MasterClass-2002

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

An Adventure in 1:20.3

By David Fletcher

Chapter 3 / Part 4 - Mr. Mason, Bogies & Boilers.

Background – Construction

Detailing the Domes

Hunt through your pile of PDF drawings and find the ones entitled "Sand Dome Details" & "Steam Dome Details"..

The Sand Dome.

The good news is that the central cylindrical section of the sand dome as provided by Hartland or Aristo is the correct size for use on our Mason Bogie. You can use that plastic cylinder as is. This will not be the case for the steam dome!

Step 1 - Remove the Cluster.

As you are aware, the steam and sand dome diameters on the Mason Bogies we're building were identical. We were very lucky to find a commercial 1870s style dome that was the exact correct size for our 1:20.3 scale models. We purchased two H-L-W or Aristo 2-8-0 'Steam domes' with the intent of turning one of those steam domes into a sand dome. Now we do just that.

Using your razor saw, cut off the steam dome cluster from the top of ONE of your domes. Cut it off flush with the domed top, like this:

Step 2 - Making the Sand Dome Cap.

We now need to make a sand dome lid or cap to replace and cover over the mess left after slicing off the cluster. Go out into the world and look for a domed button, as used by dress makers etc., or any other domed item you might fancy (end of a pen lid, tip of a screw driver handle, etc.). Make note that the sand cap is almost a squat bell shape on a Mason Bogie. Use the PDF to see the correct shape to look for. In MasterClass 2001, Norm Deyette commented on the fun he had when going to a dress making shop and asking for Baldwin styled buttons. Well chaps, its time to ask for Mason styled buttons. If they don't have any in stock, ask when they are expecting a shipment of said Mason buttons!

Paste the stylish cap (button) to the top of your sand dome using a daub of epoxy glue.

Next we need to make the dome 'final' or the little brass tip of the cap. This was the handle used by the crew to lift the cast metal lid off the dome in order to fill the dome with sand. We make the 'final' by using a short length of 0.75 brass wire, with two layers of 2.4mm styrene tube attached. If you are really clever you might even make a mini gooop for the very tip.

Step 3 - The Sand Lever.

This is a little lever arm that is operated by a control rod from the cab. The lever opened and closed the sand line manifolds, allowing sand to drop down to the rails. On the Mason, like all things Mason, the lever is damned stylish! Follow the PDF template, cutting out the component in 1mm styrene. It will be an 'S' shaped lever. At the end shown, drill a 1mm hole. We will later attach the sanding control rod to the lever here.

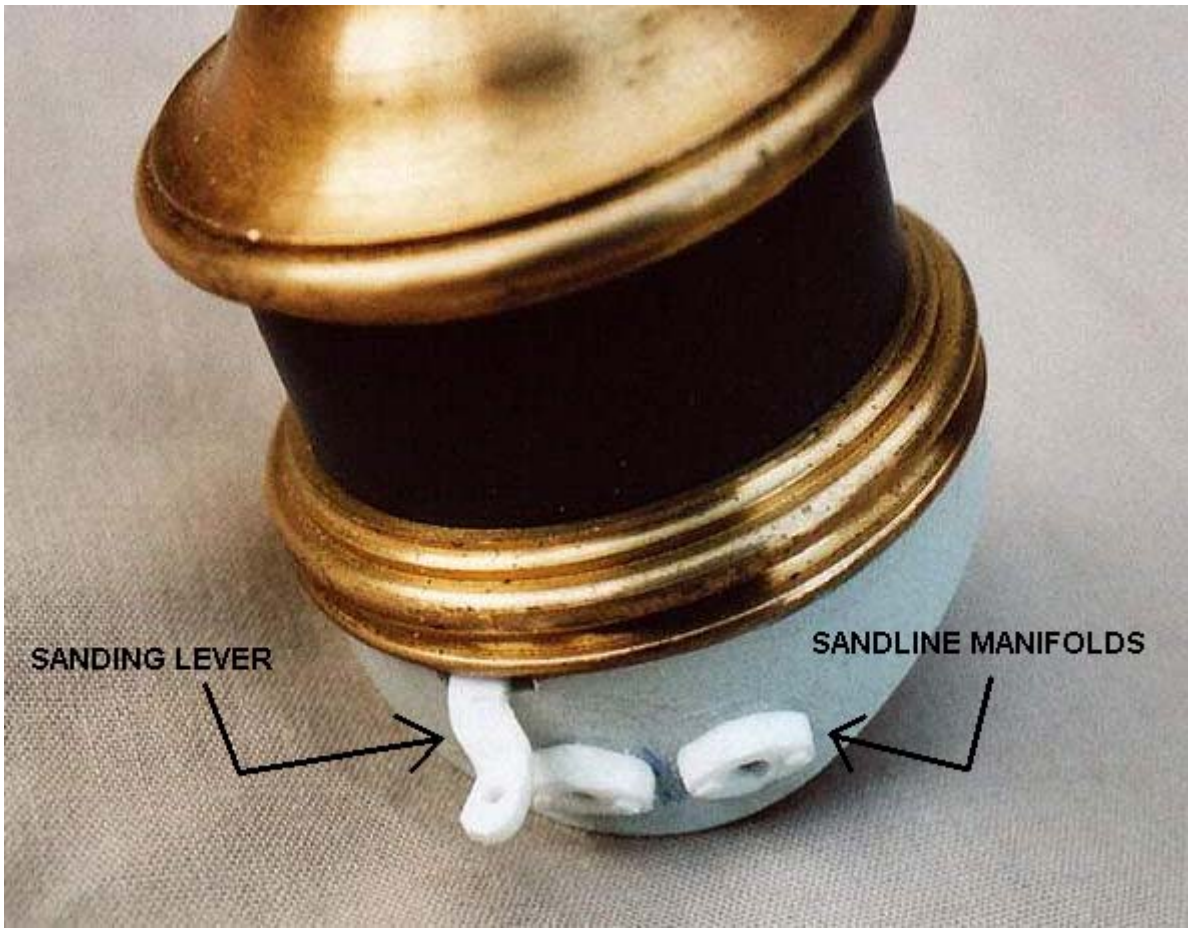
One the top edge of the sand dome base, made earlier in this chapter, carefully file out a notch, such that the lever can slot in horizontally between the brass dome ring and the PVC base. Paste the lever in with a daub of epoxy, or super-glue.

I would recommend making this lever in brass if you are able. In the time of making this dome, fitting it, messing around with it etc, I must have had the darn thing roll off the table four times! Every time the dome was undamaged, but the sand lever was history!! No wonder I never modeled this detail before!

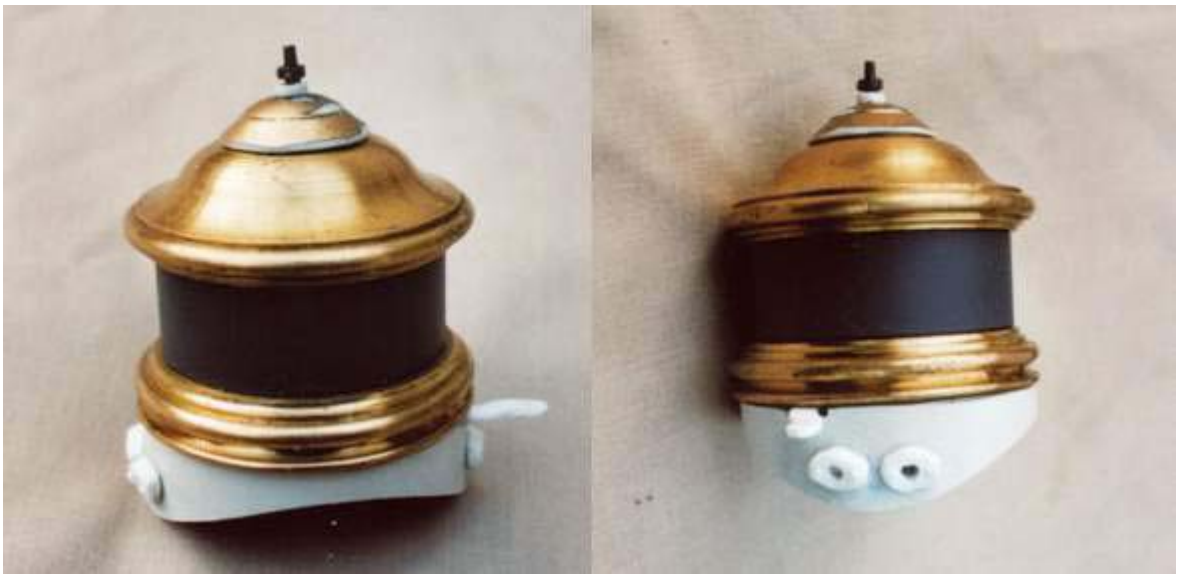
Step 4 - The sand line Manifolds.

Here is where the sand lines connect to your dome base. When the Mason Bogie was built, there were 4 sand lines attached to the dome, two on either side. These sand lines permitted sanding when the loco ran in either direction. Later the South Park removed the rearward facing sand lines. Options 1, 2 and 5 have all four sand lines, while options 3, 4 and 6 only have 2 sand lines to the forward end of the loco. No matter if your version has 4 sand lines or only 2, you are required to make ALL 4 sand manifolds! When the South Park removed the rearward sand lines, the rearward manifolds were retained, but blocked up.

Following the PDF drawing, cut out 4 of those diamond shaped manifolds in 2mm thick styrene. It is best to drill out of the sand line hole first, using a 2mm drill bit, then chip away around the hole to produce the manifold shape. Sand the corners into the rounded form required. Next comes the hard part. Place the sand line manifolds on end, and slice though the guts of it on a near 60 degree angle. The top of the manifolds will be the full 2mm thick, while the bottom edge shall only be 0.5mm thick. Get close to the angle with the knife and finish off with sandpaper. Wrap a small piece of sandpaper around some scrap PVC dome base pipe, and sand in a slight curvature over the back of the manifolds. Finally apply the manifolds to the lower dome base as shown in the PDF file. The manifolds are to be perfectly horizontal, and packed side by side in pairs, with 1mm between them. Place the dome base on your boiler and check from above that the manifolds are parallel with the boiler sides. When the glue is set, drill out the 2mm manifold holes right through into the dome base. Only drill out the holes where actual sand lines will be required. Later era South Park Bogies need only drill out the forward manifolds. The rear ones will only have the superficial hole in the manifold itself, not through the dome base.



Note in the next picture the finished dome, featuring sand dome cap, 'final', sanding lever and manifolds and holes drilled through the dome base only in my forward manifolds (1885 Mason!).



Making the Steam Dome

The steam dome uses the exact same dome parts as the sand dome, but this time we retain the brass safety valve cluster atop the dome. The plastic cylindrical section used in the dome centre is too short for use on our model, so discard it. You will be making a new dome centre.

Step 1 - The Cluster Fairing.

The cluster fairing is the ornate dome top that holds the whistle and safety valves in a 'cluster'. These fairings on Baldwin locos were a fairly plain brass cylinder. On Mason, Cooke, Rogers etc, the Cluster fairing could be a very fancy flared element.

Take a reeeeeal good look at your Mason Bogie options drawings from Chapter 1. You will notice that not every cluster is the same. Specifically option 3 and 6 do not have the fancy flared top. It would appear that the flared section of these domes were a separate attachment which, over time, might have been removed due to damage or loss. Folks building these options, or any versions based on specific photos that show no flared top, can use the H-L-W or Aristo dome top as is. The rest of us have to add all that fancy stuff to the sides of the dome top ourselves. Also if you don't want to miss out on that stylish finish, I will certainly not prevent you from adding this detail to option 3 and 6 type locos anyway.

We build up the cluster fairing in layers. The first layer packs out the H-L-W or Aristo fairing to be level with the existing lip. Use 0.5mm styrene to wrap around the brass, or slice a length of your 12mm diameter styrene tube. If using the styrene tube, cut down one side of the tube so that it can open up like a horseshoe. Stretch the pipe around the cluster and let it clamp shut around it. Then add a styrene fill-in where the tube doesn't quite reach. You will align the joints in the cluster side toward the cab wall (out of sight!). Attach the first packing to the brass cluster with super-glue.

Following the PDF, the 2nd layer is a strip of 0.5mm x 1mm styrene strip wrapped around the top of your styrene packer.

The 3rd layer will be a strip of 0.5mm thick styrene, 2mm wide, aligned to be flush with the existing cluster top. Attach this strip with super-glue. Wrap two layers of this strip to the cluster top.

The 4th later is a 1mm wide strip of 0.5mm thick styrene, welded to the outer top surface of the 3rd layer.

At each layer sand the joint where the strips come full circle. Also see that the joints all line up on the rear side of the dome, or the side that faces the cab wall (out of sight!).

Hopefully you have also acquired a brass whistle with your H-L-W or Aristo steam dome. If not, Trackside Details, or Ozark Miniatures make a good whistle to use. Go for a single chime type, of about the size shown on your original Mason drawings from Chapter 1. Take a look at the base diameter of the brass whistle, and find a drill bit that matches that diameter. You will now drill a small hole the dead centre of the steam dome cluster, and insert the whistle into that hole. Drill into the dome top by up to 4mm. Some whistles may be threaded at the base. Tap the

hole if you so feel, but this is a non-stress area. Simply locking the whistle into place with a daub of super-glue is adequate. Your steam dome cluster with whistle will look like this:

The Safety Valves.

Along with the whistle, the top of the cluster also features not less than two safety valves, used to relieve boiler pressure. Both valves are set to slightly different pressures. These valves are usually highly visible above the cluster fairing. On the Mason Bogie the safety valves are as good as hidden within the cluster fairing, with their top just above the top of the fairing. For a long time I had believed the Mason Bogie not to have safety valves on the steam dome at all. I thought Mason might have run the safety valves in front of, or behind the cab wall, venting up via long brass tubes to the cab roof (a British design!).

The Mason Bogie does, however, have safety valves on the steam dome. Because most of the valves are hidden, we need only model the very tops of them. Follow the PDF plan, and cut out two 5mm diameter disks in 1mm styrene. Cut and lay across each disk a rod of 1mmx1mm styrene as shown in the PDF. At the ends of the rod, and in the centre apply 3 rivets of 0.20x0.30 rivet rod cubes. Next super-glue these safety valve tops to the cluster top, in front of

the whistle, forming a triangle. Make note of the valve rod angles as shown on the PDF cluster top PDF plan. The finished (and painted!) safety valve tops will look like this:

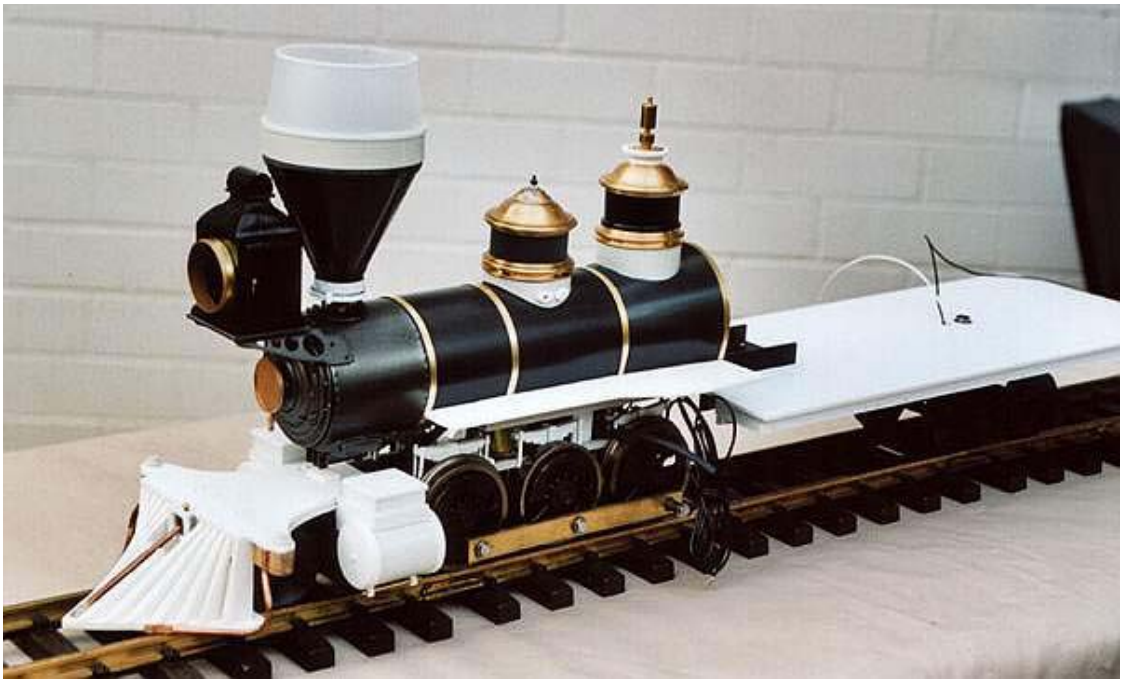
The Steam Dome Central Cylinder.

We have finished detailing the dome top, we also have the dome base organized that fits nicely into the boiler taper. We now need to find a suitable central cylinder to add to the dome. As previously noted, the plastic cylinder that came with the dome is too short.

Go out into the world and find a PVC tube of identical diameter (inside and outside) to the plastic cylinder that came with the dome. You are after a cylinder of about 31mm in diameter. I successfully found a good electrical conduit joiner of that size, but the internal size was too narrow to fit the brass dome parts. In the end I resorted to a pipe I had used for the South Park Cooke 2-6-0 model I made some years ago -- that of a black Kodak 35mm film canister (35mm film in a 31mm diameter canister!).

Cut the Kodak canister so that you get a good 13mm tall cylinder out of it. I know this is very close to the H-L-W/Aristo cylinder already, but the extra 1.5mm makes a difference! The inside of the cylinder is not a tight fit with the brass dome elements at all. We need to pack out the insides of the cylinder somewhat. We do that by using more film canister, cut into cylinders, and sliced down the side, with as chunk removed so that these inner cylinders fit within the outer casing. You will pack 3 layers of film canisters within each other in order for the brass elements to get a tighter fit. From the inside, use the 'slime technique' to ooze some epoxy into the cylinder to hold the brass top and bottom in place.

Your finished domes, resting on the boiler will look like this:



The Throttle Tube

Directly below the lower brass ring, and at the top of the PVC steam dome base, we need to insert a 3.2mm diameter Plastruct tube. It will run horizontally from the steam dome base back to the cab wall. This is the tube in which the throttle linkages ran from the backhead. Drill the dome base and insert the tube, Cut the end of the tube level with the back edge of the boiler.

Finishing your Domes.

At this time apply the PVC dome bases to you finished dome tops. You do not need to glue the bases on. Time to spray paint your domes. Use a good primer coat first, then paint the domes your chosen scheme (Green, Black, Lake etc). Make note of Jim Wilke's advice that the dome rings and dome tops were not brass, but cast iron and should be painted. I know, I know, the tuned brass domes you have are very stylish, and you feel obliged to leave them brass. Paint them!

Installing the Domes.

We do not glue the domes to our finished boiler -- no, no, no. We bolt them on. This provides for the strongest fitting, and no oozing messy glue slopped on your boiler. Under the brass tops of the domes you will notice a bolt hole. This is a tapped hole, used for bolting the dome to the boiler. Indeed the whole dome top is a giant nut. Go to the hardware store and obtain two 40mm long bolts. If using Hartland domes, the bolt size is 5/32"x40mm. This threads nicely into the dome. If using Aristo domes, the bolt needs to be 3/16"x40mm.

Measure out the dead centre of the dome hole in the boiler taper. Drill a hole on the upper datum line, and be precise. Drill with a smaller drill first, then enlarge the hole with a larger drill to allow the bolt to slip through. Next using the PDF boiler set-out drawing, measure the exact centre point of the sand dome on your boiler. Measure from the boiler rear end. On the upper datum line drill a hole at that point to allow a bolt to slip though the boiler for the sand dome. Place the domes one at a time onto the boiler, insert the bolt from within the boiler and tighten up. Do not over-tighten the bolt enough to crack your boiler! Just firm will do. The bolt to the sand dome will be a couple of mm too long. I advise inserting a square of your boiler pipe material as a form of curved washer to pack out the inside of the boiler enough to get the sand dome bolt tight.

Check the dome alignment from the front. See that they are pointing vertical, and are in line with each other, in line with the stack and in line with the headlight and platform...not an easy task. There will be a tiny bit of play in the domes for adjustment. Loosen the bolts, move the dome a tad and re-tighten. Check the alignment again. Also check the side profile of the boiler. Check that the domes are vertical, and are parallel with each other. When satisfied the domes will go on straight, loosen the bolts, apply a drop of super-glue or Loctite to the ends of the bolts, re-insert them, tighten and check your angles and leave them. They will not come off again.

Making the Famous Mason Bell Rig

(Refer to the PDF drawing entitled "The Mason Bell Rig")

Arrrrgh!! ...is this guy NUTS?? We can't make that!! $%#$%#^%#$^!!

This is one of those times. You asked for it, so I deliver...the nastiest bit of model making you will experience in this whole venture ... the Mason Bell rig ... and you are going to enjoy making it, whether you like it or not!

The bell rig on the Mason was the ultimate in integrated design. It was the support for the forward/reverse levers of the Walschaerts Valve gear. It also formed the hand rail stanchion at the bell location, and it was also the bell yoke. To make things really interesting the thing was incredibly ornate, and the bell could be rung from both sides of the boiler in a most symmetrical way.

Take your PDF page entitled "The Mason Bell Rig" -- no don't throw it in the bin -- yes that's right, take a good look at it. You CAN do this!

Some notes about this unit from a model standpoint.

1. We cannot adequately bolt the rig to the boiler, as the reverse mechanism runs right through the middle of it, and placing a bolt though the unit into the boiler will prevent us from building the valve gear properly.
2. Stresses from the valve gear will be placed on this rig. Specifically when you lift the loco off the rails, and the drive truck pivots, the links back to the bell rig will try and tear the rig right off your boiler! Take care! Build it well, built it strong, build the whole thing in brass if you can! (I did not!).
3. There are no commercial castings available that are even remotely like the bell rig, or the bell yoke even. We have to make the yoke and the bell hanger ourselves. To make the bell actually swing is even more a challenge.

So here we are at the crossroads of a totally good idea, and all I can say is hang on, enjoy the ride, make 9 crappy bell rigs, and you might get the 10th one right!

Step 1 - Working from the bottom up.

To the right of the page are the templates to cut out to make the bell rig. We start at the bottom of the page. Cut out the rectangular template with the 3 holes in it. Cut out the profile in 2mm thick styrene, this is the 'base plate'. Drill the 3 holes in the base plate as shown using a 1.5mm drill bit. Bend the plate to the curvature of your boiler (shown in section directly above the template). Now I want you to **PAINT the edges** of this base plate - not the top surface or bottom, just the 2mm wide edges. You must leave the top free of paint in order to get the best gluing bond possible. the paint colour for this base plate edge shall be the same colour as chosen by you for the domes, headlight, cab and tender.

Using the boiler set-out drawing locate the centre point of this bell rig on the upper datum line (draw an imaginary line between the stack hole and sand dome to find that point). Mark the top of the boiler exactly where the centre of the bell rig is to go.

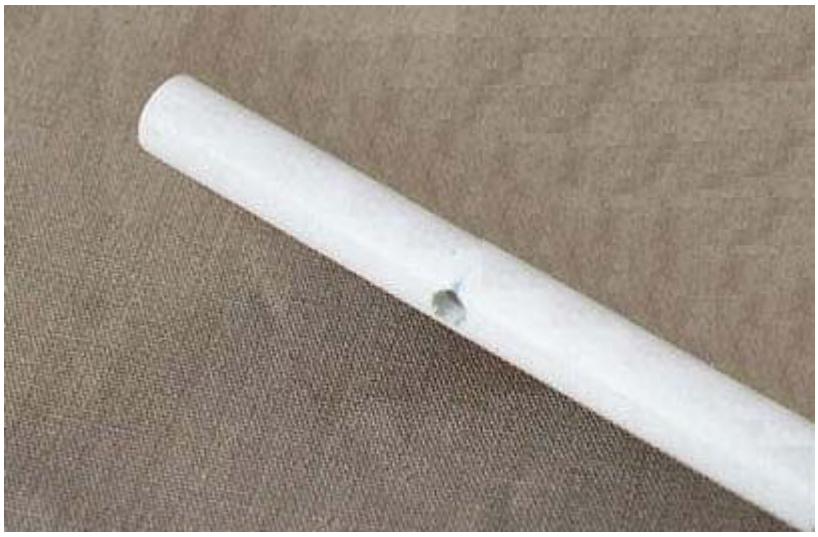
Using your smallest drill, of about 1mm size, drill a hole in the top of the boiler at that centre mark. Then widen that hole with the 1.5mm drill bit. Next apply the base plate to the boiler top. Do not use any glue. Insert a brass 10BA bolt into the boiler top, fixing the base plate to the boiler. Check that the base plate is set perpendicular to the boiler itself. Measure from the rear end of the boiler and check both sides of the base plate if you have to. It must be square.

With the base plate firmly in place, drill out the two 1.5mm holes at either end of the base plate into the boiler. Use the pre-drilled base plate holes as a guide. Insert two brass 1.5mm 10BA bolts into those two holes and tighten into the PVC pipe. Your base plate is now fixed to the boiler via 3 bolts. Finally loosen out the middle (top) bolt so that the head is max 2mm above the base plate, with a gap under the head.

Step 2 - The Transverse Reverse Lever Unit.

This is literally a pipe that runs across the boiler. Linking the valve gear on the engineer's side to the valve gear on the fireman's side. It will be made of 3 parts. The tube itself, which will be a Plastruct 6.4mm styrene tube, and the supports for the tube which will keep the tube level over the curved base plate. Cut out the two triangular supports from 2mm thick styrene. Make note of the two holes to drill near the outer ends of these support units. These are the hand rail stanchions! Drill these holes out using a 2mm drill bit. The hole will actually touch the outer edge of the supports Using your MEK welder cement, weld the support triangles to the base plate. Weld them to the centre of the base plate, and check that they are standing vertical. The very tops of the supports MUST be level with the top of the base plate. The whole concoction should look like this:

Next take your 6.4mm Plastruct tube and cut a 60mm length of it, to match the PDF. Measure out the half way point on the tube at 30mm. Drill out a hole on one side of the tube, at the exact centre of the length. The hole will be drilled wide enough to allow the bolt head to pass through from the top centre of the base plate. Do not glue or fix this tube to your loco yet. We'll make everything on top of the tube first. The tube should look like this:

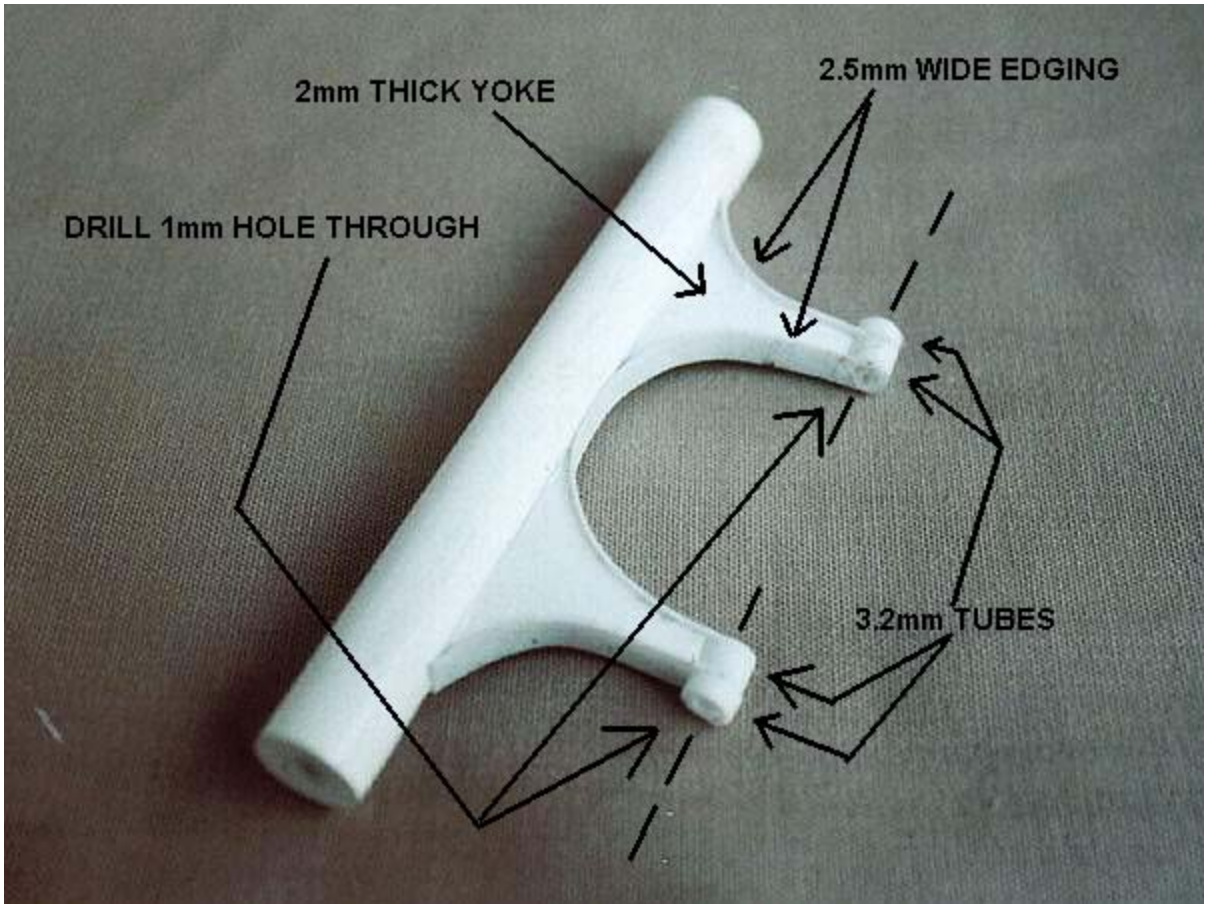


Step 3 - The Bell Yoke

Cut out the two bell yoke arm templates in 2mm thick styrene. They taper from very wide at the base to only 2.5mm wide at the top. At the top ends of these units, weld two 2.5mm long pieces of 3.2mm diameter Plastruct tubing.

Weld the two yoke arms to the top of your 6.4mm Plastruct tube at the set-out shown in the PDF template. Make sure you weld the yoke arms on the directly opposite to the central hole drilled in the 6.4mm tube.

Cut a strip of 2.5mm wide styrene from your 0.5mm thick styrene sheet. Weld the strip along the edges of your yoke such that the edges of the strip are just proud of your yoke surface. This makes for a nice rim to the yoke to simulate the Mason iron casting. The strips should run up and over the ends of the 3.2mm tubes at the top. To the outer face of the yoke, in line with the 3.2mm tubes, weld another 3.2mm tube, this time 2mm long. Finally using your 1mm drill bit, drill through the centre of the 3.2mm tubes, right through all the edging strips as well. If in doubt about being able to do this accurately, just wind the drill bit into the tubes by hand. It takes nothing to push the drill bit though those two layers of 0.5mm styrene. The bell yoke will look like this:



Step 4 - Making the Bell Hanger.

Even the bell hanger is unusual in typical Mason fashion!

Cut out the bell hanger, following the PDF template in 2mm thick styrene. Its best to drill out the two holes and the central elongated hole first, then cut out the rest of the hanger by chipping away at the edges till you get the right shape. Sand the edges smooth.

To the sides of the hanger, weld two 3.2mm diameter Plastruct tubes as shown on the PDF. Now go to your parts box and get your bell out...all you need is the bell, no other structure! The old Bachmann 4-6-0 bell is a perfect fit. Ozark make a good white metal bell kit as shown in Chapter 1. If you use this bell you will find it to be a tad too tall. Cut the bottom of the Ozark bell off using your razor saw. Remove 2mm from the bottom. You can use a metal file to do this also. The Bachmann bell needs no change.

Take one of your 10BA bolts and insert it into the top of the bell, leaving the head poking out the top. Insert a washer and nut to the inside of the bell. Place the bell into the hanger, by sliding the bolt head into the gap. Centre the bolt up in the styrene hanger. Now cut out those two tiny patches of 0.5mm styrene, and apply one to each side of the hanger, locking the bell's bolt in the styrene hanger. The Bell hanger with bolt and bell inserted will look like this, The 0.5mm patch has yet to be welded into place.

Step 5 - Fitting the Hanger to the Bell Yoke

We now make the two levers that make the bell ring. K&S brass make a strip of flat brass that is 2mm wide and about 1mm thick. This is perfect. Bend two lengths of the brass to follow the end profile seen on the PDF. Using your 1mm drill, drill out two holes in each lever. One at the very top and one NEAR the bottom.

At this point you have 3 ways to secure the bell hanger to the rest of the unit:

Option 1 - Using brass pins.

Insert two brass pins to the two holes in each lever. Allow the head of the pin at the end holes to stick out by about 2mm. From the back solder the pin to the lever and trim off the excess pin, leaving just the head end soldered to the lever. This is the rope cleat.

Solder the pin in the lower hole from the inside such that the head is hard and flat against the lever. Do the same for both levers. Brass pins can be found at hardware stores in the crafts section. Also small brass hinges, used on jewelry boxes come with these tiny brass pins.

Now holding the 1mm drill bit (or smaller if you have one!) in your hand, hand drill the ends of the bell hanger. Drill into the end grain of the 2mm thick hanger styrene, using the outer 3.2mm tubes as a guide.

Place the bell hanger into the yoke, aligning all the 3.2mm tubes. Place the levers on the outside and press the brass pins into the hanger. Test the pin length. If any of the pin runs out the end of the hanger next to the bell, then your pin is too long. Trim off the end of the pin to the right length (use side cutters). Place a drip of super-glue into the ends of the bell hanger and pin it right into the tiny holes. Make sure no glue is on the outer face of the 3.2mm tubes! Place the hanger in the yoke again and press the lever and pins through the yoke and into the hanger from both sides. Quickly align the levers to be 100% parallel with the hanger. Let the glue set. The bell should now swing by moving the levers. After the unit is painted, apply a drop of oil into the moving parts.

Option 2 - Using Tiny Brass 12BA bolts

This option is identical to the Option 1, except tiny brass bolts are used in lieu of pins. The bolts are inserted and soldered at the top end of the lever, but are simply screwed into the lower holes, and into the bell yoke, locking the bolts into the hanger with super-glue. You then hold the levels parallel with the hanger by super-gluing the bolt heads at the lever. To attempt to solder the bolts from the outside will melt your bell rig!! To pre-solder the bolts into the levers per option1 will mean you can't turn the bolts to tighten them into the bell hanger! Don't worry it works!

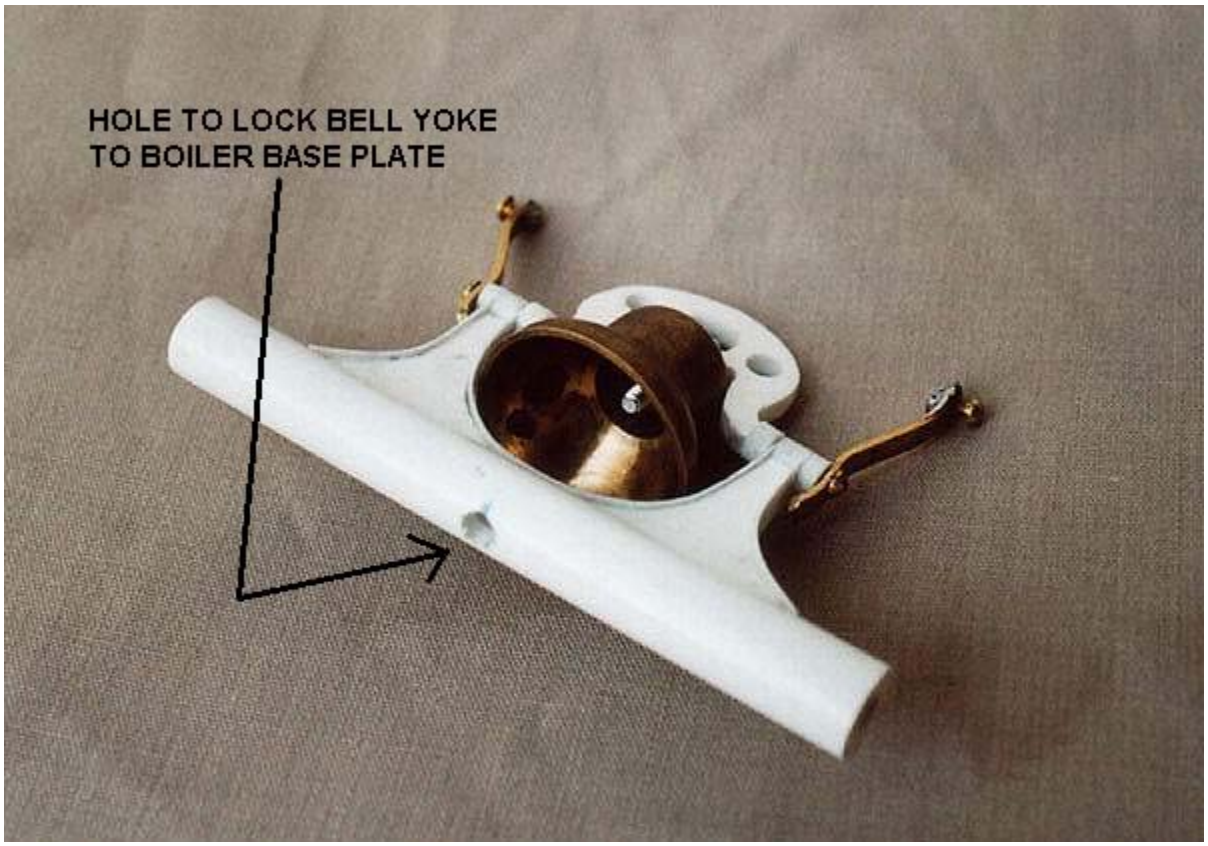
Both Options 1 and 2 look something like this:

Option 3 - A Non-swinging Bell!

Forget the brass pins or bolts or anything. Simply bend the levers out of 1mm styrene strips, and MEK weld the whole bell hanger, yoke and levers together. It won't swing, but its possible to do! (my old Crested Butte 2-6-6T is made this way -- the bell does not swing!) I would advise setting the bell angle to be slightly forward, as if the weight of the ropes to the bell are pulling down on the levers. This is the natural 'hang' of the bell, and it will look like your bell does swing!

Step 6 - Attaching the Bell Yoke to the Boiler.

Now its time to attach this whole assembly to the boiler. There is method in our madness. That oversized hole in the bottom of the 6.4mm tubing at the base of the yoke is designed to clip over the central brass bolt sticking out of the boiler base plate. Epoxy glue bonds extremely well if it can 'key' in around something. We literally 'lock' the bell yoke to the boiler base plate by using epoxy around the bolt head in the hole. It is a very strong lock.



Begin by placing the yoke and 6.4mm tube onto the boiler base plate. Run a piece of your brass 1.5mm rod down inside the 6.4mm tube. Check to see that the head of the boiler bolt does not pass higher than the inside surface of the tube. There must be a clean, open inner tube. If the bolt head protrudes a little into the inner tube, then screw the bolt down a couple of turns. If the bolt is lower than the inner tube surface, wind the bolt out a couple of turns until it is just below the inner surface.

Next apply a nice blob of epoxy glue into the hole at the bottom of your yoke assembly. Apply a daub of epoxy around the bolt head as well. Do not spill any glue over any distance wider than

the base plate. At this point apply some MEK welder to the tops of the triangular base supports. Do not allow the MEK to mix with the epoxy...keep the two gluing areas apart. Now wang the yoke down onto the bolt head. Check the yoke. The 6.4mm tube must be perfectly perpendicular to the boiler. The yoke must be standing perfectly vertical. Now take your 1.5mm brass rod again and clean out any epoxy oozing inside the 6.4mm tube. It must be clear and open, and smooth. Clean it out. Then let the epoxy harden. The whole thing is locked together now. Recheck the how well the triangular supports have welded to the bottom of the 6.4mm tube. Apply another dose of MEK to the joint after the epoxy has set. Do not slop any MEK onto your boiler of you will dissolve your Russia Iron paint, or stain your metal jacket! The Bell rig will look like this:

Step 7 - Painting the bell Rig.

Phew -- now its time to paint the rig. Paint it by hand. Black, green or whatever. Remember this unit was mostly cast iron in reality, so the main body will be painted in the same colour as your cab, tender, domes and headlight. Rim the holes in the hanger with brass paint to help highlight them.

The Wimp's Way Bell Rig.

You are really not going to like this at all. This is a cop-out of the first magnitude. basically you install a standard Ozark or similar bell and yoke atop the transverse reverse lever unit. Now we've all heard about the 10ft rule, and some of you will have seen several Masons bashed from LGB models that used this very technique. I don't much care for the 10ft rule...it basically implies that something that is wrong at 1ft, will look 1/10th as wrong at 10ft. Now wrong is wrong - doesn't matter how far away you look at it. Indeed the issue is whether anyone is looking at it in the first place regardless of distance. But I leave you with this...you do this to

impress yourself, build what you know you can build, and be happy with what you do. Do not be happy with something that you don't like at 1ft, but think is OK at 10. Make something that you're happy with period. The Wimp's Way bell is designed to look finished, and clean. Not prototypical, but neat and tidy and prototypically viable. I'd sooner you be happy with this, than some disastrous looking styrene thing atop a well made model. Do try the correct bell rig first, at least have a go!

Wimp's Way bell rig - Please follow steps 1 and 2 above, making up the transverse reverse lever unit atop the boiler. Then apply your commercial bell to the top of this as shown in the wimpy god-awful PDF demonstrating this really bad idea. Now paint up the whole thing. If you are really cunning, you might even add some styrene fillets around the sides of the bell yoke to fatten up the thing to look more like a Mason style.

Finishing Up.

That's it -- the Bell Rig is done, man!

We need only insert the valve gear rod through the tube later in this series.

Presently we'll go into the last stage of this chapter, installing the boiler handrails. These railings will run through the two holes you made in the bell rig. The finished, painted bell rig with handrails running through will look like this:

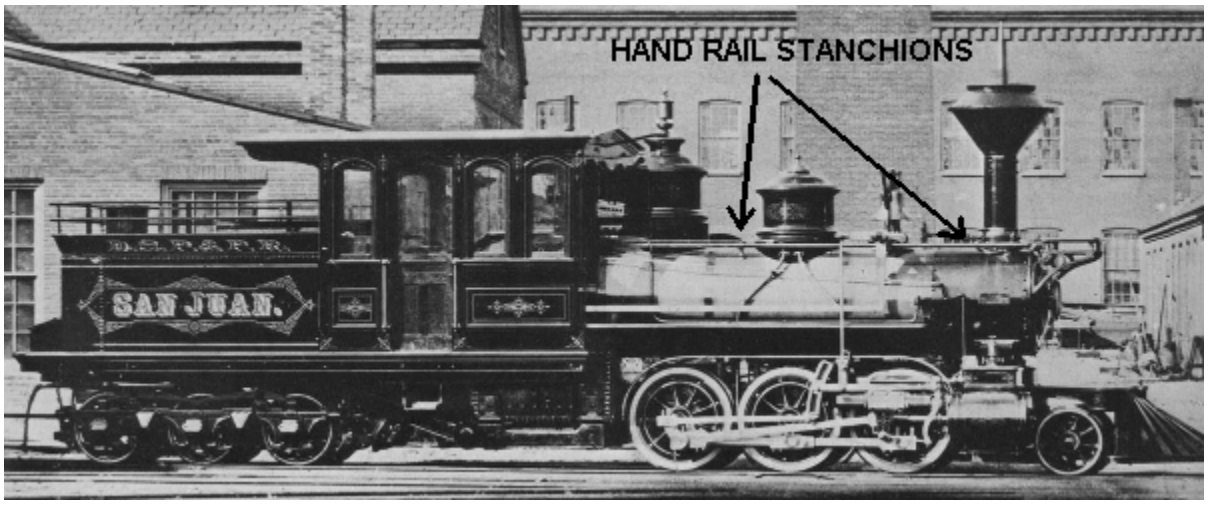
The Mason Bogie Handrails

Refer to the hand rail PDF drawings (3 pages).

Chaps, there are basically 3 ways in which the handrails were applied to the boiler. From 10 ft. away they all look similar. However, they are not. The three ways are as follows, and as summed up the 3 PDF pages, "Mason Handrail Stanchions".

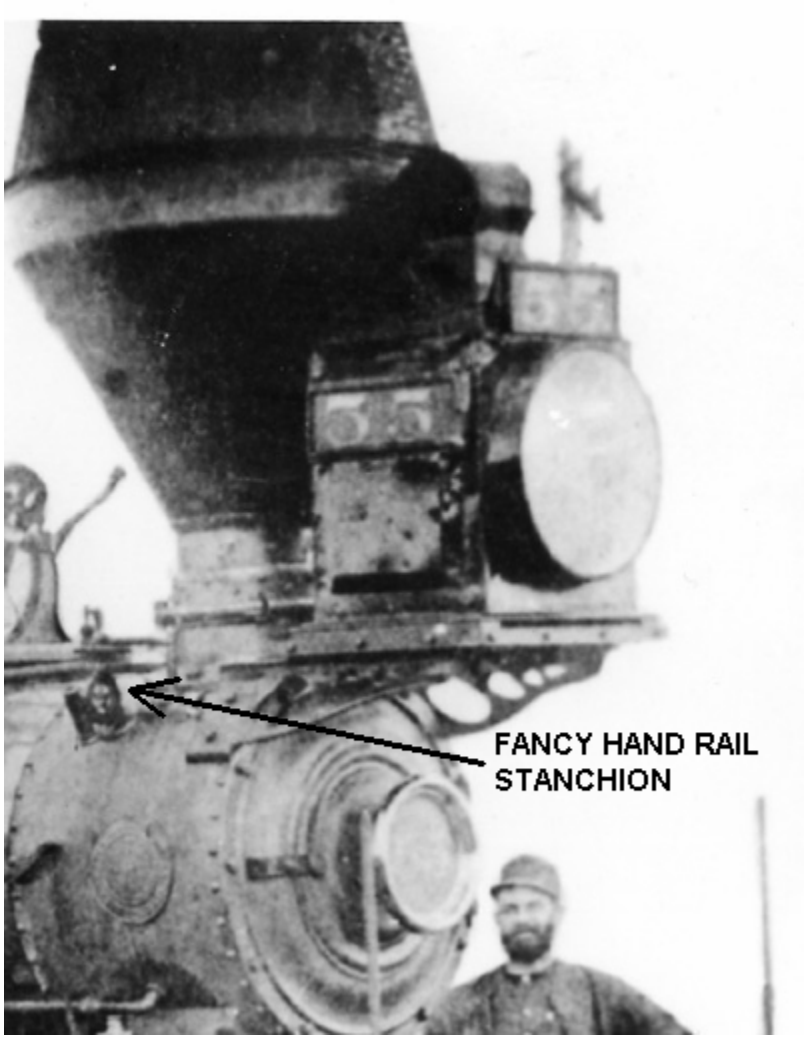
Type 1- 'As built' 1878, DSP&P #3 Oro City, #4 San Juan, and Bully Boy.

This method is about as typical is it gets. The handrails run through the bell rig as shown above, but beyond that the railing is held in place by 4 very plain rod like stanchions typical of any Baldwin or Cooke loco. This is the easiest method of applying the handrails. You will need commercial stanchions that are min 7mm long, and a max of 9mm long. Their exact placement depends on their relative insertion to the bell rig railing location. 9mm will be basically perfect, 7mm will be short. If you are 'short' you can pack out the base of the stanchions using 2mm thick circular styrene bases. The stanchions were placed on the smokebox side and on the boiler side between the sand dome and steam dome. They are clearly seen on the San Juan builder's photo.



Type 2 - As Built 1879 DSP&P #6 Ten Mile, and all Masons to follow, including all long tender Version.

This method had the railings run through the bell rig as above, but the lead end of the handrail, secured at the smokebox, was supported by a most elegant decorative stanchion. The stanchion, like the bell rig, is a 3-in-1 integrated design. The Stanchion was decorative, acted as a stanchion, was also a flag staff holder and was also a foot step, come marker light platform! The design was essentially circular with a cast 5-pointed star in the centre, and an oval plate above. All as-built versions from DSP&P#6 onward had this front end fancy stanchion.



This type of handrail was also secured at the cab end by stub stanchions that were attached to the sides of the steam dome base. There were no boiler-mounted stanchions used.

Type 3 - DSP&P Modified handrails.

This type encompasses changes that occurred in the life of the working loco.

The changes were as follows:

As the headlight brackets were changed from the boiler front mounted types to the smokebox side mounted types, the fancy lead end stanchions were moved rearward on some locos. This is seen in the above pic of #55. In the 'As Built' configuration the fancy stanchion was right up near the front end of the smokebox.

It was also common when displacing these lead end stanchions for them to be changed completely. Some post-1885 Mason Bogies, with altered headlight brackets, had their fancy stanchions removed and replaced by plain rod type stanchions similar to type 1. The rear ends of the rails were still supported by stub stanchions off the steam dome base.

What this 3rd type does is give you, the builders of this fine model, a way out of having to fabricate the fancy stanchion. You can use the 7mm-9mm long commercial stanchions per type 1 at the front end, and still be accurate to prototype.

The three types are shown in PDF drawings, also locating their set-out. Choose your option and go to it!

Use the PDF sections to locate from the upper datum where to drill the holes in the boiler pipe sides in order to get the 7mm or 9mm stanchions leveled correctly. You want the handrail to be perfectly level with a height set by the bell rig.

Demo - Building a Type 2 and 3 Handrail Installation.

I shall now describe how to do a type 2 / 3 installation, with the fancy stanchion moved back to allow the smokebox mounted headlight bracket to fit. For this installation you will need two H-L-W stubby brass handrail stanchions as used on the boiler of the H-L-W 4-4-0.

Insert two lengths of 1.5mm brass rod into the lead end of the bell rig mounting holes, and slide them all the way back to the steam dome side. Do not drag the railings along the boiler sides to avoid scratching!

View the boiler from the side, and level the hand rails with the boiler -- use the top of the boiler as a visual guide. Angle the rail back against the steam dome side, keeping it level all the while. At the steam dome side, where the railing touches, make a pencil mark under the touching point. Drill a 1.5mm hole in that location. Then widen that hole with the drill size needed to fit the H-L-W posts (should be about 3mm). Insert the stanchion, keeping it in place with a drop of super-glue. Run the railing through it to ensure the hole in the stanchion is facing the correct way. The finished rear end stanchion and railing will look like this:

Next comes the hard part. You've seen them there haven't you? You've seen those fancy handrail stanchion templates, plus the little 5 pointer star insert to fit into it. It's your lucky day – it's time to make that thing...and make it twice!! Begin by sticky taping the template straight into 2mm styrene sheet. Next, drill out the centre of the stanchion with a 1.5mm drill bit. Then widen to the full drawn hole size. Then drill out the 1.5mm hole at the top of the stanchion where the railing will run. Using your 1mm drill bit, drill out all the tight corners in the outer edges of the stanchion. Next chip away at the edges of the pattern around the big hole until you have carved out the stanchion. Use metal files and fine sand paper to clean it up -- it is tiny. If you are feeling particularly clever you can drill out the flag staff holder to the side. I left mine solid.

Sticky tape the 5 pointer star pattern onto 1mm thick styrene. Cut that out by chopping along the side of each point. This is quite easy to do, just don't over-chop!

Trim the points of the star until it fits snug inside the big stanchion hole.

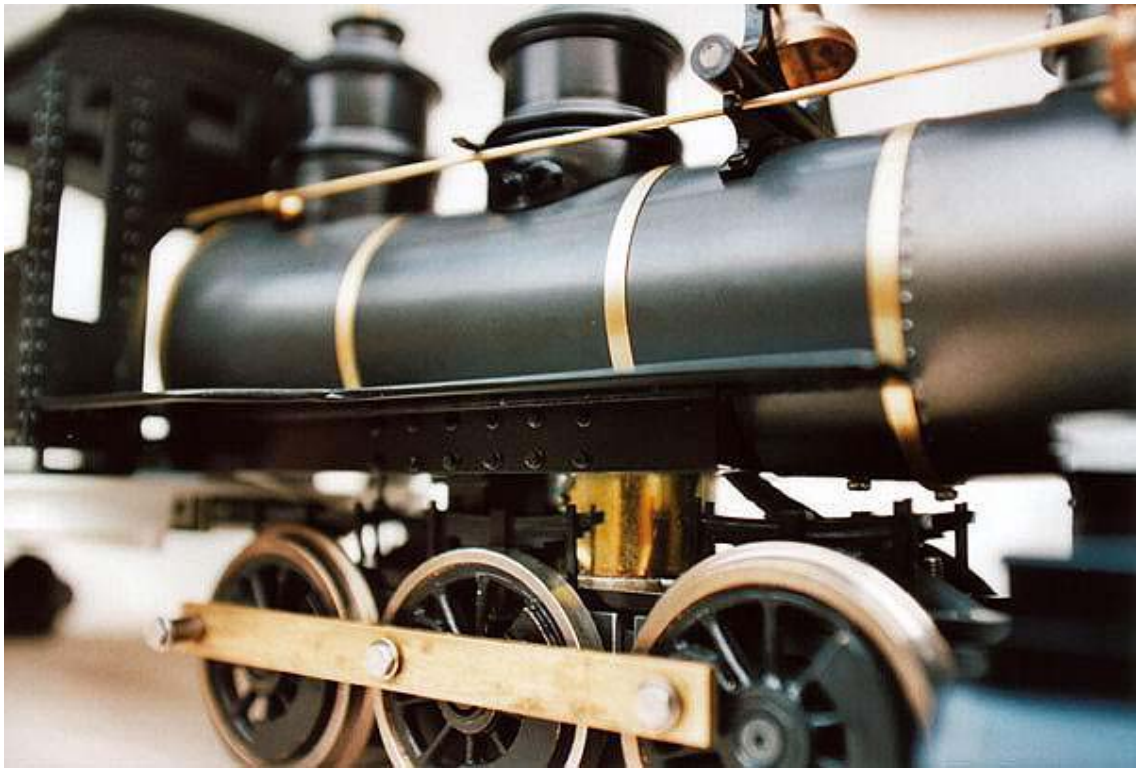
Cut out the tiny oval profile in 1mm styrene. This is the foot step to be welded directly above the stanchion in a horizontal plane. Insert the stanchion onto the end of the handrail (still in place on the loco). Run it back over the smokebox to the correct location per the PDF, depending on the headlight bracket type used. You will need to bend the handrail back a little to allow the nipple at the base of the stanchion to pass over the smokebox side. When it is in the correct place, and centered nicely over where the stanchion should be inserted in the smokebox, mark the smokebox, remove the stanchion and drill a hole on that mark to the size of the stanchion nipple. Insert a tiny washer (10BA size) over the bottom of the nipple, and insert the stanchion back onto the railing and into the smokebox side. It should all look like this now:

...and painted up, the stanchion looks like this:

Here is a better view...

and with the headlight removed...note the oval foot steps atop of the fancy stanchions.

...a view from below the hand rail, see how it passes through the bell rig to the steam dome stub stanchion..



The Fancy Stanchion Alternative - The Vance Bass Alternative.

This is another way to make the fancy stanchions, without the chipping away around a tiny profile. Try it out if the above method fails you. Take much care with this method, as the tiny stanchions will be more fragile, and still frustrating to make.

Take two lengths of styrene tubing, one 7.5mm o.d., the other 4mm o.d., and glue them together lengthwise. Then glue a piece of 2mm x 5 mm styrene strip to the 7.5mm tube, such that it touches the tube at a 45 degree angle to the 4mm tube. Finally glue another piece of the 2x5mm strip on its edge, at a 90 degree angle to the first.

You now have an extrusion of the shape of the stanchion. Take the razor saw and saw off a couple of 2mm thick slices, and you have the body. Attach the star and platform and you're done. If you mess one up, you can just saw off another slice.

If you can make this out of brass, you'll be in a much stronger position!

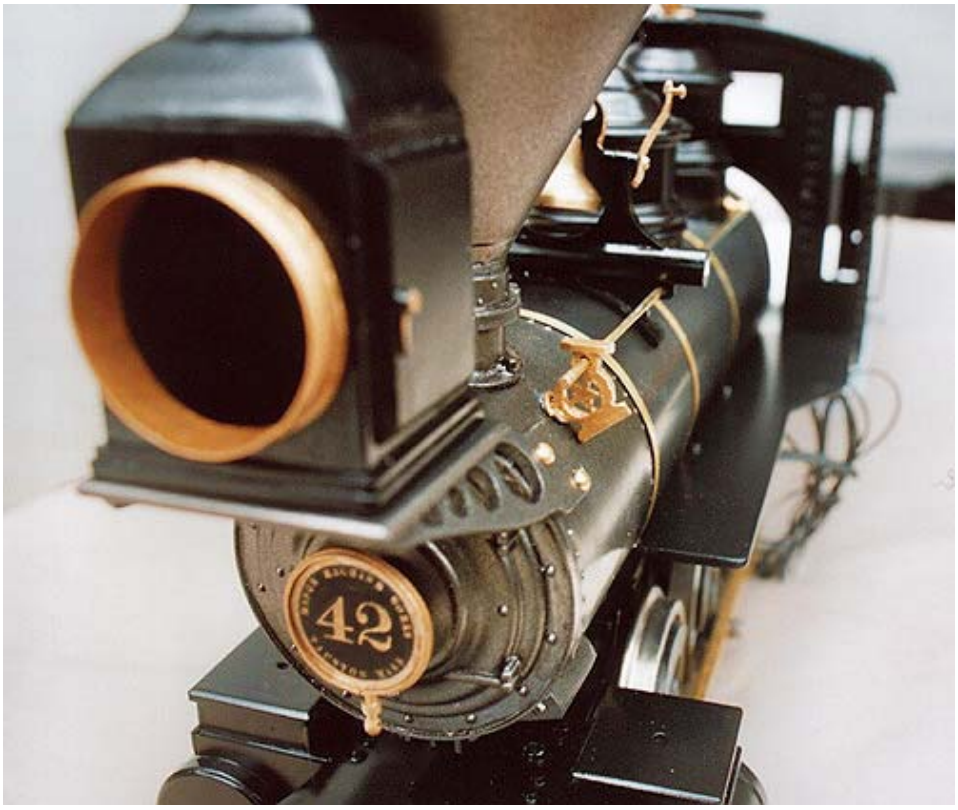
What's All this With the Mason Disk and #42 on the Front of this loco?

(Refer to the PDF drawings, entitled "Mason front Plates".)

Well, it's time you made your own. We will be looking at making up some decal sets later in this project for general decoration of the models, however, builder's plates and front number disks are things we can make ourselves in the normal process of modeling. I use AutoCAD to draw up all manner of builder's plates, incorporating correct dates and serial numbers of the prototypes I'm building. We shall do the same for the Mason Bogie. At this stage you can make up the number plate if you wish.

Take out that weird page of number disks. Find the disk that best represents your loco and number, or use the blank one (place your own decal number in the centre). You can either print out the relevant disk directly onto decal paper if you have the right sort of printer, or do as we do, and photocopy the disk onto an overhead transparency - that clear acetate film used for overhead projectors. If you don't have access to such equipment, take your page to the local photocopy joint, they will be able to do it. Reduce the PDF drawing by exactly **50%**. I enlarged them on the PDF page to twice actual size in order to maximize the resolution. You will note that the disk size when scaled down 50% is smaller than your styrene disk plate. This is correct, since the decal we're making will fit well inside the styrene disk. Paint the styrene front disk brass/gold. The decal will be black with clear writing. Trim around the outer line of the decal using small scissors. Next apply a film of epoxy glue to the back of the decal. I'm asking for a mere greasing of the back. Insert the decal to the disk and center it up. The gold paint will show through the clear letters making a nice looking plate. That's it. We will be making the builder's plates to the side of the smokebox in the very same way, but not until the official birth of the model in the final chapter of this series, Chapter 8.

The finished front disk will look like this:



The Last Hurrah

(Refer to the PDF Pages entitles "Fixing the Boiler to the Chassis")

It is sometimes suggested, in our architectural profession, that gravity always gets the last laugh! It is for this reason that we take some care to bolt the loco together properly so that it does not come apart when lifted off the rails.

This is the broad overview of how this loco goes together:

1. The pivoting BBT 2-6-0 chassis, supported by the upper frame, can only be released from the frame from above (by releasing the upper PVC clip) Thus to access the motor or release the chassis, we have to remove the boiler first.

2. In this chapter you note that we built the boiler to the front cab wall only. The rest of the boiler, inside the cab will be a separate section. You will also note that, on the FH&PB wood cabs and the cabs you will be making in the next chapter, we do not provide a circular hole in the cab front wall for any boiler to pass through. That is because our chapter 3 boiler runs up hard to the cab front wall, and stops there.

   We've designed the model such that you can remove the boiler (everything from this chapter) by removing 4 screws, lifting the assembly free of the chassis, and with that gain instant access to the chassis and motor. This will aid access for fitting and repairing smoke units, lighting wiring, wiring for sound etc. This access is possible without removing the cab from the chassis or tender.

3. The cab, once made, will be bolted down to the deck and will not need to be removed except for very special reasons. Access is possible, but you will not need to do it. Bolts are threaded up from under the deck.

4. The tender also bolts down to the deck and will be removable for access to battery or sound system space. Again we're designing this tender unit to be removable without removing the cab.

Fixing the boiler to the Chassis

You will only need to do this step when you have the BBT chassis in your hands. Until then I recommend leaving the boiler removable from the running boards, and no fixings through the running boards to the chassis yet.

When you do get the chassis, you will notice Barry has provided 4 tapped bolt holes to the sides of the upper metal frame, in line with where your running boards assembly sits. You will extend those 4 holes into the sides of the lower framing of the running boards. Bolts applied from the outside will then screw through the running board sides and tighten into the BBT upper frame. When you lift the loco by the running boards, the chassis will come with it, no chance of it breaking out! We have applied the bolts in 'shear' angle, which means the weight of the loco is supported by the bolts on their side, not by the thread of the bolt gripping a tapped hole. Even if your bolts are loose, the chassis cannot fall out.

The down side of this design is that there are 4 exposed bolt heads visible below the running boards. But it is a foolproof fixing method, and access is easy. One can remove the boiler without even rolling the loco over.

For those not satisfied with this approach, a less easy approach, and one that will place greater stress on the styrene in keeping the loco locked together, is to insert 4 bolts from under the BBT upper frame, and extend and tighten the bolts into the running boards within the boiler. The bolts run in a vertical direction and can pull out of the running board assembly. But the bolts are out of sight. To access these 4 bolts, you would roll the loco onto its side and pivot the chassis as far as it will go to one side in order to reach the bolt heads. Do this method if you wish to.

The PDF drawing "Mason Bogie Fixing Design" indicates the approach taken with this model and the option.

Well that about wraps it up for this month!

Here is what your loco will look like at this end of this month, with the BBT drive attached....The ugly steel cab is just placed there to give the model some context. The real Mason cab is quite a bit larger and better looking!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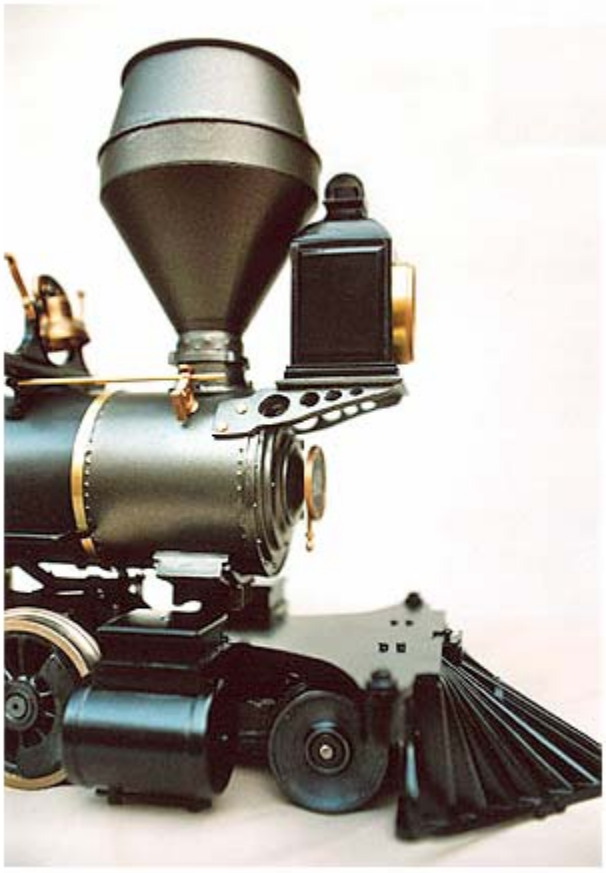



42

This has been a marathon chapter, really two chapters in one, but I felt it best to do all of this work in one go, rather than break it down any further. Future chapters will not be so involved, with the exception of the pipework chapter!

Go to it, and good luck!

Fletch,

Melbourne Australia

September 2002.

Acknowledgements:

Many thanks go to the many people who have helped full this chapter together.

Barry Olsen, for his ongoing efforts in pulling together your custom Mason Bogie chasses. At the time of writing we're nearing our 100th Bogie chassis.

Chuck Meckam, for his ongoing effort in developing the 6-wheel tender truck and side rods for the BBT chassis. At the time of writing the masters for both are nearly complete. The tender truck is a work of art in its own right, and I guarantee you will not have seen anything like it.

Vance Bass, for his support in providing the specialized Mason cab kits, pilot kits and now tender shell kits as well! The cab will be required in the very next chapter. Some of you will be able to take a holiday while the rest of us scratch make the thing!

We are also indebted to Vance for proofreading all my swill! There are a lot of words, and even I don't understand what I've written sometimes.

George Sebastian-Coleman gets a big thanks to for providing the excellent background into William Mason in this chapter. But also a big thanks for his hidden work in helping us build a model that reflects the prototype as much as possible. George is an invaluable knowledge base and we are all benefiting from the experience.

Jim Wilke, for his on-going contributions in helping us decipher the unusual color schemes of the 1870s

John Clark, of Fall River Productions, for stepping up to the plate and manufacturing the big 23" box headlight for our class. Thank you John.

Lastly a big thanks to **Shad Pulley**, owner of **myLargescale.com** for hosting this class, and the many hours spent up-loading such extraordinarily wordy scripts!

We also welcome back to the MasterClass, our original MC2001 Veteran, Chris Walas, with an all-new shoulder, and a can-do attitude. We can't wait to see the Masons rolling out of the Walas works!

The Possum Pass & Frog Mouth Gulch RR... is proud to announce that two of its resident Marsupial Possums have recently given birth to two cute li'l Possumettes. The li'l Possums are about 4 weeks old, and spent most of that time being carried in their mother's pouches (a bit like a Kangaroo). As of last Sunday they outgrew the pouch and now ride everywhere on their Momma's back. The RR has long been named after the wild life that lives in the trees above...here are the latest additions to the Possum Roster...

Continue on with the article to read about Making Patina boiler jackets.

By Kevin Strong

A Bit of History...

Since the dawn of time, man has debated what Russian Iron actually looked like, and what color it really was. In reality, it really wasn't a "color," so much as just a way of treating raw sheet iron so that it was somewhat resistant to the elements. The result was a boiler jacket that had a nice, polished look to it. As such, it reflected whatever color was around it. In most cases, this was blue sky, and that led to the myth that Russain Iron was blue. The end result of this myth is a plethora of blue boilers on model steam locomotives.

An alternative to Russian Iron was called "Plannished" iron. Baldwin Locomotive Works used this on many of their early locos. A metalurgist can better describe the actual processes involved, but the end result was similar - sheet metal that had a somewhat polished, mirrored finish to it. Historians describe the finish as being somewhat grey in color. (This finish, to the best of history's records, not quite as mirrored as the Russian.)

Unfortunately, there's no real way to replicate that with paint. Many folks have used automotive paint. I experimented with that as well, but was never satisfied with the end result. It ended up looking like a Ford with siderods. There had to be something else out there.

Chemical Blackeners

I had seen these in the past, but never thought much about using them myself. Fellow live steamer Vance Bass used some old jewelry chemicals to patina one of his locomotives, so I figured I'd try the current batch of chemical blackeners on a boiler jacket, just to see how it worked. I bought a bottle of Birchwood Casey "Brass Black," and went to work on a sheet of brass. The end result was quite nice looking, certainly better than any painted finish I had ever applied.

Feeling pretty proud of myself, I took the model to a steam-up down in Mississippi. There, I ran into another modeler, Sonni Honniger. He was working on what can best be described as a real K-27, only smaller. This thing was gorgeous, and had every last little detail the prototype has. (Sonni's an engineer on the C&TS, so access is not an issue.) His entire locomotive was not painted, but patina'd in a manner similar to mine. His boiler jacket looked awesome - a little beat up, dinged, and well loved. I combined our two methods, and will never paint a boiler again.

The Process

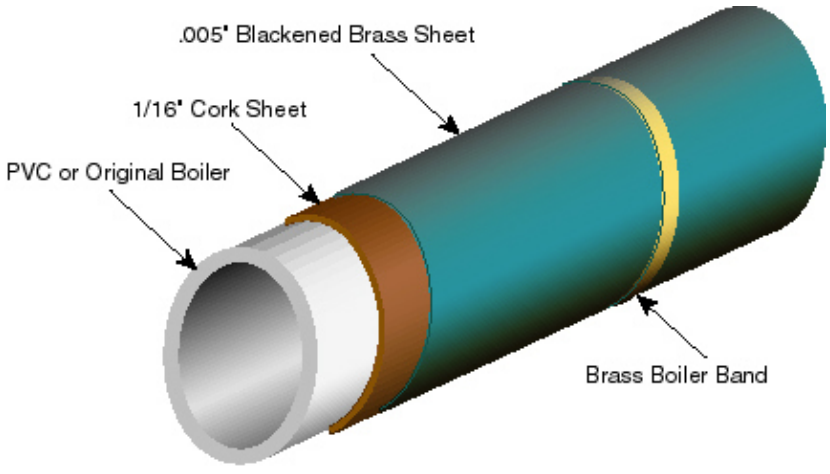
The key difference between my and Sonni's methods lay in the thickness of the boiler jacket. I had been using .025" brass. Sonni used sheets that were considerably thinner. The jacket itself is .005" brass sheet. The thinness of the sheet allows for a much nicer finish.

The sheet is first treated with the chemical blackener. This is swabbed on with a Q-tip, working in little sections at a time until the entire thing is as dark as it can get. This will leave you with a smooth "black" brass sheet. It's not actually black, but a very dark bluish brown. You may find the blackening agent wanting to pool up, and not completely treat the areas to which you are applying the finish. There are a few ways to combat this. First, make sure the sheet is free from grease, oil, and dirt. A quick once over with household cleanser will work fine. You may want to take some very fine steel wool to the sheet as well. While this looks like it's polishing the sheet, it's also creating microscopic grooves that will help the liquid stay where you want it.

If you have a large supply of the chemical agent, you may try submerging the sheet into a bath. You may have to do this twice to get the darkest finish. One warning: too many trips through the bath will cause the patina to actually flake off, leaving you to start over again. If this happens, just rub the sheet with the steel wool again.

Now that your jacket is the color you want, you could apply it to the boiler as is, but the next step is what gives the jacket that "something extra." Boiler jackets are seldom without blemishes. They are, after all, thin sheets of metal themselves, and subject to dings, scratches, and other blemishes from everyday use and handling during maintenance. To replicate this, I took the sheet outside to the driveway and walked on it. This gave a few minor nicks, dings, and pings to the sheet. A quick re-application of the blackening agent will cover any places where the patina had been scratched off. Now, you're ready to apply the jacket to the locomotive.

Now, there are two ways to go about this. For a steam outline (electric) locomotive, it's pretty easy. In the case of the Bachmann Mogul kitbash in the photos, the boiler was a piece of PVC pipe. The smokebox was wrapped in .005" styrene with rivets embossed in the back, similar to the techniques discussed in the MasterClass. On most American locos, the smokebox is an extension of the boiler tube, so the lagging and the jacketing add to the diameter of the boiler. To add the "lagging," I wrapped the PVC with 1/16" cork, then put the jacket on top of the lagging. I let the front edge of the jacket overhang the cork by 1/16" so I could bend it over to hide the cork lagging. Everything is then held in place by the boiler bands. (They were also blackened in a similar fashion, but not to the same degree.)



Patina Finish Boiler Jacket Construction

If you're applying this to an existing model boiler, such as the Bachmann Consolidation or something like that, the boiler is already larger in diameter than the smokebox, so you can skip the lagging step. Also the Mason Bogie does not require a different smokebox/boiler diameter, so again the lagging step is not needed. Simply wrap the boiler with the jacket, and secure with the boiler bands. In the case of the Mason, there is little difference between the smokebox diameter and that of the boiler, so again you can omit the lagging.

For a live steam locomotive, I place a "sub jacket" of .025" brass between the lagging and the thin, treated jacket. This sub jacket supports any accessories such as running boards, air pumps, domes, etc., that would otherwise just be screwed into the plastic or PVC pipe on an electric steam loco. Usually these mountings take the form of 0-80 studs that will stick out from inside the sub jacket.

Locating and Mounting the Fittings and Accessories

For the live steam version of this application, all the locating marks and fitting work can be done on the sub jacket, before the finished jacket is ever applied. Once you drill all your holes, wrap the finished jacket around, then go in from the back and lightly indent the finished sheet from the backside through the holes. You can then drill these holes out, and everything should line up. (Screw heads that protrude inside the sub jacket must ultimately be grinded or filed to less than the thickness of the lagging, which should likewise have holes cut to clear the screw heads.)

For the electric locos, there are two ways to go about locating and mounting fittings, depending on how brave you are. The first is to make your marks right onto the finished jacket. This offers one primary advantage. Since the boiler is cylindrical, and the finish is reflective, any light that is reflected will be reflected in a straight line along the cylinder. A goose neck lamp with a single bulb makes this a fairly easy task - the trick is to not move either your eye or the lamp. (It's easy, really.) Use a small punch or scribe to lightly indent the brass sheet to locate your holes. The disadvantage to this is that if you miss your mark, you've made another blemish in the sheet. Depending on the degree of blemish, this could be a good or bad thing.

For those whose skin isn't that thick, wrap a sheet of paper around the outside of the boiler jacket, but under the bands. Make all your marks on the paper first. Then drill your holes once you're sure everything's in the right place. Loosen the bands, remove the paper, and voila! Fittings can then be screwed directly into the PVC or plastic.

Protecting the Finish

Depending on the chemicals used, the durability of the finish may vary. You want to make sure nothing is able to scratch the surface once the finish is completed. I haven't put any kind of protective coating on any of my jackets, and have had no real trouble with the finish wearing off. The advantage here is that if it does wear thin for whatever reason, be it handling or repairs, you can simply reapply the blackener to the affected area.

You may want to rub a light coating of oil over the surface to protect it a bit. This collects dust, though, and may ultimately dull the finish undesirably. Live steam locos naturally get this coating simply through everyday use.

There's also the option of spraying a clear finish over the jacket. I've not done this myself, but it is certainly an option. This would certainly protect the finish from wear and scratches.

Room for Experimentation

To date, I've worked with brass, and brass blackeners. There are other metals, and other chemical patina agents. I want to experiment with gun-bluing agents and steel sheets. There's lots of room to play with things to get a finish that fits your particular tastes. Nickel silver holds some promise, as it starts out a lot closer to a steel color than brass does. It may be possible to play with aluminum as well, although my attempts at blackening aluminum rail met with less than desirable results.

Finally

I don't know when locomotive builders and railroads started painting boiler jackets, or if there was ever a time when it became "standard practice." I do know that the majority of locomotives in my time frame (c.1900) had unpainted jackets, at least the eastern US narrow gauge locos to which I'm partial.

I'm a big fan of using "real" materials whenever possible. If a cab was build out of wood, then I want to use wood. There's not much point in simulating materials when the real thing is at hand, and easily workable. (Although I do use styrene for tenders and steel cabs, so long as they're going to be painted.) Patina'd boiler jackets are simply an outgrowth of that practice. It has a nice look, and reflects light beautifully the way I can only imagine the prototypes did 100 years ago.