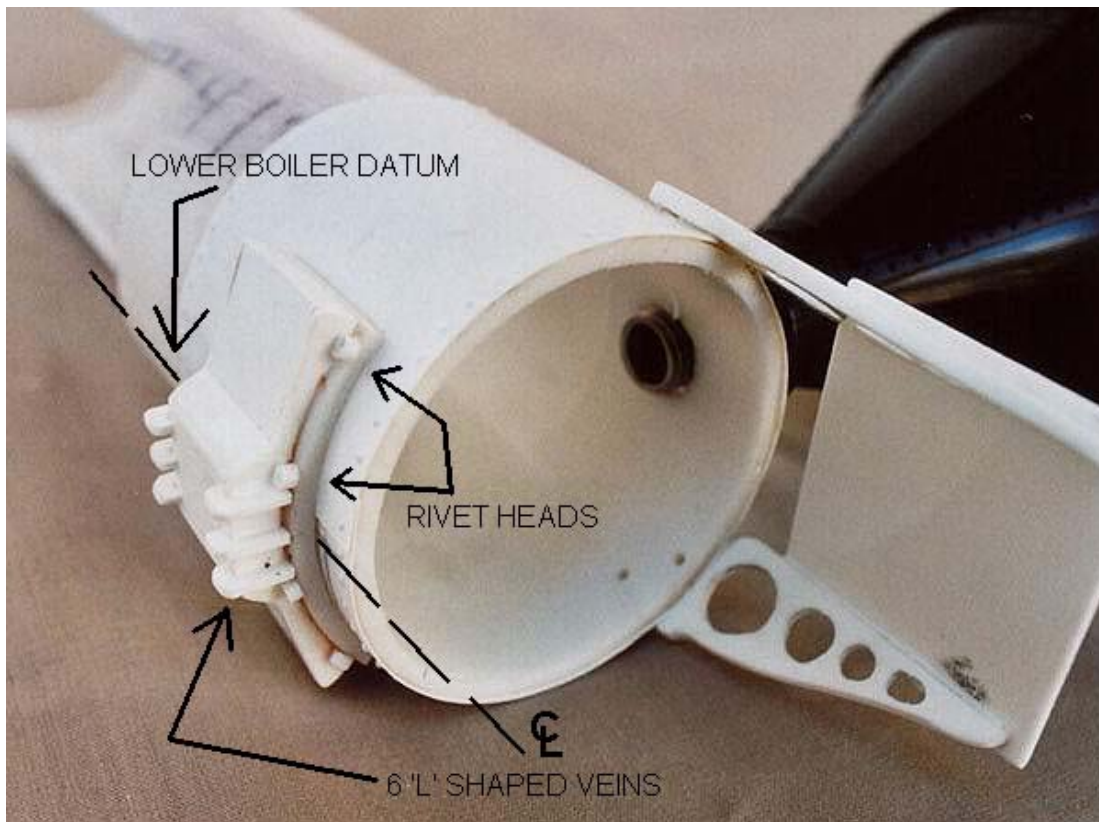


Next weld the saddle onto the saddle base, Make sure the ends of the saddle and saddle base line up perfectly. Sand the ends so that it forms one smooth flat face.



Finally attach the saddle assembly to the bottom of the smokebox, locating the centre of the saddle as shown on the PDF. Make absolutely sure you install the saddle such that it is square over the boiler lower datum line -- you don't want the saddle to be seen to one side of the smokebox! Use 5 minute epoxy to hold the saddle in place.

At this point cut out and weld into place the 6 'L' shaped vanes that run vertically on the front and rear face of the saddle. Using your 1.5mm styrene rivet rod, slice out 8 rivet heads. Weld these 8 rivets to the base plate as shown in the PDF and photo:



Making the Smokestacks

(Refer to the stack of PDF drawings set up for the Smokestack options.)

IMPORTANT!

No matter which stack you use on this model, the stack must be removable. The stack must slide into position on the smokebox, or screw in, etc...it must not be glued into place. This is essential for servicing the headlight in future, not to mention helping with any installation and operation of smoke units.

The following section will not only make a pretty cool stack of various types for your Mason Bogie, but could help you develop a stylish stack for use on your Bachmann 2-6-0s, 4-4-0s etc. At the time you read this section, you will probably not yet have your Bachmann balloon stack. These will be provided with your BBT drive if you requested the Balloon stack. Thus some of you making the Nesmith stack (option 2), or Congdon stack (option 3, 4), or the NPC Bully Boy stack (Option 6), will not be able to do much of this section. I can only ask you to wait. I do not want to waste Barry's time or money sending out individual stacks at this time, then to later send another package with your chassis. I want him to devote that time into producing your chassis. So please bear with us. Many of you will already have one of these Bachmann balloon stacks from a trashed Christmas 4-6-0, or an old plus version D&RG 4-6-0. If you have one, use it!! If you have a Bachmann Balloon stack on a operating model, and really want to do this stack...you might consider 'borrowing' the stack from your 4-6-0 until your new Balloon stack arrives. Do this at your peril! As the stack you might get to replace the stolen black stack might turn out to be a green Christmas stack, and will therefore need repainting!

I can see it already, some of you are going to get carried away with stack making. I see no reason why you might not like to try making interchangeable stacks, such that it is possible to run the loco with Nesmith one day, and Congdon on another day!!

Folks building options 1, and 5 will be using a H-L-W diamond stack, and can proceed at this time. Additionally, since we stated work on this class, H-L-W have released their finest 4-4-0 to date, that of the Disney Lilly Belle. Hartland have developed a brand new stack for the Lilly Belle, with is a classic NPC/SPC coal stack. It is highly detailed and even comes with a cinder cap!! Cost is \$10. This stack is not appropriate for use on the Nesmith stack, the cone angle is too steep, but it is more than suitable for the NPC Bully Boy, Option 6 stack, and can be used without alteration. The H-L-W stack can also be used for the Congdon stack, with a tad more work than when using the Bachmann balloon stack. The Bachmann stack and H-L-W stack are almost the same size, but differ in cone angle. The cost is the same at \$10. If you wish to try this stack, or even get a sample to try on your Bachmann 2-6-0s and 4-4-0s (they are a perfect addition to those models), then call Phil Jensen on Tues or Thurs and order the Lilly Belle stack. This is the finest stack released onto the market that is readily available.

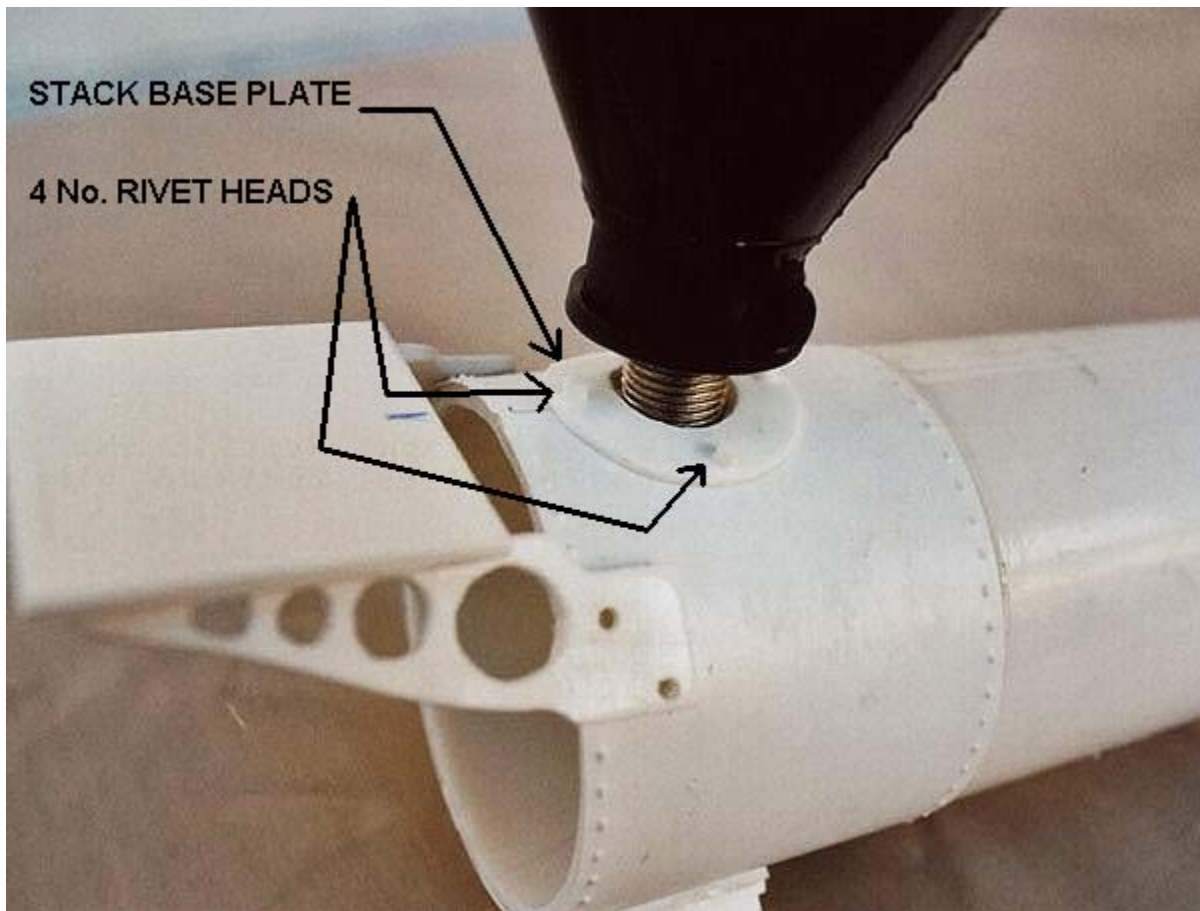


Smokestack Mounting Plate - needed for all stack types.

Check which type of stack you are using, and follow the PDF pages to cut out the circular mounting plate profile. The Bachman stack will use a larger mounting plate than the H-L-W stacks.

Using the PDF profile, cut out the smokestack mounting plate from 1mm thick styrene. Bend the plate in your hands to the curvature of the smokebox. Paste the plate onto the smokebox top, using the upper datum line as a guide to locating accurately. Use the PDF stack setout line to locate the centre point of the plate on the smokebox and weld into place. When the plate has hardened, apply 4 rivet heads of 1.5mm styrene rod to the locations shown on the PDF...two along the datum line, and two at the lowest part of the plate. Install the rivet heads just away from the plate edge, not more than 1mm from the edge. At this time there is no hole drilled into the plate centre for the stack. The hole required will vary depending on stack type used.

The stack base plate will look like this: The hole drilled in the centre demonstrates the installation of the threaded H-L-W stacks. We'll drill this hole later in this section.



Making the Stack Bases

All the various stacks are to be detailed at the bottom end in the same basic style. There are two ways to achieve this depending on the brand of stack used. There is the H-L-W stack base and the Bachmann Balloon stack base.

The H-L-W stack base

Step 1 - The Rim

On all the H-L-W stack bases you will notice a plastic rim molded on. This is great because you are already 90% of the way to producing the flanged edge to the stack. Cut a 2mm wide strip of 0.5mm styrene sheet. Using welder cement, wrap the strip around the outside face of the H-L-W rim. Keep winding the strip around, like cotton onto a reel, until you have produced a flange about 2mm deep... the face of the rim is now 2mm proud of the stack's stem. Sand off the exposed end of the strip until it is flush with the rim itself. Cut four 2mm slices of our 2.4mm diameter Plastruct tube. Carefully slice off one side from each 2.4mm cylinder, producing a flat side to each. Weld the 4 cylinders to the side of the rim, install one at each compass point, or at 12, 6, 3 and 9 o'clock. Next cut 4 slices of your trusty 1.5mm rivet rod. Weld one rivet to the top of each rim cylinder. You have now produced the bolted flange plates where the lower stem is bolted to the upper stem on the prototype.

Step 2 - The Riveted Wrapper

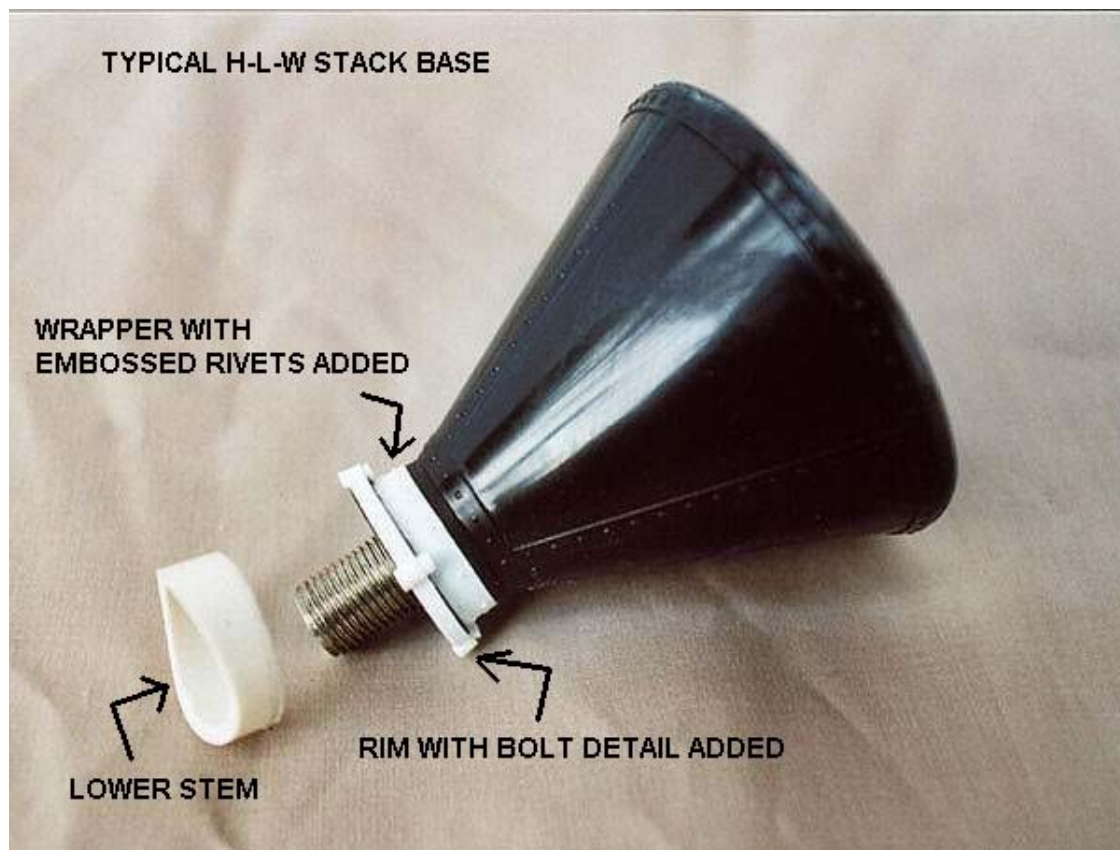
Using the PDF template cut out a strip of 0.5mm thick styrene, and emboss the rivet pattern using a spike type tool. Like making the smokebox wrapper earlier in this chapter, emboss the rivets over a firm surface such as a block of wood. This will give you the cleanest rivets. Wrap the styrene strip around the stack stem, directly above the bolted rim you've just done. When you wrap to a complete circle, trim off the excess strip.

Step 3 - The Lower Stem

Finally obtain a plastic pipe of approx. 19mm diameter or less. This will be used for the lower stem of the stack. Plastruct make such a pipe, but since you only need about a 10mm length, it just isn't worth buying! I would go to the stationery store and investigate the plastic pen and markers for sale - look for a marker with a plastic body casing of pipe size 18-19mm!! That will do nicely.

Now compare your model stack to the one in your 2-6-6T/0-6-6T Options drawings. Compare the height of your stack relative to the height of the stack shown in the drawing. The difference in height will be taken up in the length of pipe to cut for the lower stem of your H-L-W stack. Cut the 18-19mm marker pipe to that length, it will be in the order of 10mm long. Next run the end of the pipe over your spare boiler pipe, wrapped in sand paper, and sand off the bottom of the lower stem to the curvature of the boiler.

Your stack, including rim with bolts, embossed wrapper and lower stem sanded to the boiler curvature will look like this:



Step 4 - Installing the H-L-W stack to the Smokebox.

You can now work up the mounting of the H-L-W stack into the smokebox top. Remember the stack must always be removable.

We need to drill out the smokebox top in the dead centre of the base plate already installed. You will ultimately drill out a hole the same size as the threaded base of the H-L-W, and simply screw the stack into place. It is very dangerous to drill out this large hole in one go. You risk shattering the smokebox, and worse, going completely crooked! So we begin small. Start by drilling the very centre of the stack location by drilling a 1.5mm diameter hole. Next drill out that hole with a 3mm drill, then a 5mm drill and so on until you get to the 8mm hole required for the H-L-W stack to screw in. Use a metal file in the hole to sand out the last of the hole for a good tight fit.

Step 5 - Attaching the Lower Stem to the Smokebox.

The Slime Method of Gluing.

The Slime method is a technique I use to glue parts together using epoxy type Aryldite glues etc. These types of epoxy glues tend to leave bulging glue lines where the joints are. We don't want to see the glue lines, just a clean joint. The slime method is to basically glue the inside of the objects thus keeping the ugly glue lines out of sight.

It is now time to glue the lower stem of the H-L-W stack part to the smokebox. The stack will then screw down onto this base. Do not apply the epoxy directly to the base of the lower stem pipe, because it will bulge out of the joint line, and make an ugly mess! NO we apply the epoxy to the inside of the pipe, near the base, but not on the bottom edge at all. Then dump the stem base pipe onto the smokebox top, central about the hole drilled...and wait...the epoxy will take about 20 seconds to start sliming! It will ooze down the inside of the stem pipe onto the smokebox top within the stem area. When hardened, you'll have the stem nicely bonded to the smokebox, and a nice glue-free joint line as seen from outside...the slime method of gluing!

The Bachmann Stack Base

The alteration of the Bachmann stack base is almost identical to the H-L-W base described above, only the lower stem is already part of the stack, and there is no screw thread to use in attaching the stack to the smokebox.

Step 1 - The Rim

Midway up the stem of the Bachmann stack you need to install a rim. Cut a 2mm wide strip of 0.5mm styrene sheet. using welder cement, wrap the strip around the stem. Keep winding the strip around, like cotton onto a reel, until you have produced a flange about 2mm deep...or the face of the rim is now 2mm proud of the stack's stem. Sand off the exposed end of the strip until it is flush with the rim itself. Cut four 2mm slices off our 2.4mm diameter Plastruct tube. Carefully slice off one side from each 2.4mm cylinder, producing a flat side to each. Weld the 4 cylinders to the side of the rim, install one at each compass point, or at 12, 6, 3 and 9 o'clock. Next cut 4 slices of your trusty 1.5mm rivet rod. Weld one rivet to the top of each rim cylinder. You have now produced the bolted flange plates where the lower stem is bolted to the upper stem on the prototype.

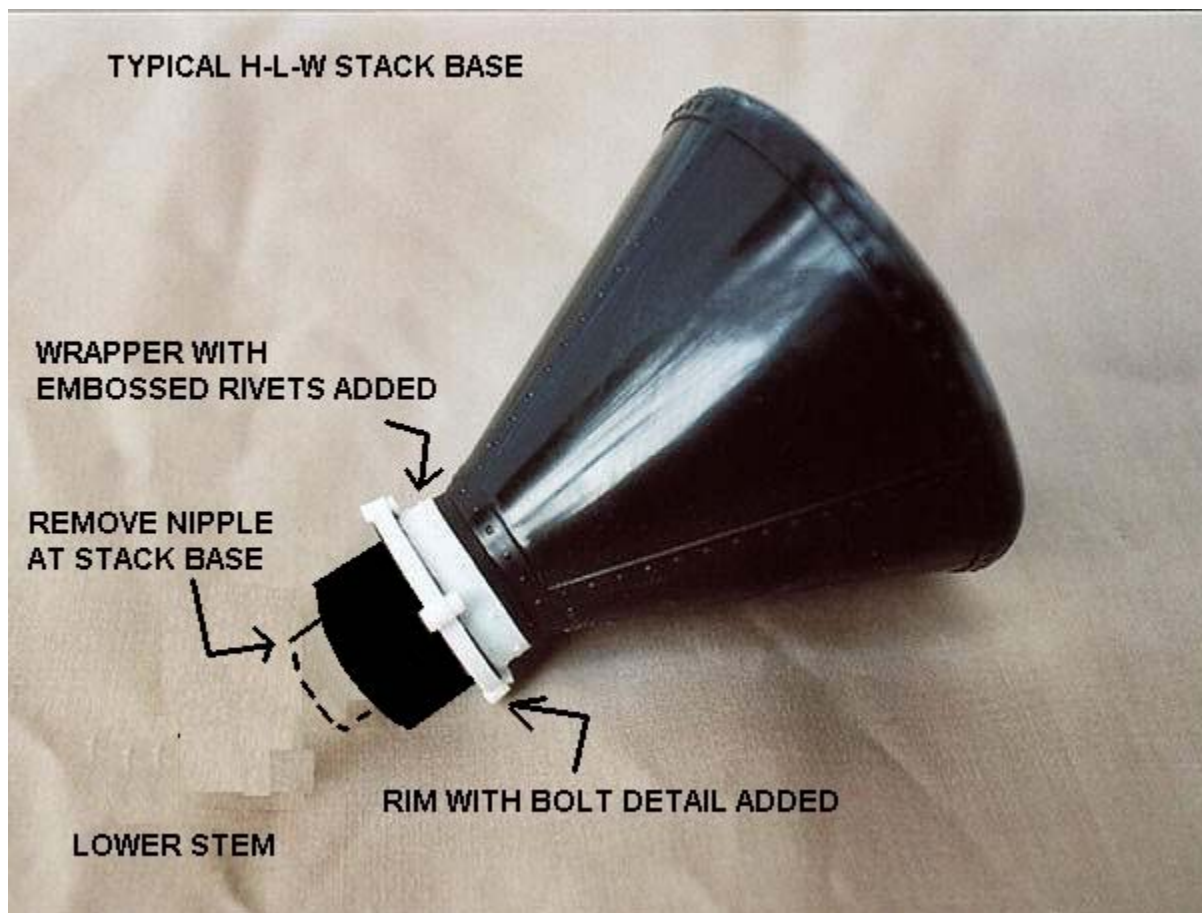
Step 2 - The Riveted Wrapper

Using the PDF template, cut out a strip of 0.5mm thick styrene, and emboss the rivet pattern using a spike type tool. Again, like making the smokebox wrapper, emboss the rivets over a firm surface such as a block of wood. This will give you the cleanest rivets. Wrap the styrene strip around the stack stem, directly above the bolted rim you've just done. When you wrap to a complete circle, trim off the excess strip.

Step 3 - The Lower Stem

Remove the nipple at the base of the stack. Next run the end of the pipe over your spare boiler pipe, wrapped in sand paper, and sand off the bottom of the lower stem to the curvature of the boiler. When sanding the lower stack stem on the spare boiler piece wrapped in sandpaper, it's really important to check for squareness while sanding, so the stack doesn't sit crooked. While you're sanding go slow, and look at the stack from the side and from the end of the pipe to make sure it's standing straight in all directions.

Your stack, including rim with bolts, embossed wrapper and lower stem sanded to the boiler curvature will look like this: (This is a doctored photo to indicate the concept only!)



Step 4 - installing the Bachmann Balloon stack to the Smokebox.

You can now work up the mounting of the Bachmann stack into the smokebox top. remember the stack must always be removable.

Go out into the world and look for a plastic or metal pipe that fits snug into the inside of your fully sanded stack stem. Plastruct make such a pipe, but since you only need about 20mm length of it, it just isn't worth buying it! I would go to the stationery store and investigate the plastic pen and markers for sale -- look for a marker with a plastic body casing of pipe size equal to the inside diameter of you stack stem (approx. 10mm). That will do nicely.

Insert the marker pen pipe into the bottom of the Bachmann stack, leaving about 10mm exposed at the bottom. Weld the pipe into place using the welder cement. When hardened, apply some epoxy glue into the inside of the stack around the pipe sticking up from the base...this will make a strong base to the stack.

We need to drill out the smokebox top in the dead centre of the base plate already installed. You will ultimately drill out a hole the same size as the 10mm marker pen pipe size, that is now the new nipple on the base of the stack. It is very dangerous to simply drill out this large hole in one go. You risk shattering the smokebox, and worse, going completely crooked! So we begin small. Start by drilling the very centre of the stack location by drilling a 1.5mm diameter hole. Next drill out that hole with a 3mm drill, then a 5mm drill and so on until you get to the 10mm hole required for the Bachmann stack to slide in. Use a metal file in the hole to sand out the last of the hole for a good tight fit. You can now simply insert the stack by sliding it into the hole. Do not glue it, the stack must remain removable.

It is now time to detail the upper portion of the stack to suit the type used on your loco option.

Painting your Smokebox - All Stacks

It is now time to paint your smokebox. You can paint it black per builder's photos, or dark graphite grey, or silver etc. The color used on my smokebox was Tamiya Metallic gray MS-5. This is a high gloss dark metallic graphite color. I sprayed the smokebox, headlight bracket and lamp platform all in one go. I then matted it off with a coat of Testor's Dull Coat, 1260. Do not paint the removable part of the stack yet. You need to detail the upper portion, which we shall do now!!

Detailing the upper stack.

Chaps, it's now time to make up the upper portions of all your stack options. The best description is to follow the PDF paper devoted to your specific stack and follow the details there. In summary the changes to the H-L-W and Bachmann stacks are as follows:

General Notes About Rivet Details to the Cones.

There are a number of ways to add the rivet lines to the conical sides of your stack. The Lilly Belle Stack is already riveted! But the others are very plain. The conical sections were usually made from between 4-6 segments, The segments, where joined, had a line of rivets. Most of the smaller diamond type stacks such as option 1 and 5 should have about 4 segments.

The Nesmith and Congdon comes appear to have either 5 or 6 segments to the lower cone, and perhaps 4 segments to the upper cones...which is why those cone joints appear out of sync!

Rivet Method 1

Slice a whole bunch of those tiny rivet cubes from your 0.20x0.30 rivet rod. Draw pencil lines on your upper and lower cones to work out the best rivet line locations. Then weld the rivets to the stack one at a time, at about 3mm centers.

Rivet Method 2

Use HO rail spikes, and drill a line of holes into your stack, insert the tiny pins into the line of holes. (I don't much like this approach!)

Rivet Method 3

Cut a 2mm wide strip of 0.5mm styrene, and emboss a line of rivets at 3mm centers down the centre of the strip. Then weld the strip to the cone sides...the H-L-W Lilly Belle stack is virtually made this way. Rivet strips will look like this:



A Question of Rivets

I'll leave these rivet options to you. However, after looking hard at the photos. I can see the joint lines in the Nesmith and Congdon quite well, but the rivets are barely visible. In keeping with the clean lines of our Mason, it appears that the stacks were NOT a festival of rivets. I know you guys love rivets, but this might be the time to back off on stack rivets...and I bring you recommended Rivet Method 4...

Rivet Method 4 - (Recommended for this Project)

Run pencil lines along the cone sides to work out the spacing of the segment joints, then using your knife, score a firm line into the stack sides, following the pencil lines. That's it. Do not add any domed rivets of any kind. When the light strikes the stack, you'll see the joint lines, and the appearance is much like that seen in the photos.

Cinder Caps

At the bottom of the Nesmith stack and NPC stack only is a small cinder hatch. This is a tubular outlet with a circular cap on it. You make these using Plastruct 4.8mm tubing, capped at one end with a 1mm styrene circular patch. Apply a handle to the cap using your 0.20x0.30 rivet rod. Sand the bottom end of the 4.8mm tube to a curvature to match the circular face of the stack. Weld the cinder cap into place.

Option 1 - As Built Mason stack - small diamond type.

This stack uses a H-L-W 4-4-0 diamond stack. There is nothing to do to this stack except remove some of the upper cone, to the size shown in the PDF. You can do this by cutting away at it with a knife, or by slowly sanding it down. When you get the upper cone down to the right level, use sandpaper and metal files to sand the horizontal top edge into a more vertical face. There you weld a band of 0.5mm styrene strip to create the lip at the top of the stack. Around the very top of the lip, use a length of your 0.20x0.30 rivet rod and wrap a strip around the outer face of the very top of the lip. Detail the lower and upper cone rivets to the method preferred by you, and spray paint the stack to match your smokebox color.

Option 2 - Nesmith Stack.

The Nesmith is almost a dead ringer for the Bachmann Balloon stack. All one has to do is lower the height of the upper cone. An obvious Wimp's way is to simply use the stack as is, no cutting required. When applied to the Mason, it will actually look like a Nesmith!

To do it properly however, we must remove a portion of the top of the stack. Begin by removing the top cone, it just slides out. Carefully remove the screen and screen mounting from within this top cone. Use a screwdriver or knife to pry this mounting off.

Now cut away some of the upper cone, to the level shown in the PDF. You can do this by cutting away at it with a knife, or by slowly sanding it down. When you get the upper cone down to the right level, use sandpaper and metal files to sand the horizontal top edge into a more vertical face. There you weld a band of 0.5mm styrene strip to create the lip at the top of the stack. Around the very top of the lip, use a length of your 0.20x0.30 rivet rod and wrap a strip around the outer face of the very top of the lip.

Now it's time to make the coal baffle within the stack. There is no meshed screen required in the Nesmith -- they just didn't use a screen. The baffle is to be a disk with angled sides, to the diameter shown in the PDF. You can either make this up out of layers of 2mm styrene and sand the angled sides to a smooth finish or go out into the world and find something that looks about right and is the right size. Go to the hardware store, check the supermarkets! Here in Auz I found two possible candidates for this baffle. One is a plastic plug that is used to plug into power outlets in the home. These are used to stop kids sticking things into power outlets. The other source I found was the conical measuring cup used to measure medicine doses, and also for

measuring hardeners etc when mixing epoxy out of a tin. Some baffle candidates might be these: The PVC pipe at the back is for something else -- cant remember what, but I'm sure I'll figure it out later...



You are to install this baffle in the upper cone of the stack, such that the top of the baffle is actually proud of the stack top. It will be exposed out the top by about 4mm. Hold the baffle in place by resting it on top of two 1.5mm brass rods that rest on the stack mid band as shown. Notch the baffle on two sides where the upper of the two rods pass.

Detail the lower and upper cone rivets to the method preferred by you, and spray paint the stack to match your smokebox colour.

Option 3 - Congdon Stack.

We use the Bachmann or H-L-W balloon stacks for this stack. The Bachmann stack will provide the best results in terms of size, however I must emphasize that in investigating the Congdon stack, no two of these stacks were quite the same in the DSP&P photos! There is a bit of latitude.

The Bachmann stack surprisingly matches the patent Congdon dimensions almost perfectly. The lower cone taper is within a couple of mm, the width at the top is a spot on match as is the height. The only area which does not match perfectly is the diameter of the stem. The stem of the Bachmann stack is 21.5mm. The actual Congdon at 1:20.3 scale should have a stem of 19.5mm..Big deal many of you will say, and rightly so, considering the number of variations seen in this stack type. I bring this to your attention. You can use the Bachmann stack with little worry, but for those that want perfection, think about cutting the Bachmann stem off, about 2mm below the lower cone, and inserting the cone onto a 19.5mm pipe. Then sand the bottom of the cone to continue the cone taper to the new stem size. A bit of messing around, but do-able. You

will note on my demo Congdon stack, I did this alteration to see if it could be done. My stem will be narrower than the standard Bachmann stem...OK to the stack....

Begin by removing the top cone from the Bachmann stack and throw it into the junk box.

We now need to add the famous, unseen domed coal screen inside the stack. Go out into the world and look for a tea strainer used in the making of a nice hot cup of tea. These are stainless steel. Some come with handles, others simply as a meshed ball, that splits into two halves. Our UK brothers will have no problem finding these, as they invented it! I got a tea strainer in the form of a meshed ball for \$3.50. The two halves gave me two goes at getting the screen right! When you have your strainer, cut the rim off the meshed part using scissors (not your wife's good ones OK - take it from me, not a good idea). Your strainer will look like this:



Next insert the strainer into the top of your stack. I glued the thing into place using daubs of epoxy glue, applied from the inside.

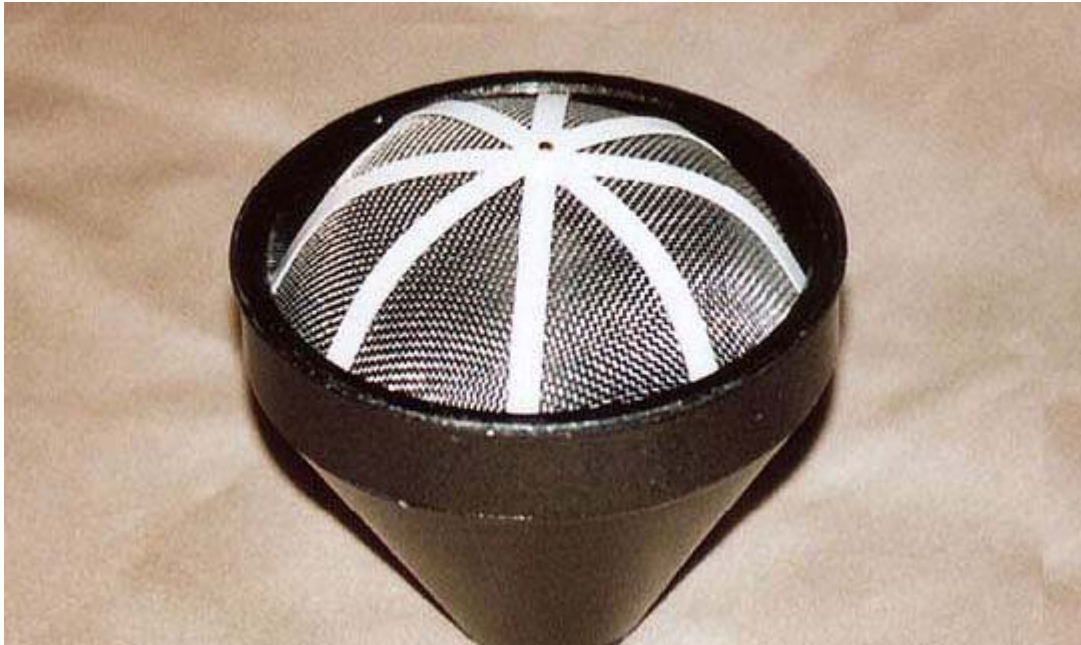


Using your 0.5mm styrene sheet, cut four lengths at 3mm wide, per the PDF. Weld the three strips together to form a 'star'...make sure the weld is exactly in the centre point of each strip. Weld them on top of each other...thus:



At this time run a rim of 0.20x030 styrene rod around the very upper perimeter of the stack's middle (vertical) band. Weld into place.

Now insert the 'star' strips assembly into the stack top. Bend the ends down into the gap where the strainer meets stack sides. The 'star' will want to pop right out. Stick a pin through the middle of the 'star', and run it into the mesh at the very centre of the stack...this will hold it down. From below the mesh, apply a tab of sticky tape to the pin to keep the pin from lifting out, and apply a blob of 5min epoxy to the pin where it meets the underside of the mesh. When hardened, remove the tape from the pin. Your stack should look like this:



Making the Congdon Upper Cone

This part is damned difficult...it took me several goes to get this right.

There are two ways to do this:

The PDF Profile

Cut out the taper profile from the Congdon PDF template. Cut the pattern out in 0.5mm styrene sheet and weld the cone together at the overlap. This will guarantee a good cone, to match the patent drawing. The down side is the visible overlap. Yes you can hide it with a rivet line, but think about what I said about the visibility of the rivets on these Mason Bogie stacks.

The Bottle Hunt

This involves finding the correct shape cone from the world of plastic junk! You are to look for a conical plastic object - perhaps a plastic BBQ cup, a Coke cup with the Simpsons on the side, perhaps a plastic ketchup bottle, a shampoo bottom, a gardening sprinkler head...dunno. A conical plastic object. The difficult part is getting one with the correct taper. All of my early attempts had me cut a cone to the right size, install it... only to find the top was just too steep...too close to vertical. It plays tricks with the eyes. So I'm going to make it easy for you - we're going to make a cardboard jig first, with which you'll go out into the world and find the plastic cone with the right taper.



On the Congdon PDF drawing you'll see two circles drawn. One circle represents to the diameter of the upper end of the cone. The wider circle is the outer diameter of the lower end of the cone. Paste these two circle templates onto cardboard, and trim the edges as shown, be precise, cut exactly on the lines. Then cut out the two circles leaving a hole in the centre of the two cards. Fold the sides of the square cards into the vertical line, forming two boxes. Insert the slightly smaller box into the larger one. You now have a nice box with circular holes in the top and bottom. OK off to the shops you will go. Find those conical bits of Tupperware. When you find one, insert it into your box, though the two holes. If the plastic cone runs into the smaller hole fine and comes to a stop, but the edges of the bigger hole is wider than the plastic cone, then the cone you have is too steep. You need to find something with more of a taper on it. If the plastic cone fits snug against both hole sizes, you have a match! Take the cone home and trace a line onto the cone side using the top and bottom of the cardboard box as a guide. Then cut the cone section free of the rest of the plastic conical thing. You have your upper cone for the Congdon.

The Upper Cone Rim.

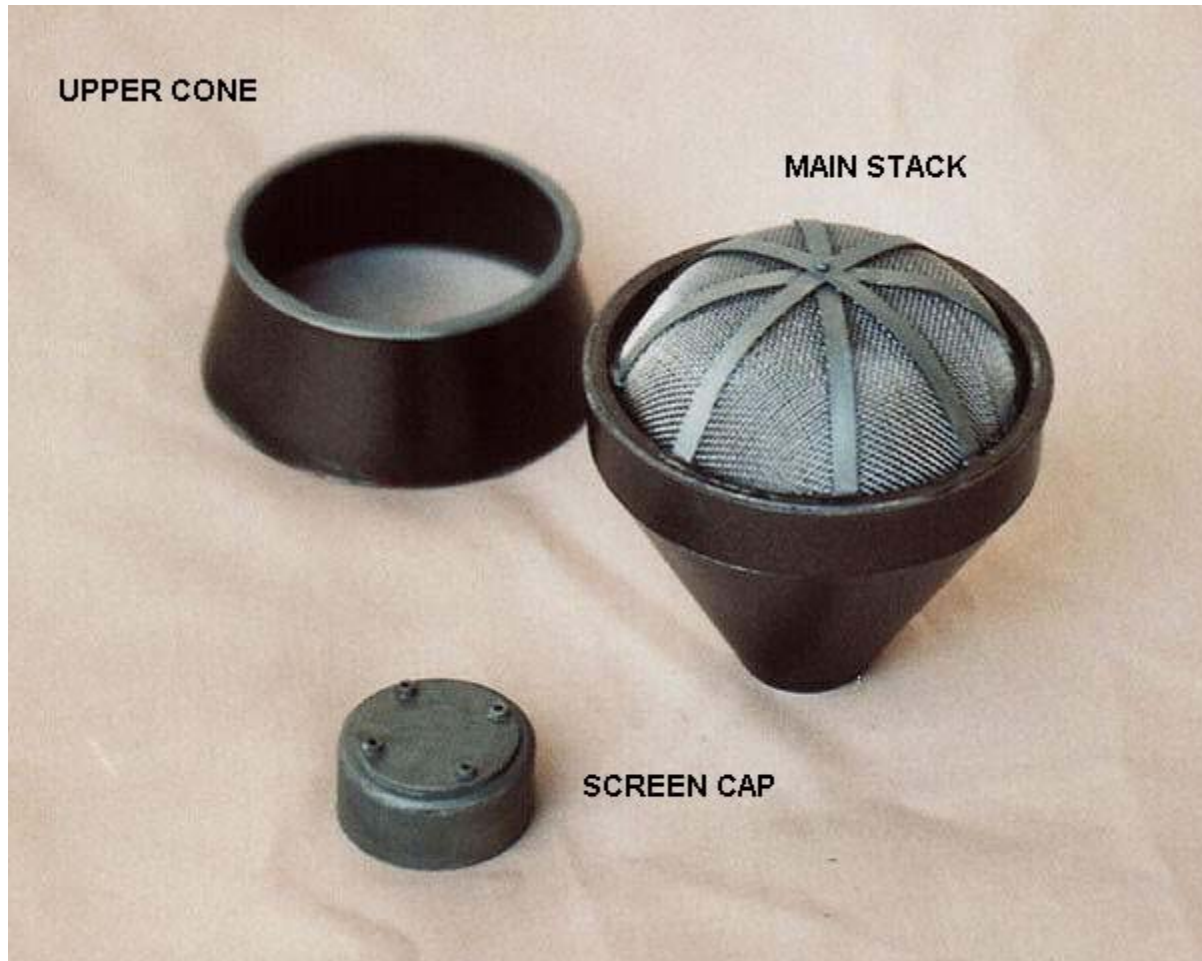
When you have you upper cone sorted out. Its time to run a rim around the very top of it. You can use your 0.20x0.30 rivet rod as a nice rimming strip, or you can pre-bend some 0.75mm brass rod into a circle that matches the upper end diameter of the cone. Then dump the brass ring onto the top and secure it by greasing some epoxy over it. No dribbles or runs, smooth it out. When hardened, give it a sand over the very top, and smooth it all out.

Making the Screen Cap.

The last part of the Congdon to be made is the upper, visible end of the screen cap. Find a 26mm diameter plastic tube. Electrical conduit might be right, or yet another plastic-bodied marking

pen. Rest a length of the pipe atop your screen within the stack. Rest the new upper cone atop the whole stack assembly. Measure out the line of the top of the upper cone on the side of the 26mm tube. You want to cut this tube at a line about 2mm taller than the stack top. When cut, apply a circular capping in 1mm styrene to the top 26mm tube. Round off the cap edges by sanding. Finally weld a 2nd, smaller, 1mm styrene circular capping to the top and apply four brass 10BA nuts as shown. Fill the holes in the nuts with a daub of epoxy.

Your stack parts should look like this:



Using two daubs of epoxy glue, glue the screen cap to the 'star' directly over the centre top. Apply only two daubs of glue to where the cap actually touches the 'Star' strips. In the glued position the cap will look like this:



The Slime Method of Gluing.

The Slime method is a technique I use to glue parts together using epoxy type Aryldite glues etc. These types of epoxy glues tend to leave bulging glue lines where the joints are. We don't want to see the glue lines, just a clean joint. The slime method is to basically glue the inside of the objects thus keeping the ugly glue lines out of sight.

It is now time to glue the Congdon upper cone to the main stack body, and we want to do it as cleanly as possible - no bulbous glue lines. Do not apply the epoxy directly to the base of the upper cone, because it will bulge out of the joint line, and make an ugly mess! NO, we apply the epoxy to the inside of the cone, near the base, but not on the bottom edge at all. Then dump the cone onto the stack body, centrally located...and wait...the epoxy will take about 20 seconds to start sliming! It will ooze down the inside of the cone onto the stack top within. When hardened, you'll have the cone nicely bonded to the rest of the stack, and a nice glue-free joint line as seen from outside...the slime method of gluing! If the glue does start to slime out through the joint, wipe it off.

The stack top fully installed will look like this:



Finally detail the lower and upper cone rivets to the method preferred by you, and spray paint the stack to match your smokebox color. The finished Congdon smokestack as seen from above, with the nuts filled in with epoxy, looks like this:



Option 5 - As Built Mason stack - Bully Boy 0-6-6T.

This stack uses a H-L-W 4-4-0 diamond stack. Remove the entire upper cone of the stack, and trim off the rim between the two cones. Next go out into the world and find a small PVC pipe of approx. 43mm diameter. Cut a 10mm length of the pipe, this will form the upper cylindrical section of the stack.

You are now in need of a tea strainer similar to the guys building the Congdon stack above, only you'll be looking for a smaller type. Cut the screen out of the tea strainer frame and insert it into the PVC pipe section. Glue the screen into place using daubs of epoxy from the inside. The top of the stack should look like this:



Follow the NPC Option 5 stack template and cut out the 'star' shaped component in 0.5mm styrene. Cut out the 'cap' circle of styrene in the PDF template in 1mm styrene and weld this to the centre top of the star. Next insert the star over the screen, bending the points of the star into the gaps between the screen and cylinder wall. In concept, it will work like this: (the central top will be solid, not meshed!).



Stick a pin through the middle of the 'star', and run it into the mesh at the very centre of the stack...this will hold it down. From below the mesh, apply a tab of sticky tape to the pin to keep the pin from lifting out, and apply a blob of 5min epoxy to the pin where it meets the underside of the mesh. When hardened, remove the tape from the pin

Finally apply the cylindrical stack top to the top of the H-L-W cone, using 5 min epoxy. Use the 'slime' method to glue it on without any glue oozing out of the joint.

Detail the lower and upper cone rivets to the method preferred by you, and spray paint the stack to match your smokebox color.

Option 6 - NPC Balloon stack.

This stack uses either the H-L-W Lilly Belle 4-4-0 stack or the Bachmann Balloon stack.

If using the H-L-W stack, guess what -- you have nothing to do!! Go and use it as is.

If you're using the Bachmann stack, you have to simply add a rim around the very top of the upper cone. There you weld a band of 0.5mm styrene to create the lip at the top of the stack. Around the very top of the lip use a length of your 0.20x0.30 rivet rod and wrap a strip around the outer face of the very top of the lip. Detail the lower and upper cone rivets to the method preferred by you, and spray paint the stack to match your smokebox color.

The Russia Iron Boiler Jacket.

First a few words about the Russia Iron boiler jackets used on classic American locomotives. Real Russia Iron was a form of treated metal. It was not painted. At this point I direct you to read the Russia Iron Treatise by Jerry Kitts, which will give you an excellent understanding of what Russia Iron is. Please refer to these two links:

<http://www.railwayeng.com/dspp/russiron.htm>

<http://www.railwayeng.com/dspp/colrnote.htm>

Chaps there are two basic ways to finish your boiler. This is the time to do it, before the domes get attached. The two ways are:

- 1 - Painting your boiler.
- 2 - Cladding your boiler in a treated metal jacket.

The Painted Boiler.

At this time you must decide whether you will glue styrene boiler bands onto your boiler, then paint them, or apply real brass boiler bands after the boiler is painted.

Styrene boiler bands.

Using your 0.5mm styrene sheet, cut 4 lengths of 3mm wide strips. These will become your boiler bands. Take your boiler, and following the boiler set-out PDF drawing, draw 4 pencil lines where the boiler bands will run. Check that the pencil lines are perpendicular to the upper and lower data lines, use the masking tape method to acquire a straight line around the boiler. Next take your 3mm wide styrene bands, apply super-glue sparingly to the rear face, and carefully wrap them around the boiler following your pencil lines. Your boiler is now ready for painting.

Paint the boiler to the methods outlined below. Spray paint over the boiler bands. You can later repaint the bands in brass/gold paint, using a small paintbrush, or simply leave the bands in the Russia Iron color. It was common for Russia Iron boiler bands to be used in lieu of brass in the 1870s and 1880s.



It was quite common in the 1870s for the boiler bands to be made from Russia Iron material, matching the boiler jacket. It also happens to be damn stylish!

or



...Paint the boiler bands a brass color! The color scheme of this loco is also demonstrates my attempt at doing a 'Lake' color scheme to an 1870s Baldwin 2-6-0. Lake is a very dark brown. The boilers in both of these models were painted using automotive spray cans.

Painting the Boiler

The Automotive Metallic Spray Cans - The Fletch Method.

These are the car spray cans used to touch up damage on your cars, available at all auto stores, Wal-Mart etc. My advice in selecting these spray cans is to think dark and think metallic gray. Amidst the many metallic colors you will find, it will be difficult to keep your mind focused on the preferred color -- think dark and grey!

These paint very well, without primers. Just make sure you have no grease on your boiler. Mask off the smokebox area, already painted up in the last section. A good masking tape is actually one made by Tamiya for this very purpose. I like it because the tape does not have a strong bond, and it will not tear the paint off, when removing the tape!

Testor's Buffable Paints - the Jim Wilke Method.

Russia iron is incredibly easy - no mixing complicated paints, no muss, no fuss. I found a solution which is 100% accurate to actual samples of Russia iron I've seen. I've used it myself, I love it and here it is:

Testor's "Gunmetal" Metallizer buffable paint. It's marketed to aircraft modelers who need polished metal surfaces on their plastic kits. You airbrush it (or use the spray can version) and buff when dry to a genuine metallic finish. Then use Testor's Non Buffing Metallizer Sealer to prevent tarnishing. That's it.

Three steps - paint, buff, seal. Period.

I've seen TONS of genuine Russia iron. This the best.

Jim

The Humbrol Paints - The Peter Bunce Method.

For those members who cannot buy the Testor's paint (it is not available in the UK), could I suggest the 'Metalcote' paint from Humbrol - they have a 'Metallic Grey' color (ref 27004) which is a 14mm tinlet at £1 (UK) each.

It is very thin, dries in 30 minutes and covers well (on white it could do with a couple of coats, and the surface needs to be smooth), looks very dull black in colour till polished with a smooth cloth -- then a transformation takes place: it takes on a satiny sheen, and turns dark grey (and lives up to its name!), the best way of describing could be like a 'B' grade drawing pencil. I used a brush (as a trial of it), but a 'sprayed on version' would be best I think.

Yours Peter Bunce

Painting a Wrapper or Jacket - The Vance Bass Method.

I needed a temporary boiler jacket on my Accucraft Ruby to run before I had time to make a proper blackened brass wrapper. I knocked one out of tinfoil and painted it with a black metallic paint I got at Wal-Mart, sold under the brand "House Beautiful Decorator Metallics". It is a little too sparkly compared to the blackened brass, but much more credible than the usual metallic baby blue most companies use for "Russia Iron". This may be the easiest paint for most people to find, given that there's a Wal-Mart on every corner now. (Vance Bass).

Boiler Bands on a Painted Boiler.

Once you've painted your boiler, for those who will be adding real brass boiler bands, refer to the Brass Boiler Bands section below. If you've painted over the styrene bands, you can now leave them as is (Russia Iron Bands) or hand paint them a brass color.

The Russia Iron Metal Jacket Wrapper.

This is where we make a real boiler jacket, to be wrapped around the PVC boiler pipe. You do not need to paint the boiler any further than the smokebox you have already painted.

Refer to Kevin Strong's article on patinated boiler jackets. You will be using this technique to make the boiler jacket for the Mason. My best advice is to get an excess of the 0.005" brass sheeting, and do a number of tests in blackening the jacket material before applying the real one to the model.

Important!

Kevin recommends wrapping a layer of cork around the boiler first with the jacket applied on top of that, for the purpose of creating the 'step' at the smokebox interface. On the Mason Bogie, this will not be appropriate, as there is NO step at the smokebox. The smokebox diameter and fully jacketed boiler diameter of the Mason are identical. Thus do not pack out the boiler with cork, simply apply the metal jacket directly to the PVC boiler pipe.

Kevin's Cork wrapper is designed for all other locomotives, such as Baldwin, Cooke etc.

Some points to observe:

1. If you have enough brass 'blacken-it', you can totally immerse the full jacket sections and obtain a very clean even finish. Take care, because if you immerse too long, or more than twice, the blacken-it will flake right off!
2. It is desirable to roll the metal jacket sections into the desired cylindrical form before applying it to the model. This will reduce the stresses places on the boiler bands holding it in place. We do not glue the jacket in any way. In fact glues will stain the jacket.
3. I rolled the jacket parts before blackening, but you could roll it afterwards. Just take care not to scratch the surface too much. Yes it can be touched up, but I have had great difficulty obtaining a totally even finish when touching up. If your jacket is to look old and used, then the touching up is desirable!
4. Don't mess with the jacket, be deliberate. Blacken it, roll it, apply it, secure it and leave it. That's it. Don't pull and tug at it, don't sticky your domes to it and mess around with it just to see how your Mason is looking, don't try polishing it up on the model. All this will lead to scratches and you might not like the finished look of the repair.

Making the Jacket.

Refer to the PDF page entitled "Boiler Wrapper Templates".

You should have already applied the smokebox wrapper earlier in the chapter. There are two wrapper templates left on the page...the straight boiler section and the boiler taper section, with the steam dome hole cut in. Cut out the PDF templates. Wrap the paper templates around your boiler and check how well they fit. Make note of any alterations you need to make to the paper templates to ensure a perfect fit. The straight boiler section will allow an overlap at the base of the boiler. You will apply a small bolt through this overlap and into the base of the boiler to hold the jacket in place.

Trace the PDF templates onto your 0.005" brass sheeting. Cut the brass to suit. I used scissors. Smaller nail scissors can be used to cut out the dome hole. Be precise, you don't want any white boiler showing between your jacket and dome base, when the dome is finally located. You can always make a small hole larger, but not make a larger hole smaller. Be careful cutting out the dome hole.

Roll the jacket using a length of electrical conduit or similar 15-20mm pipe. Roll the conduit pipe back and forth over the brass sheeting atop a 20mm thick foam rubber base. The foam rubber I used was the yellow stuff that Bachmann use to pack around the outside of their Spectrum loco boxes. Slowly bring the wrapper into a curve to match the boiler curvature. Do not bend the sheeting around the pipe, just use the pipe to roll the wrapper. To forcefully bend the wrapper around the pipe will result in kinks in the sheeting.

Blacken the wrapper per Kevin's instructions. If blackening using Q-tips, or cotton buds, place your wrapper over some scrap boiler pipe to support your jacket. Blacken it up, and buff up the finish. You will be polishing away a film of brown oxide dust to get down to the cool dark grey Russia Iron finish. The rolled and blackened jacket might well look like this:



Apply the tapered section to the boiler first. Match up the dome hole perfectly. See that it all fits. You will still have a white gap between this jacket and the very back end of the boiler. This last strip will be covered by the last brass boiler band.

Take the taper jacket away again and apply two strips of double sided tape to the lower ends of the jacket. Use the thinnest double sided tape you can find, a real film thickness. You can purchase this at a stationary store. It is very strong. Place the tapered jacket back onto the boiler, using the dome hole to locate. Then press the sides down, thus holding the jacket firmly in place with double sided tape. The tape will never be removed, but its role is to hold the jacket in place until all the bands are in place. The tapered section otherwise has a tendency to slide forward!

Finally apply the straight boiler jacket section to your boiler. The rear end of the jacket will over-lap your taper by 1mm or so -- this is desirable as it will help to clamp the tapered section in place. At the front end of the jacket, at the lower datum line, drill a small hole and apply a 10BA sized bolt. Tighten it up. This will hold the jacket in place, and prevent any forward movement. Now its time to add the brass bands.

The Brass Bands - For Painted and Jacketed Boilers.

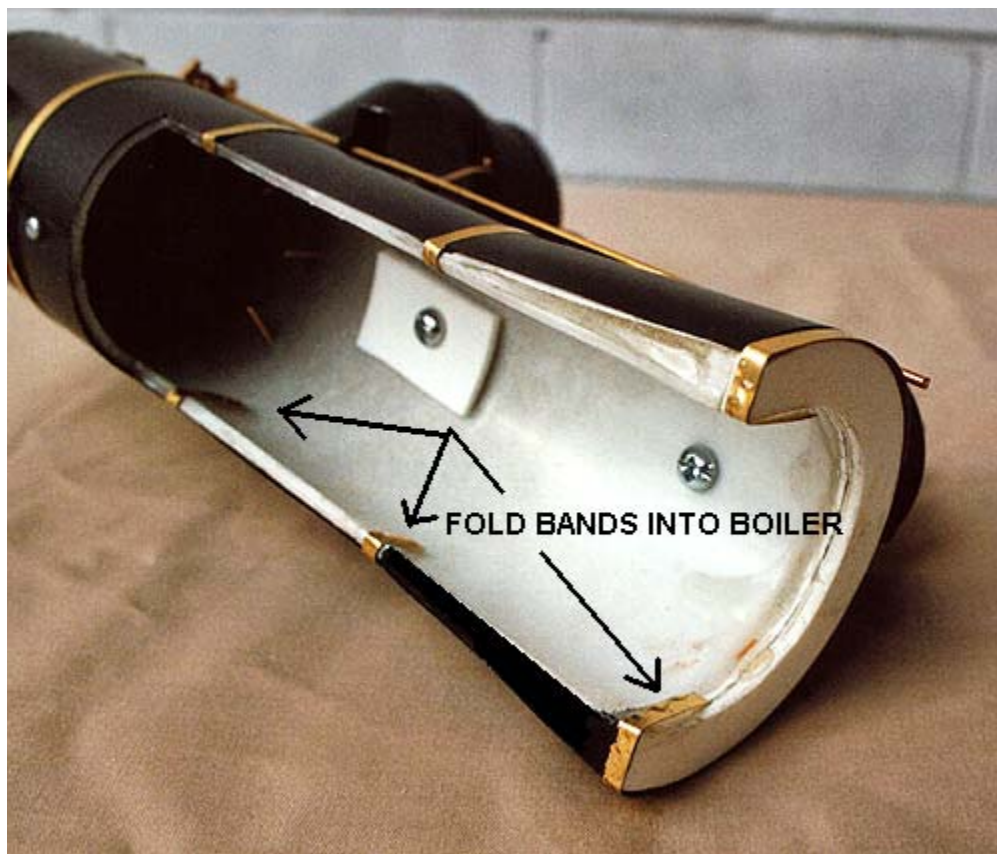
Using your 0.005" brass sheeting, Cut some 3mm wide strips. Make sure the strips are long enough to wrap right round the boiler with an inch to spare. Roll the bands a little to bring them to the boiler curvature.

The first band behind the smokebox will wrap all the way round the boiler. Apply a 1/2" length of double sided tape to the rear face of the central section of the band. That will be the area of the band that will pass over the top of the boiler. The tape at the top will hold the band in place, stopping lateral movement that could scratch your boiler. Once the band is tightened into place, the tape becomes redundant, but leave it there anyway.

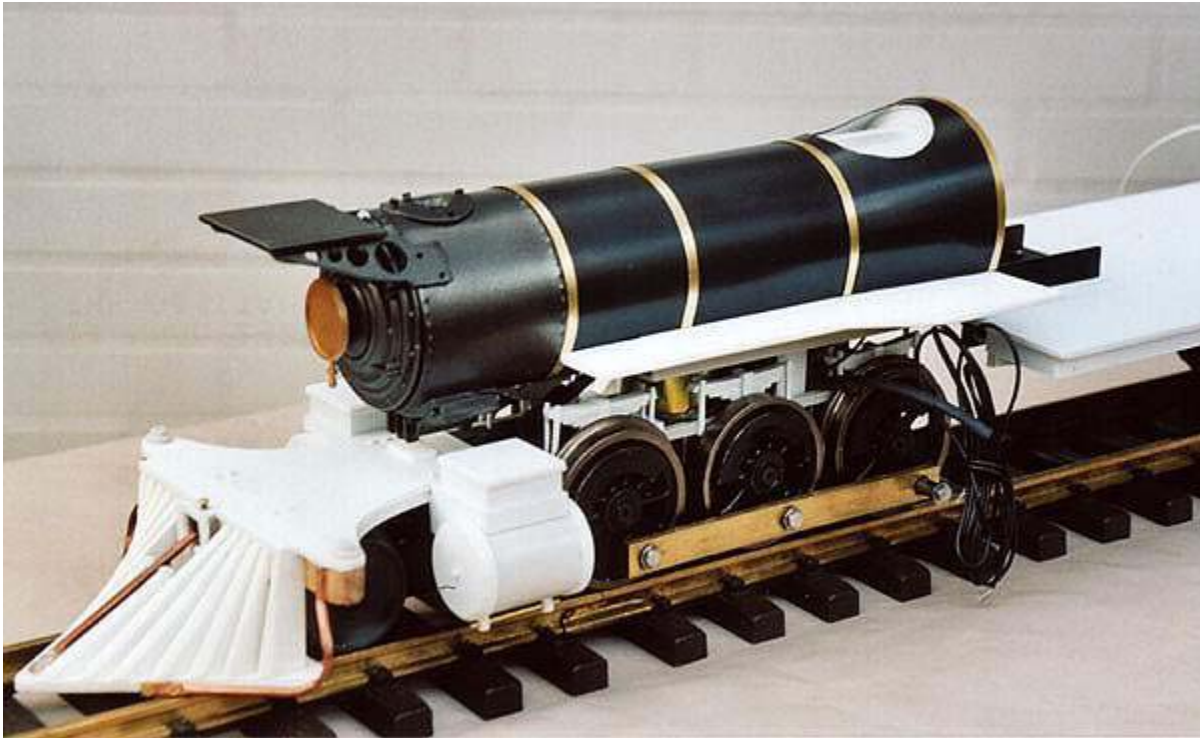
Wrap the band all the way round the boiler and allow a 1/4" over lap over the lower boiler datum line. At this location hold the band in place and drill a small hole through both layers of band and into the styrene pipe. Insert a 10BA bolt and tighten up. The first band is done.

For bands #2 and #3, apply a 1/2" length of double sided tape to the rear face of the central section of the band and wrap the band around the boiler and fold the ends under the bottom edge of the boiler. Fold them round a 180 degree bend back into the inside face of the boiler. These bands become almost circlips. Make sure the band at the bottom edge of the boiler is hard, flat against the cut edge. Allow about 1/2" band overrun inside the boiler itself. At the very ends of the bands within the boiler apply a daub of 5 min. epoxy to hold them in place.

For band #4, apply it the same way as #2 and #3, but see that it covers over the rear edge of the tapered jacket, holding that line in place. The band will also cover over the last remaining exposed white boiler material. Fold the band under the boiler rear end. There will be a length of flat band where it runs under the end packers for the boiler taper supports. Inside the boiler, secure the ends of the band with epoxy. Looking under the boiler, it may look messy, but it does the job. A view inside the boiler with the bands wrapped around is seen below - also note the two bolt heads visible in the boiler - these are the bolts that hold the domes in place, refer later in this chapter.



The finished boiler with brass bands applied (whether painted or metal jacket) should look like this:



The hole for the dome in the boiler taper section will look like this:

