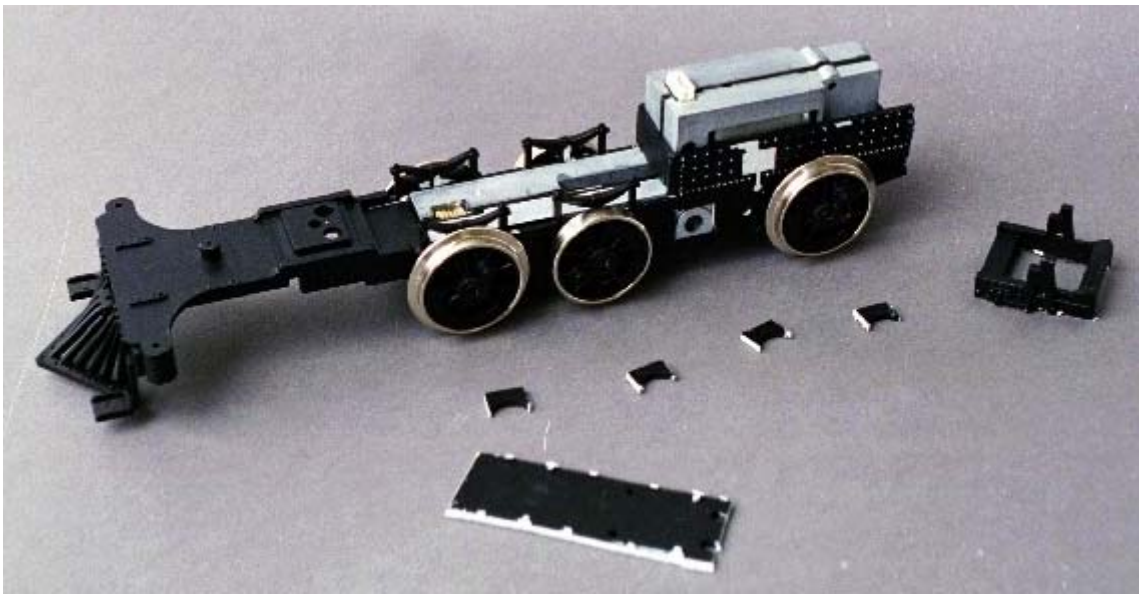
Construction

The locomotive Chassis

This week we'll add all the detail required on the chassis to create a perfect representation of a 1870s Baldwin 2-6-0 chassis. We'll cover the minor alterations to this detailing for post 1880s versions. Given these 2-6-0s were in service for over 50 years, they saw much modification, but the basic chassis detailing was never altered, only added to.

When we left off at the end of Chapter 2, our chassis should be looking like this, the 1:20.3 versions will only have a bit more frame length at the rear end.



The ugly looking chassis at the end of chapter 2.

The work we'll be doing to the chassis this week will include:

1. Patch the C-16 frame and extend the firebox.
2. The bar frame and the structural firebox-bar frame connections
3. The equalized pivoting beam and fulcrum point
4. Engine Brakes - brake cylinder fitting to post 1880 versions only.
5. Painting the chassis.
6. The pistons, Stephenson valve cranks, crossheads and side rods.
7. Alright, Alright...we'll fit the pilot (cow catcher) too. I know you've been hanging out to do that!!

Remember the work I cover for the chassis has to be done to both sides. Thus mirror my instructions for the other side of the chassis as well.

OK You Win - We'll Put the Pilot on First!!

If you've bought either the Delton / Aristo C-16 modern steel or wood pilot, the pilot simply slides into position from below the pilot deck. Go ahead and push it into place. No screw fixing is required and no glue. The pilot is a tight fit and is best not glued.

If you're using a H-L-W shorter wood pilot or Vance Bass wood pilot, you can either glue that onto the face of the pilot beam or preferably screw the pilot onto the beam with small self tapping screws on bolts. Caution & Warning, the H-L-W pilot is a tad tall and will drag on the rail head if fitted unaltered. It's best to take a 2mm slither of plastic off the top beam of the H-L-W pilot casting, then fix it to the C-16 pilot beam. The H-L-W pilot has 4 cast on bolt heads on the beam. Why not use those locations as the fixing points for your bolts? Grind the cast bolts off first, then place the pilot into position on the frame. Tack-glue it if you like. Then drill the 4 holes though the pilot and C-16 beam in one hit. Fix the 4 bolts though the pilot and beam and your done man!!

Patch the C-16 frame and extend the firebox

This is where we hide the ugly hole in the frame where the C-16's 3rd driver/axle used to be.

Step 1

Cut a rectangle of 0.5mm styrene sheet, 68mm long X 23mm wide. Place this 'patch' cleanly between the 2nd and last driver bearing arch. (repeat both sides). Use solvent, welder to weld this patch over the C-16 chassis. You will only be able to glue the patch to the raised 'bar' frame details, don't attempt to bend the styrene into the frame recesses.. Align the rectangle with the bottom edge of the frame, the top should align with the bar frame top, right below the firebox area.

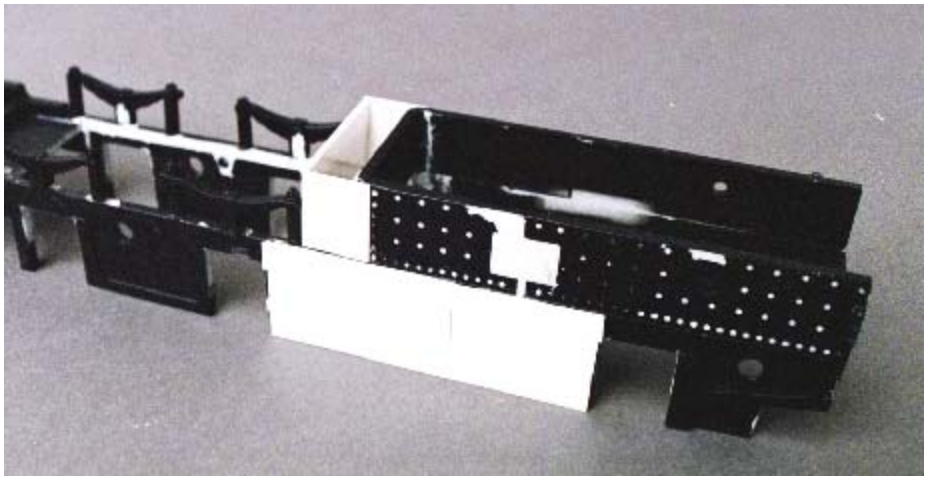
To cut styrene sheet of any thickness, simply cut/score the styrene using a knife along a steel straight edge..no need to cut right through the sheet. After scoring the styrene with the knife, fold the styrene along the scored line and styrene will snap cleanly along the line. Do this for all 0.5, 1.0 and 2.0mm styrene.

Step 2

Next we need to extend the firebox forward. Cut a **34mm long X 16mm tall** rectangle from **1.0mm styrene sheet**. Place vertically across the chassis, parallel to the existing firebox front wall, approx 10mm in front of the old front wall...it should basically rest against the rear of the 2nd driver leaf springs. Place the Aristo block into the frames to provide a correct height of the new firebox wall.

Cut two rectangles of styrene **14mm wide X 17mm** tall of **0.5mm styrene**. These are the side wall extensions of the firebox. Using welder cement glue these side walls to abut with the end of the rivet detailed walls of the existing C-16 firebox. The base of the C-16 firebox wall will curve around behind the extensions. Glue the front edge of the firebox side extensions over the edges of the new front wall. The best way to weld two perpendicular styrene walls is to dob a drip of welder to the top corner of the two parts. The welder will run down the vertical joint and form a perfect bond.

We now have a patched 0-6-0 frame and a firebox that extends forward to the rear of the 2nd driver springs.



The 0.5mm styrene patch between the 2nd and last driver bearing arch and the firebox forward extension to the rear of the 2nd driver spring.

The bar frame and the structural firebox-bar frame connections details

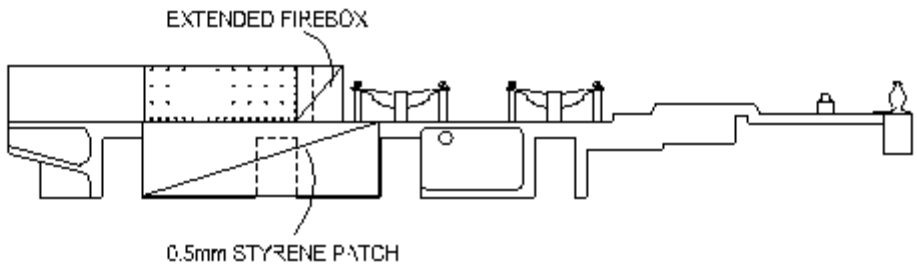
Step 1

You'll remember in the 'background' section, we looked at the bar frame of the 8-20-D 2-6-0 Glenbrook under restoration. The chassis bar frame between the rear and middle drivers had the upper bar a wide flat bar. The lower bar was a thinner unit with the equalizing spring below.

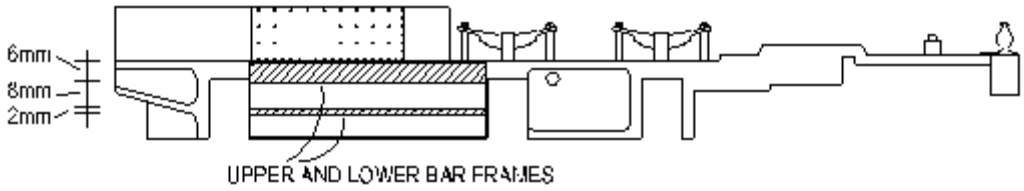
We'll add these horizontal bars to our frame now.

Upper bar frame - cut a **68mm long X 6mm tall** bar from **0.5mm styrene**. Apply this bar between the 2nd and last driver bearings to align with the top of the chassis bar frame, directly below the rivet detailed firebox. Weld into position.

Cut a second bar of 68mm long X 2mm tall , from 0.5mm styrene and weld into place exactly 8mm below the bottom edge of this upper bar frame. We now have the upper and lower bar frames installed.



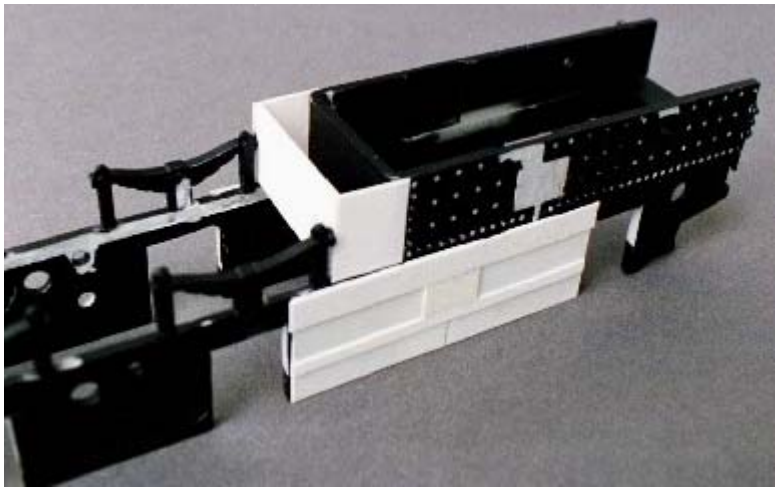
PATCHING THE CHASSIS



INSTALLING THE BAR FRAMES

The above diagrams summarize the work carried out so far.

At this time, using a pencil, mark a vertical line exactly midway between the two wheel bearings, center point of frame and the location where the equalizing pivot point will be.
Cut a 12mm long X 8mm tall patch of 1.0mm styrene and weld into place in the 8mm space between the upper and lower bar frames. Locate this patch exactly midway between the two wheel bearings on your pencil center line. This patch is the support point for the equalizing fulcrum where the upside down leaf spring shown above will rest.



The upper 6mm and lower 2mm horizontal bar frames,
with the central patch between them.

Step 2 - Clamping the firebox to the bar frame

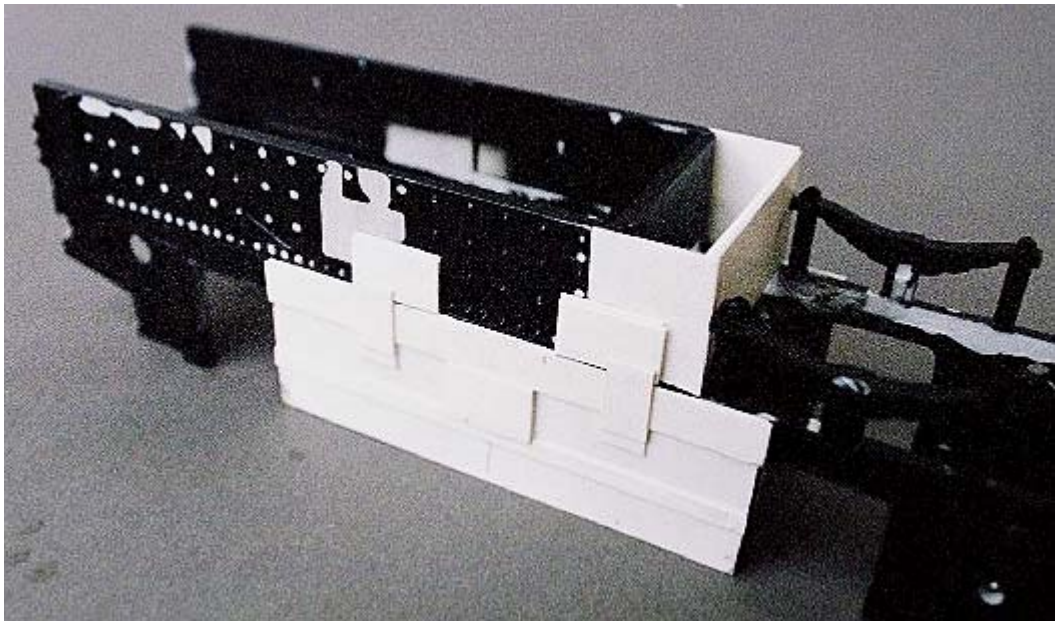
We'll now add the classic Baldwin detailing of typical NG 4-4-0s and 2-6-0s. The clamps that hold the loco superstructure to the frames.

Cut two **12mm long by 7mm tall** patches of **1.0mm styrene**. Install them directly above the upper bar frame, on top of the existing C-16 firebox sides. Install them with 14mm space between them or starting 7mm either side of your pencil center line. Using the knife, clean off the

individual rivets on the firebox sides that snag the fitting of these patches. These patches form the top of the firebox clamps.

Next we install two **5mm long X 4mm tall** patches of **0.5mm styrene**. Fix directly below the upper bar frame. These small patched will be aligned with the outer edges of the upper patches.

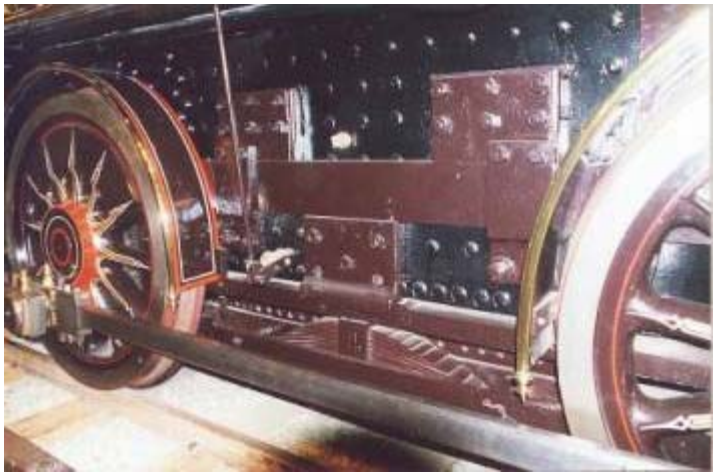
We now install the clamping units, connecting the upper and lower patches, thus clamping over the upper bar frame and fixing the firebox to the chassis. Cut two **5mm wide X 10mm tall** rectangles of **0.5mm styrene** and weld them over the upper bar frame between the upper and lower patches. Center the 10mm height of these rectangles about the center of the 6mm tall bar frame.



All the patches in place. The firebox clamped to the upper chassis bar frame.

Step 3 - A most riveting occupation

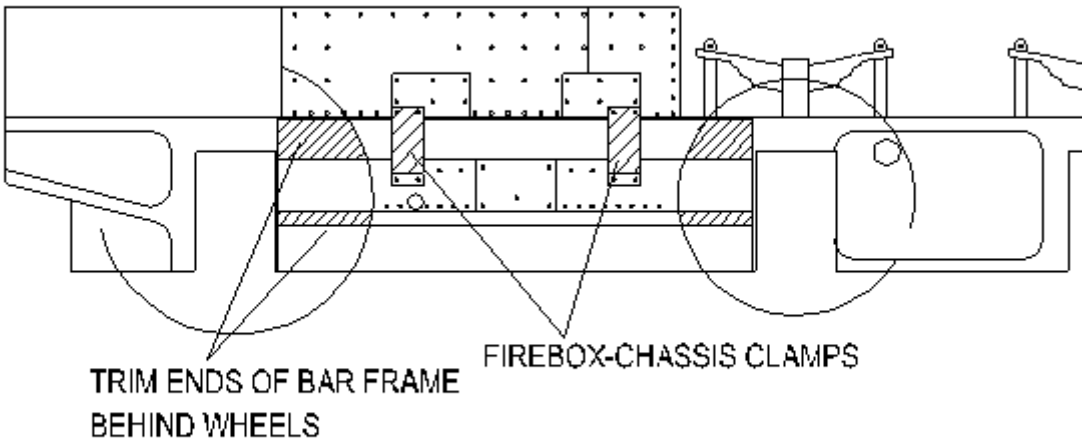
Now is time to put the rivets to your chassis. We need to get the above bar frame details, firebox, and chassis clamps to look like this:



(ignore the equalizing beam and spring below the lower bar frame at this time).

Open your packet of 'Evergreen Styrene' .020x.030 styrene strips. Grab one of those strips and start dicing the strip into tiny cubes exactly like chopping up a carrot at 1:24 scale!! Best to not cut straight down, rather slice over the strip, otherwise your tiny cubes will zing off into outer space. When you cut a group of about 12 cubes, start welding them onto your model at the nominated location. You can also weld a cube onto the firebox areas where ever you might have accidentally cut off one of the wanted C-16 firebox rivets (firebox stays). What I do is place a tiny drop of welder on the surface where the rivet is to go, drop the cube-rivet onto the surface and move into place using a small screw driver. Once the rivet is in the correct location, dob another tiny drop of welder over the top of it. This helps to seal the rivet to the chassis and also helps to dome the top of the rivet.

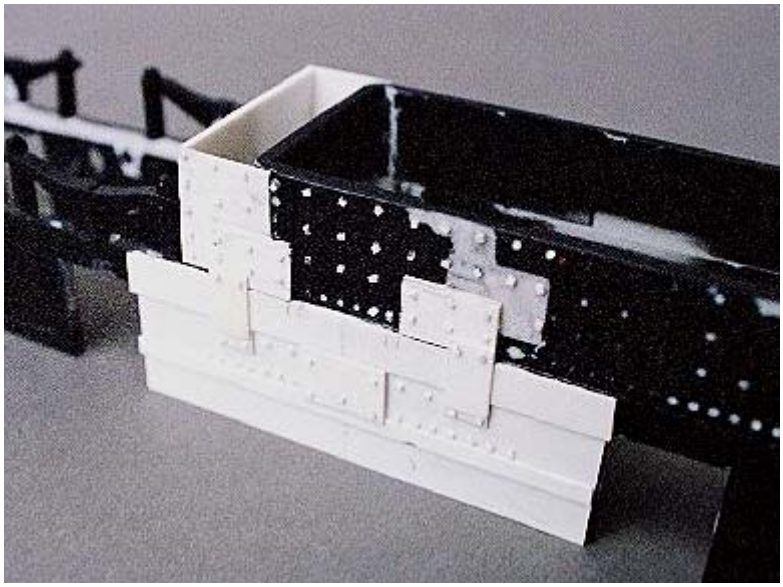
POSITION RIVETS LIKE THIS



INSTALLING THE RIVETS

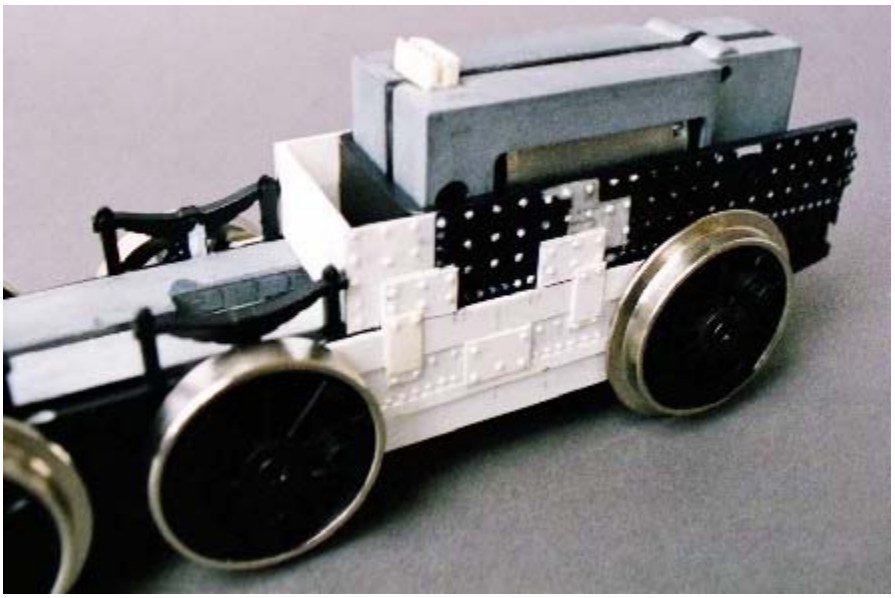
Locate the individual rivets as shown on this diagram. Yep glue each and every one of them!!
Note bar frame ends to be trimmed as described in a coming paragraph.

Once all the rivets are in place, including firebox stays to the firebox extensions, ash pan rivets, and firebox-bar frame clamp rivets, your chassis should look like this:

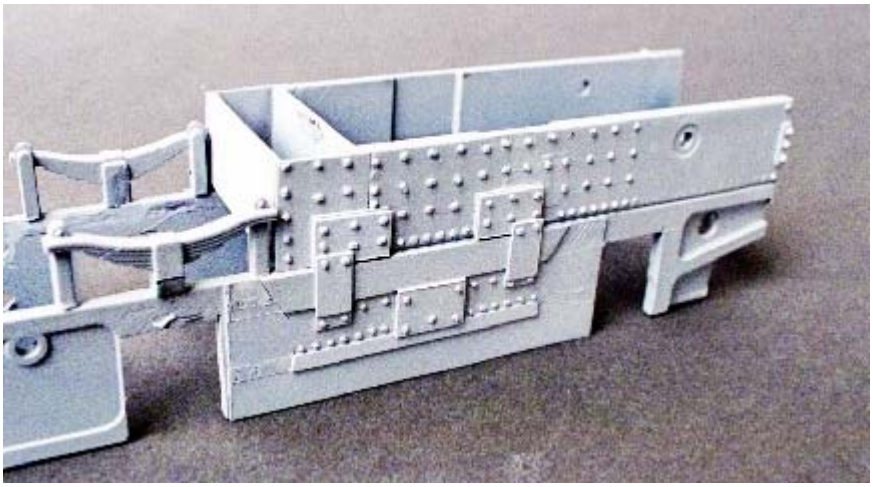


Frame Details

Now place your C-16 block back into the frame. Thus:



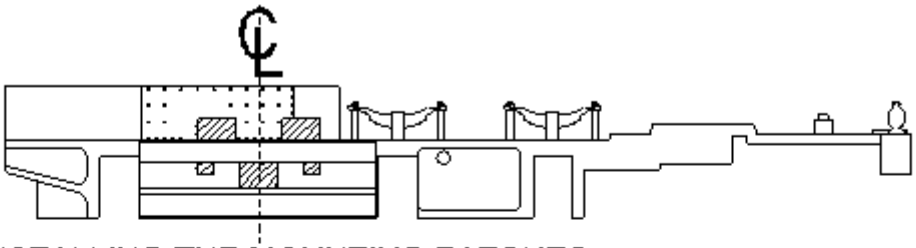
Using a pencil, trace the outside line of the drive wheels over your bar frame details. We have to trim off the upper and lower bar frames that extend behind the wheels. These frames will snag the screws in the backs of the wheels as they turn. Remove the bar extensions by cutting lightly over the bar frames where the pencil lines depict the extent of wheel radius, and slice under the bars prying them off. Do not pull off the whole bars, or cut the large rectangular base patch.



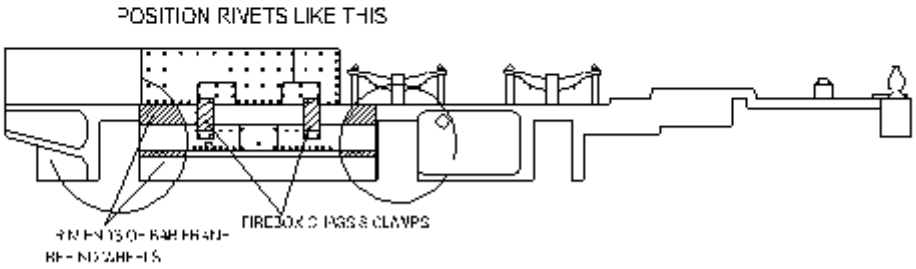
This is what your frame should look like now. Note the trimmed ends of the upper and lower bar frames. I've primed my chassis at this point to help photograph the construction. You do not need to paint the chassis just yet. At this point the typical Baldwin 2-6-0 frame is built, including the structural connections of the firebox to the frame.

Remember how the Aristo block was held in the chassis frame, with two black bolts fitted in front of the last driver? You notice we've gone and clad over that new hole you drilled 5mm above the old fixing hole? Now we have to drill out the styrene cladding over the new 'upper' fixing hole. Hold the frame up in the light, see the light shining through the rear fixing holes, forming two dots on the outer styrene patch. You need the upper hole on both sides of the chassis to bolt the

frame to the motor block. Trace the light pattern of the upper hole only and drill a hole in the styrene to match. You will now be able to bolt the chassis to the block in the same manner as in Chapter 2.



INSTALLING THE MOUNTING PATCHES



INSTALLING THE RIVETS

The above diagrams summarize the work to this point.

The Equalized Pivoting Beam and Fulcrum Point

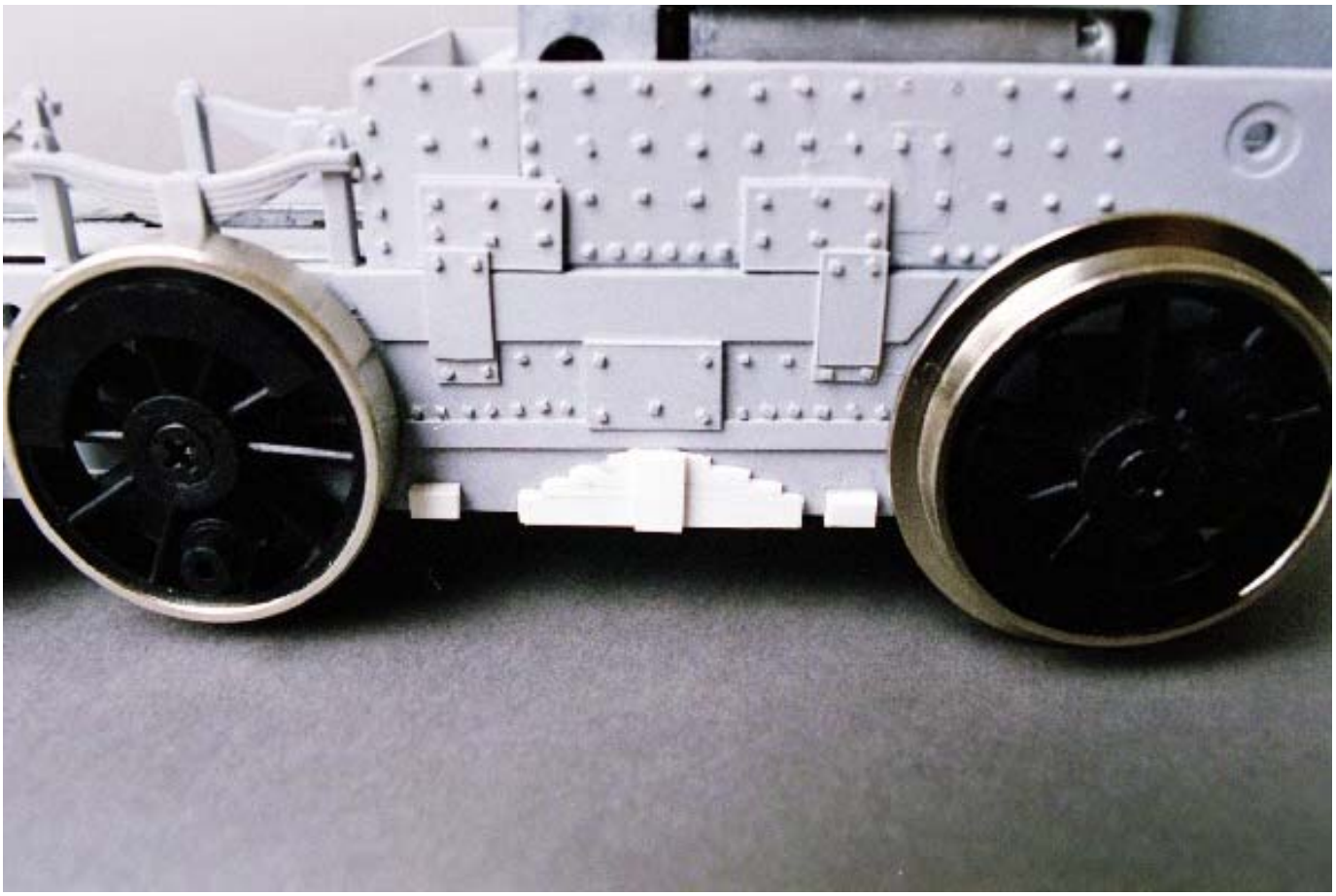
We now complete the typical 2-6-0/4-4-0 chassis by adding the equalizing beam and fulcrum point detail.

We are to add the details below the lower bar frame. This is the leaf spring (fulcrum) and double equalizing beam shown either side of the spring. Since our chassis is kind of packed full of motor block, we shall only model the outside equalizing beam, which is slightly proud of our chassis face.

Step 1 - Making the Fulcrum Spring

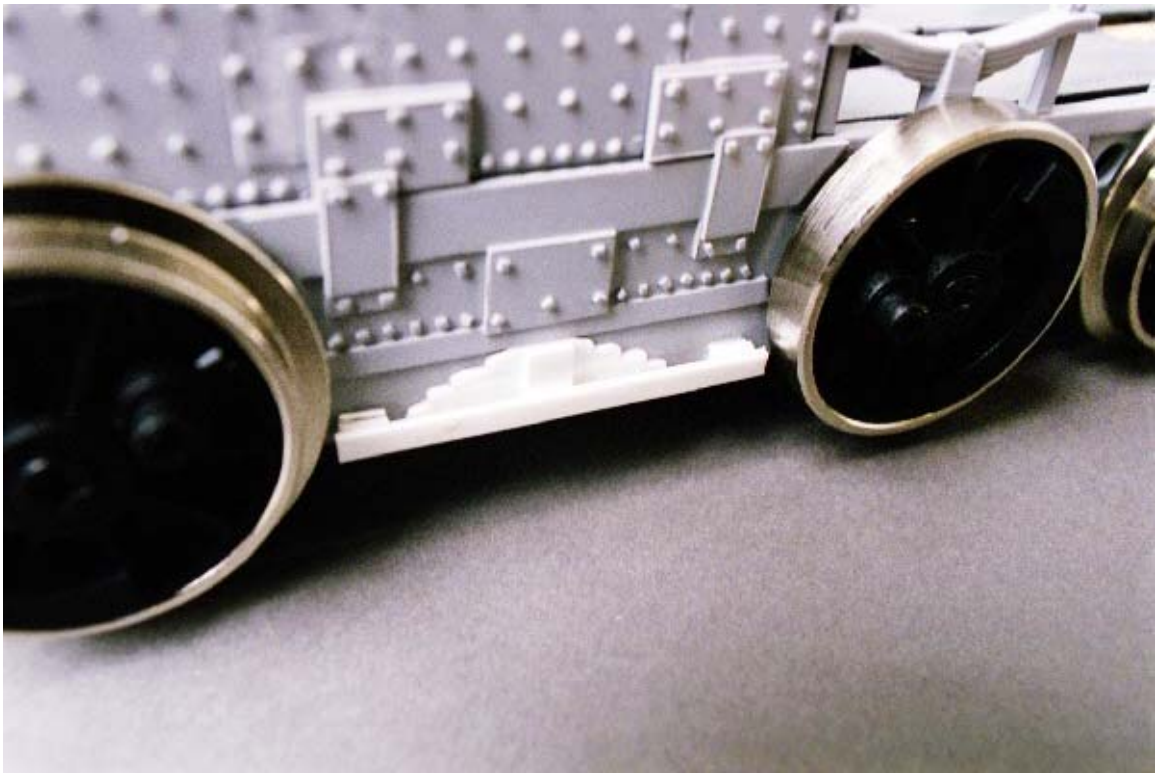
Cut a triangular patch from 1.0mm styrene, 26mm long at the base and 8mm tall to the apex. Using your knife score a series of horizontal lines across the triangle - these form the 'leafs' in the spring. Next place a 4mm wide X 8mm tall strap of 1.0mm styrene over the center of the spring. The overall thickness at the center of the spring is now 2.0mm.

Immediately next to the wheel flanges, weld a 2mm thick cube of styrene, 3mm long x 2mm tall, made from two layers of 1.0mm styrene. Weld these cubes to align with the chassis base line. Your model should now look like this:



We now have the fulcrum spring for the equalized suspension installed and part of the equalizing beam installed.

We now weld the outer equalizing beam between the two blocks and spring. Cut a 45mm long X 2mm tall rod of 1.0mm styrene. Weld the rod into place.



This is the finished chassis frame including all clamps, bar frame members and equalizing suspension details.

Now for the big issue. Should an equalized 2-6-0 such as this, with rocking beam also have a leaf spring above the 2nd driver to indicate vertical suspension for that driver only? Answer. NO. These locos as built only had a leaf spring over the lead driver. The suspension of the 2nd and 3rd drivers was only the fulcrum spring...that's where the weight of the loco rested. So if you're building an 1870s version, strip those leaf springs off from above the 2nd driver right away!! If you're doing a later version, it is possible to go both ways. Another Baldwin 2-6-0 we know, the North Pacific Coast #13 (pictured below under painting) had a rocking beam and fulcrum AND a leaf spring above the 2nd driver. However, the rear most tie rod from leaf spring didn't bolt to the frame, rather continued down the chassis side and fixed to the rocking beam. This then integrated the leaf spring of the 2nd driver into the equalized suspension of the 2nd and 3rd drivers. This system would become typical of later 2-6-0s, 2-8-0s etc...where all wheels had springs above for vertical suspension as well as equalizing beams. You can choose to keep your leaf spring on the 2nd driver or loose it, its up to you!! The Bachmann 2-6-0 is detailed for the spring only over the lead driver. This is correct for the 1870s.

Engine Brakes - Brake cylinder fitting - Post 1880 versions only

This is a short diversion for those modeling post 1880s versions of the 2-6-0, such as NCNG #2. After reviewing the typical installation methods of locomotive brake cylinders discussed in the 'background' section, you have to choose how you'd like to install your brake cylinders. For my demonstration model, I've chosen a typical horizontal fitting of the brake cylinder, with the cylinder located just below cab floor and in front of the rear driver. This appears to be the method used on the NCNG #2.

As indicated in the chapter 1 parts list, a real good brake cylinder casting is the Precision Scale K-27 brake cylinder set. These cylinders are made of brass. Take the brass cylinders and using the

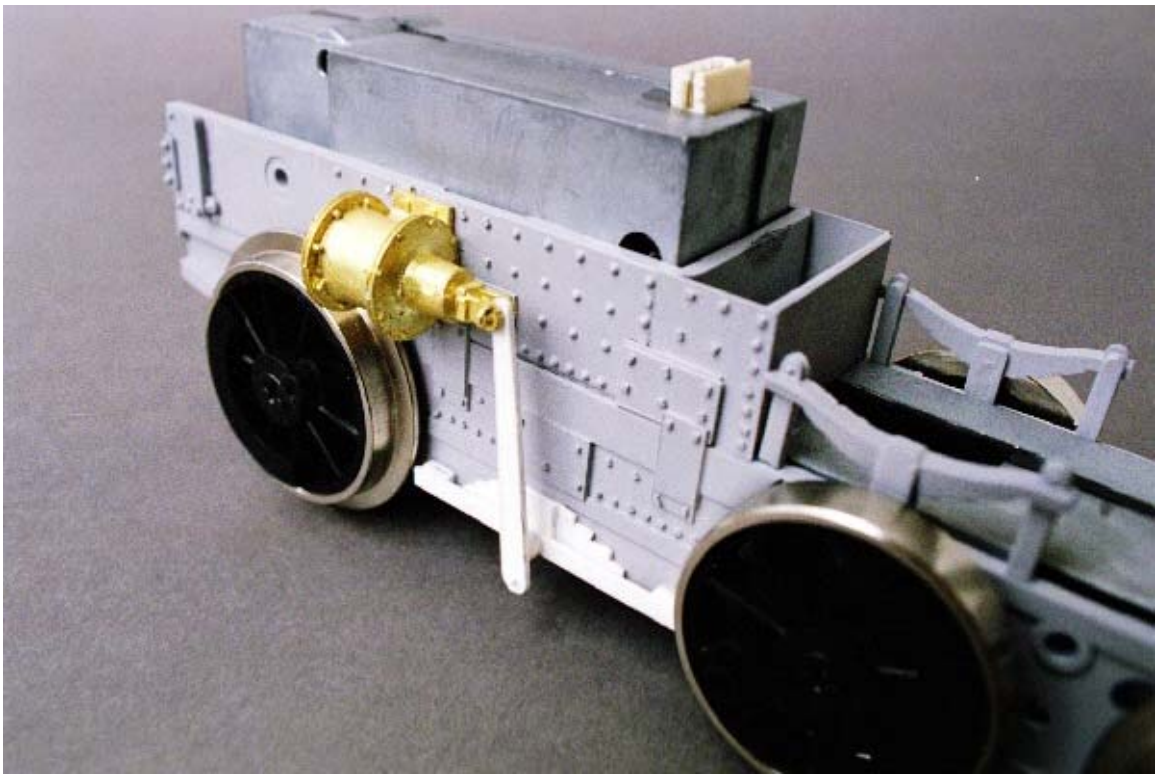
razor saw remove the brass tab on the back of the mounting bracket such that the cylinder can be mounted flat on the chassis side. We cannot drill the brake cylinders a fixing hole because of the motor block being so close behind the frame...so we'll fix the cylinders onto surface using 5 min Araldite.

Glue the cylinder mounting bracket so that the top edge of the bracket is at least 1mm lower than the chassis top edge. We don't want the cylinder to bind with the cab floor. Place the unit as close to the rear driver as possible without it clashing with the wheel flange. Including any wobbly wheel syndrome!! You might have to clear away some firebox rivets to get a good fixing surface on the firebox side. The base plate of the cylinder should rest hard up against the rear of the firebox-bar frame mounting patch. If the brake cylinder binds with the wheels in this location, you might have to carefully trim back the rear edge of the frame patch to get the cylinder in place.

Discard the brass brake cylinder levers provided with the K-27 units, these are way too short for your loco. Using 1.0mm styrene, cut new levers approx 38mm long. The levers should taper such that at the bottom end they're about 4mm wide and at the top end only 2mm wide.

Cut a small 3mm length of 3mm dia. plastruct tubing, weld this tubing to the center of the equalizing bar, providing a support for the bottom end of the brake lever. Then weld the brake lever in place. Use CA (super glue) to hold the upper end of the lever into the brake cylinder joint.

The finished brake cylinder assembly should look like this:



Note the 3mm long, 3mm diameter Plastruct tubing holding the lower end of the brake lever in place. From this point you can add as many or as few of the brake lines and brake shoes as you like to the 6 locomotive wheels. I'm not putting any more brake detail onto my chassis at this time.

Painting the Chassis

Its time to paint the chassis before we put the wheels and side rods on for the last time. First thing to note with painting is that I'm leaving the paint choices to you. You can paint the loco in what ever color you like. You can use air-brush, spray cans and brush paint as much as you like. I recommend spray painting all the major assemblies such as the chassis frame, boiler, cab and tender. All smaller areas can be hand painted or masked/sprayed.

For those without air brushes, and without much spray painting experience, I offer the following notes:

1. Spray paint outdoors. Good ventilation.
2. Spray on a dry day, not a damp cool day. Spray paint cans absorb moisture from the air and turn your paint surface to look like old leather!!
3. Warm the cans in a tub of warm water first. Just float them in the tub. This helps to make the spray cans spray finer.
4. do not spray in one go. Expect to do 3-4 layers. Spray on lightly, spraying left to right about 1.5-2ft from the model. Do not glug it on, spraying too much, causing ugly runs. Go light, let it semi-dry and spray again, light layers. This is the only way you get paint coverage. Spray paints by their nature will not just cover the detail you want, but rather will fall into the crevices leaving the detail exposed and un-painted.
5. Always use a primer spay coat especially if painting over pre-painted commercially painted areas such as the Aristo black chassis frames. These pre-painted areas usually have an anti-fungal agent in the paint which causes later painting to bead off and not stick. It makes a big ugly mess. If that happens to you, stop painting immediately and wait for what you've painted to dry. If more paint does not fix it, then go with the undercoat.
6. Once painted if you get runs or paint globs occurring because you've put too much paint on. LEAVE IT!! Don't try and wipe it off. You'll wreck all your detail work. When the paint is dry the globs reduce quite a bit. More paint only makes it worse.

Paint Choices:

If using spray cans, I recommend the Tamiya or Testors range of colors. They are nice fine sprays. The Tamiya is a good range, because with every spray can color they have, they also have a corresponding matching paint jar for hand painting. This is great for touch ups.

For Russia Iron, I use metallic Automotive spray cans. I use dark gun metal grey/blue color. A problem with Russia Iron color is the tendency to go too light. Bright blues just spoil the look...think dark....yes I've heard the stories...Russia Iron reflects the blue sky, making it look blue....true, but that's no reason to paint the model sky blue....paint it dark and let the model reflect the sky also. For examples of colors, check my own web page of models, look at the colors used at the Cal State RR museum, on locos such as Sonoma, Genoa, Empire etc. Also checkout the Russia Iron on Inyo and Dayton at the Nevada State RR Museum. Look at the color used by Dan Markoff on his 1875 8-18-C 4-4-0 Eureka. Both Inyo and Eureka have 'real' Russia Iron jackets, they are not painted, and they are reeeeel dark. The finish on both of those locos was based on surviving original jacket parts from the 1870s belonging to those locos. I'll go into the background of Russia Iron process in chapter 4.

Painting Eras

If you're building an 1870s D&RG version, or modern version, you probably will be building an essentially black loco, with black wheels and frames.

Typical colours-1880s on the South Park and D&RG

1890s on the D&RG

You might also consider painting the modern version a dark grey all over, rather than black.

The modern Black look!! 1920s

If you're doing a Californian or Nevada line version, you might consider painting the loco with a lot of chocolate browns and blacks, such as used on Eureka and Sonoma and was common for Baldwin products of the 1870s. On such a loco the drive wheels were often painted brown...see detail shots of Sonoma in this article.

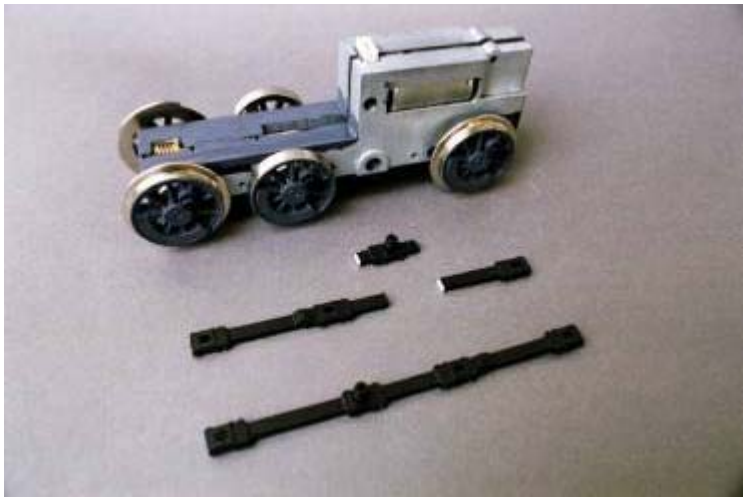
1870s in California

Painting the chassis

Depending on the era choice and look you're after, Take the motor block out of the frames and set aside. Then go and spray paint the whole chassis frame complete with all the rivet details etc. If you're having wheels of a color other than black, you might consider hand painting the wheels on the block with a Tamiya jar of paint using a brush.

If you're leaving the wheels black, no need to paint the wheels again. But you might consider painting the chrome tire front edge, that's flush with the plastic wheel center. By painting these chrome elements you can visually help to make those ugly big flanges less intrusive.

Paint the top surface of the block, which is left exposed in the chassis frame a black or dark grey color.



The painted top of chassis and painted wheels of the block.

If building an 1870s-80s version, you can leave the Aristo cylinder and steam chest unit as delivered - all black with brass cylinder heads...no paint needed.

If you're interested in getting the cylinders 'correct' for an 1870s look, check my Californian 2-6-0 picture above. Both Californian and D&RG versions in the 1870s had brass cylinders with polished steel (Chrome) heads.

If doing a modern version. Prime the whole steam chest unit and spay paint it black or dark grey, including the brass cylinder heads.

The pistons, Stephenson Valve Cranks, Crossheads and Side Rods

Now we get to the bit that starts to make our chassis look like something from a steam locomotive - the cylinders and side rods.

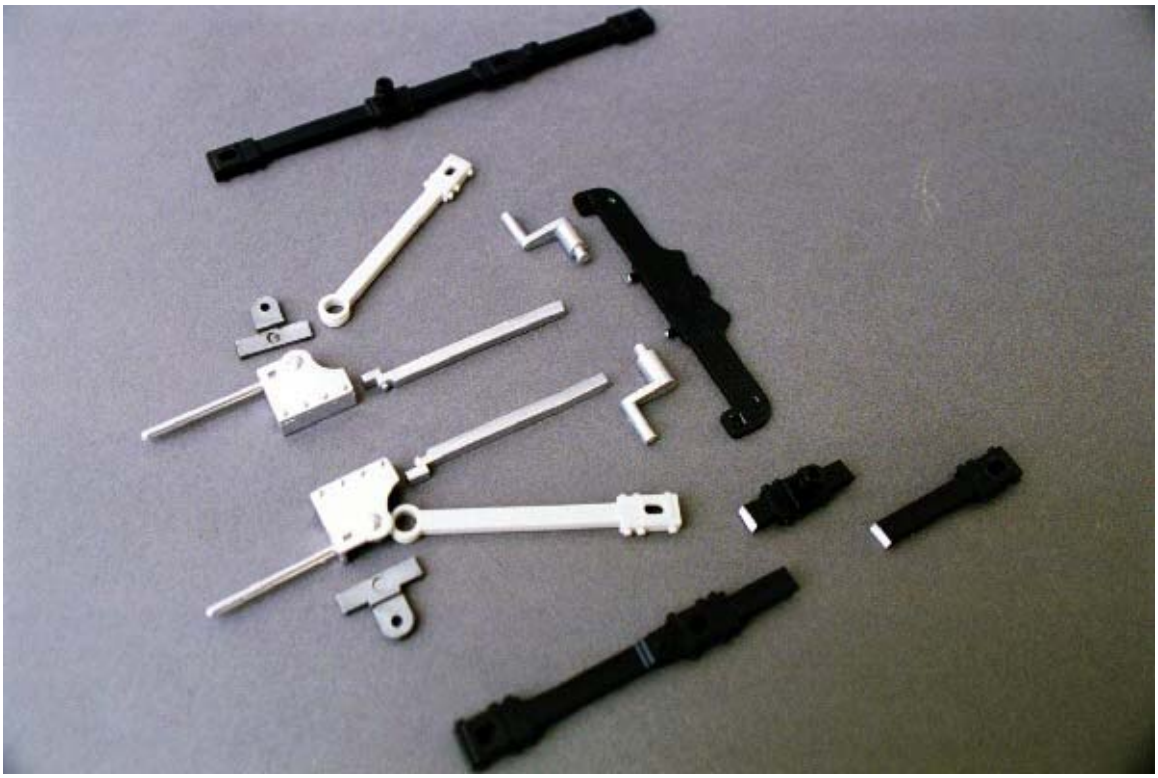
Assemble your cylinder set. These are made up of a plastic steam chest casting, two brass front cylinder heads and two brass rear cylinder bands, two steam chest top covers and two brass oil cups on top (if doing an 1870s version). Insert the cylinder/steam chest unit onto the frame. It is pressed on from below with the center hole in the cylinder unit aligning with the center hole in the chassis frame. You might put a temporary nut and bolt though the hole to tighten it up so that the cylinder unit will not drop out unexpectedly. On the top of the steam chests is a small hole at the center of the concentric ringed chest covers. In the 1870s versions, a brass oil cup can be inserted into those holes. Basically this was a gravity fed lubricator that oiled the slide valves and cylinders while the loco was in motion. The crew would stop from time to time and top up the oil cup. By the 1880s onward, these oil cups were removed and a lubricator line inserted. Oil was now steam fed from the cab's 'Hydrostatic Lubricator' and a long copper oil line went to the steam chests from the cab, the line was hidden under the boiler jacket. Only the last bend in the lubricator line is visible. We'll be adding this detail to our model near the completion of the model.

Now it's time to collect together all the locomotive rod components.
You need:

- two connecting rods (black)
- two piston (main) rods
- two cross heads
- two cross head guides
- two 'T' shaped rear parts to Cross heads and two tiny screws to screw them to the cross heads
- two Stephenson Valve cranks
- one guide support yoke (black).
- four short bolts and washers to bolt rods to end drivers
- two long bolts and washers to bolt piston rod and connecting rods to 2nd driver.

Be sure to remove all dags and flash off the rod castings...we don't want any defects on the rods that could cause binding while in motion.

The assortment of parts are these:



Sorry by I got carried away and already began cutting one of the connecting rods to turn 8 coupled wheels into 6 coupled wheels!!

Step 1 - Converting the side rods for 6 coupled wheels

Take the two black connecting rods. You will notice there are 8 bearing points for connection to the C-16's 8 drive wheels. We only want 6 connection points. Notice also the two center bearings are different. One has a raised bearing point on it for the main piston rod connection.
The other has extended detail indicating a pin joint in the side rod just beyond the C-16 3rd driver.

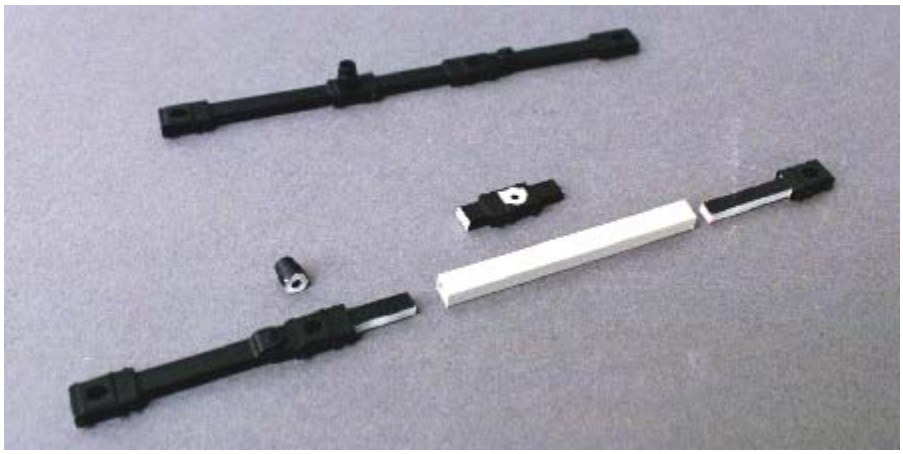
We want the pin joint detail AND the raised bearing point, both on our 2nd (middle) bearing.

Take ONE SIDE ROD ONLY and Cut off one of the two center rod bearings entirely. Remove the one with raised bearing point cast on it...cut close to the bearing point as shown above. Now Carefully slice off the raised bearing point from the severed bearing/rod part.

You now have a side rod in 4 parts, with the rod pin-joint detail bearing as part of the 2nd bearing, a loose 'raised bearing point', the cut-off end of side rod component. The 4th part, as cut from the 3rd bearing location of the rod can be discarded.

We're going to splice the side rod back together using a section of 6mm X 4mm Rectangular Hollow Section (RHS) Plastruct. Cut two lengths of the RHS Plastruct rods at 68mm long.

Your collection of parts should look like this:



Note the Plastruct RHS section ready to take the cut ends of the old side rod. Also note the raised bearing point cut off the discarded bearing ready to be installed on the new 2nd rod bearing

Carefully sand down the top and bottom surfaces of the cut ends of the side rods, back to the bearing points as indicated in white in the above photo. Sand the rod ends down enough to let the RHS slip over the cut rod ends.

Next paint a heap of solvent, welder glue onto the cut ends of the side rods and insert the cut rod ends into the RHS, welding the side rods ends into the RHS. Place your modified side rod right next to the other unaltered side rod and perfectly match the length of the side rods..slide the cut side rods in and out of the RHS to get a perfect length match with the existing unaltered rod. You want the new 6 wheel rod exactly the same length as the old 8 wheel rod so that the rods don't bind with the wheels. Now weld the cut off 'raised bearing point', onto the new 2nd bearing point on the rod.

One completed side rod for a 6 coupled wheel loco. Note the carved off 'raised bearing point' from the old disused bearing has been welded to the 2nd bearing of our modified rod.

Repeat the above procedure for the other side rod, and match it's length with the first side rod you modified....you'll be left with two side rods of correct length ready for installation on your 6 wheel chassis.

Step 2 - Painting the side rods

Plenty of options here....choices are:

1. Paint the whole rod set black like Aristo does. This is an accurate thing to do for later era locos, but tends to hide the side rods.
2. Paint the rods black or dark grey and only highlight the bearing points, cross heads and Stephenson cranks in silver/chrome. This is my preferred option. The rod bearing sections historically were kept polished to enable easy checking of the rods for fractures at the bearings...this was the most likely point of failure. Often the whole rod set were polished steel, especially in the early days, but I feel our side rods are too thick and chunky to paint them completely silver. To make the rods less intrusive, I paint the bearings silver and the main rods back...Old photos of the D&RG locos in the late 1880s and 1890s indicate this style of side rod...see my model photos above under 'painting'.
3. Paint the whole side rod set silver.

Step 3 - Installing the Side Rods

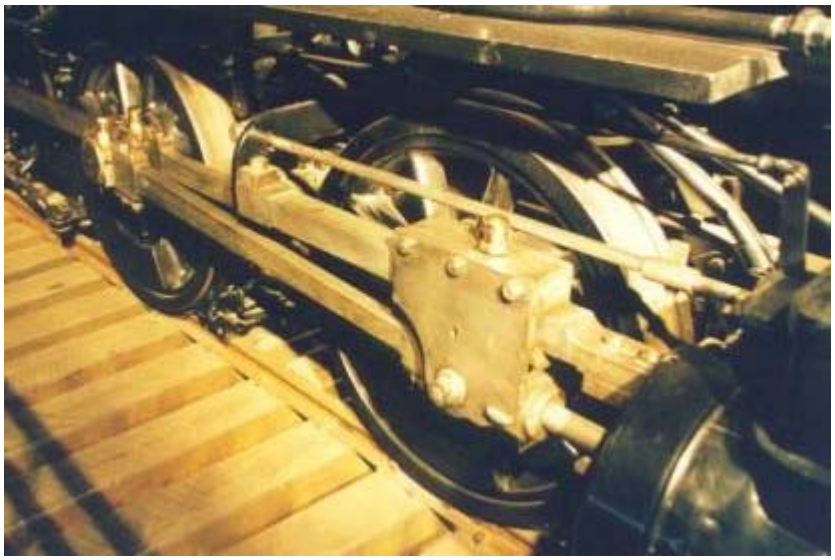
Take the cross head guide support yoke, the black weird looking thing. We need to make this fit laterally atop the chassis where our metal motor block now protrudes. Remove a 35mm wide (chassis width) X 2mm tall strip out of the bottom of the yoke. The two plastic pins will be discarded with this strip. This will now allow the yoke to set down over the block and meet the cross head guides at the correct height. Using the welder cement, weld onto the rear face of the yoke a 34mm length of 3mmx3mm styrene plastruct SHS rod. This will help the yoke sit vertically.

Remove the plastic 'key' on the top of the yoke. Cut it off with a knife. We want a clean curved top surface on the yoke to rest our boiler in the next chapter.

Insert the Stephenson valve cranks into the frame with the ends of the cranks facing up. The fixing holes are right in front of the 2nd drivers.

Install the side rods onto the loco wheels. Place a small chrome washer over each rod bearing point on top of the rod and then bolt the rods to the 1st and 3rd driver set only, using the chrome short bolts The 2nd (middle) driver is to be left unconnected, however be sure the 2nd driver crank is fitting snug in the recess under the side rod...awaiting a bolt

The crosshead's connected to the...Main rod, da main rods connected to da...side rod, da side rods connected to the...wheel cranks....now hear the word of the.....Oh knock it off....



These are the rod components we're about to install as found on our prototype 8-16-D 2-6-0.

Insert the main-piston rods into the cross heads from the rear, place the 'T' shaped backing part over the rear of the cross head and screw the unit together with the tiny screw. The cross head now holds the main rod.

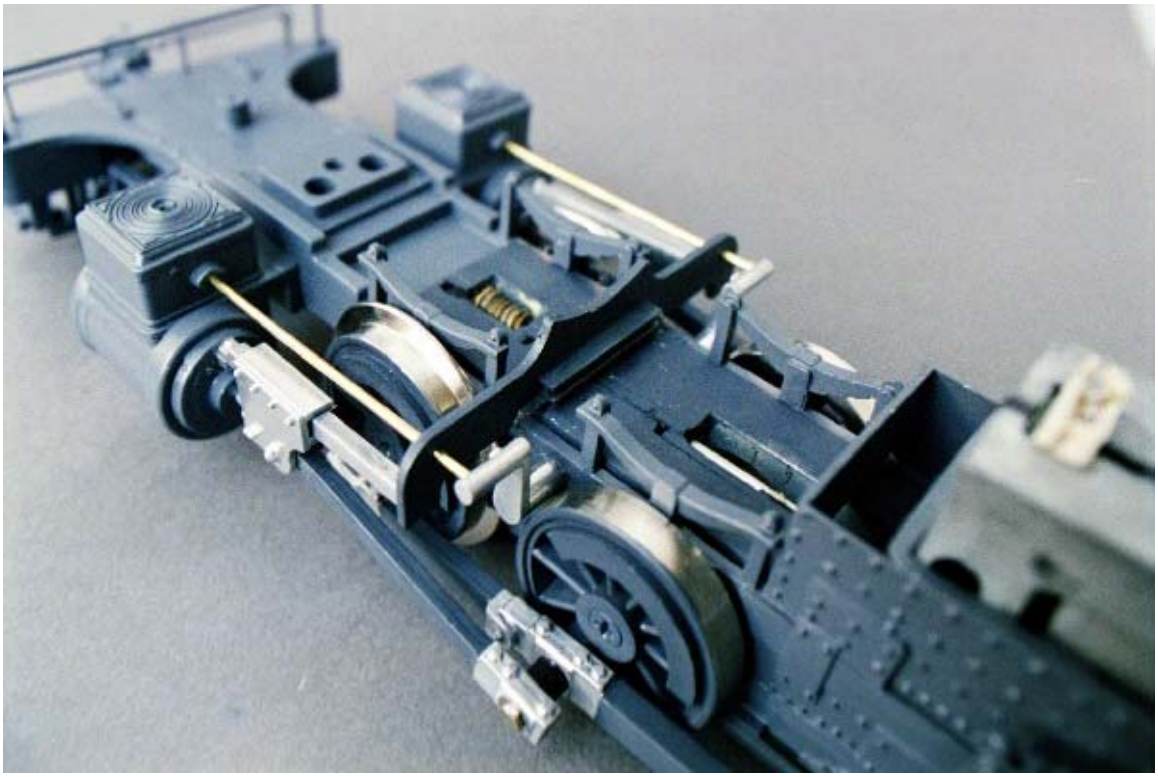
Look at the rear cylinder head. Above the central piston hole is a rectangular slot. Insert the cross head guides into these slots. Push them in as far as they will go The main square section of the guide rail 'steps up' immediately behind the cylinder head. Check my locomotive drawings to see how the guides are positioned...don't insert them upside down!!

Slide the cross heads onto the cross head guides and direct the pistons into the cylinder center hole.

Insert the rear end of the cross head guides into the square hollows formed at the ends on the support yoke. Put in a drop of welder to help hold the guide ends into the yoke. The yoke will now be loosely sitting atop of the motor block.

Cut two 65mm lengths of brass 1.5mm rod. These are to be the slide valve rods connecting the steam chests to the Stephenson valve cranks. Insert the end of the brass rod into the steam chest, a small hole is provide above cross head guide. Insert the other end of the brass rod through a hole in the yoke above the guide rear support and run the end of the brass rod into the hole in the Stephenson valve crank.

Connect the main rod onto the top of the 2nd driver side rod 'raised bearing point', place a chrome washer on top of the rod and insert the long chrome bolt, fixing the main rod and connecting rod to the 2nd driver crank. MAKE SURE the little 'raised bearing points' we cut off the old rods are there to space the main and connecting rods on the 2nd driver, or the rods will bind behind the cross head.



Positioning of all the rods, guides, support yoke, cross heads and valve rods in place. Note the spacer between the main rod and connecting rod bearings on the 2nd driver crank (it's the black cylinder in there)...this is the ol' ' raised bearing point'

Make sure all the bolts holding the side rods on are not too tight, but hold the rods on firmly. The rods must rotate freely.

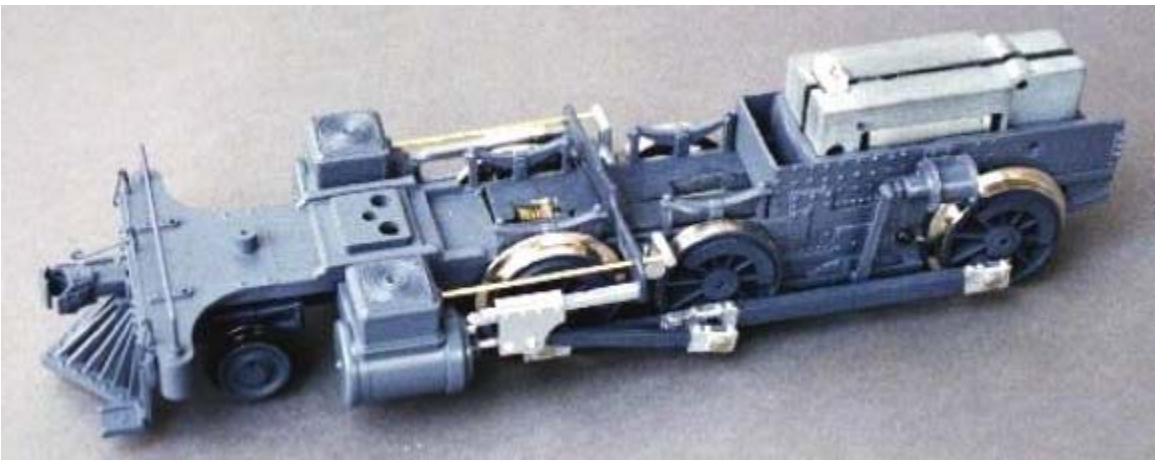
Once all is done, test you chassis Use low power to turn the wheels at low RPM. Watch the rods turn and listen for binding. The binding problem areas are:

1. The screws in the back of the crossheads clashing with the lead driver rod bolt (make sure screw in back of crosshead is all the way in, and bolt holding side rod to lead driver is all the way in, just loose enough to allow the rod to turn)
2. The side rod binding under the support yoke (place a slither of styrene under yoke and raise it up a tad)
3. The piston rod binding under the support yoke (trim bottom of yoke)
4. The side rod hitting the Stephenson valve cranks (push the cranks into the mounting holes further)

The whole design is real tight, there isn't much tolerance. Use a dob of Araldite to hold the support yoke down on the top surface of the motor block. It'll be held in place later by the boiler.

Finally take your Aristo C-16 pilot truck, and bolt it to the support molded under the chassis, right in front of the motor block. You'll find a 2mm dia threaded bolt of around 12mm long will fit perfectly. Use a washer under the bolt head. Typical bolts of this nature can be purchased at a hardware store.

You finished chassis should look like this....WOW MAN!!



In this photo note the black bolt right in front of the last driver. This is the bolt fixing the frame to the block. Be sure to have drilled out the correct hole earlier in the chapter. The grey color chosen for my Masters prototype model was chosen for photographic reasons. It shows the detail better. I guess my 1920s 2-6-0 will look kind of weathered without any real weathering!!

Here endeth the lesson for the regular locomotive builders. Next chapter we put a boiler on this thing.

For those wanting to add more detail, proceed to the 'Detail' section of this chapter. There we shall look at adding brake shoes, cylinder drain cocks, pilot rails and pilot uncoupling bars.

Good luck dear model builders. See you in a week to 10 days and as always. Good luck.
David Fletcher
July 2001

Detail

This is additional work of a more fragile and detailed nature. Its up to you if you wish to add these details to your model. In some cases I will not model the details, rather point out what details would be found on the prototype and would be required to make your model as accurate as possible.

Cylinder Details

These are some minor additions to the old Delton C-16 cylinders and steam chests. Most larger scale models tend to ignore there parts, even some of the Spectrum models.

We'll be adding the cylinder 'drain cocks' and steam chest 'steam cocks' to the model.

The drain cocks were two outlets at the bottom of the cylinders, one at each end, for the purpose of draining the condensed steam or water out of the bottom of the cylinder. You usually see these lil suckers blowing and squelching steam when a loco takes off. They serve two primary purposes when a loco takes off from rest:

1. Drain all the collected water out of the cylinders as quickly as possible to improve the efficiency of the cylinders
2. Reduce some of the 'chuff' velocity in the blast pipe in the smoke box. When a loco takes off from rest, with a loaded train, the first few chuffs are real belters as the pistons struggle against the loaded train. The chuffs can be so powerful that the vacuum formed in the smoke box can lift the fire right off the grate in the firebox. Whole chunks of unburned coal are sucked forward and thrown out the stack. You definitely don't want to suck the fire into the smoke box and out the stack when taking off....so... the drain cocks blow off a lot of that steam pressure, reducing the initial vacuum in the smoke box and thus help to keep the fire in place.

The drain cocks are controlled by a lever in the cab which moves a long rod down to the cylinders. The rod connects to a horizontal bar between the cocks. Usually all you see is the horizontal bar. The bar is slid to one side, opening drain cocks during the exhaust stroke.

A very fine lady....1873 'Genoa' Note the drain cocks on this 4-4-0, The cocks are the brass vertical cylinders extending from the bottom of the cylinder at each end. The horizontal bar linking the two cocks is the control lever to open and shut the drain cocks. You can also see the control link to the horizontal bar, which connects back to the cab. V&T #12, 'Genoa', Cal State RR Museum.

The Steam Cocks are a steam release valve on the steam chest, used when the loco is at rest. These cocks let any residual steam out of the slide valves chest and main steam pipe.
On our 8-16-D 2-6-0, the steam cocks are a very typical form for a 'D' pattern slide valve. These are small brass fittings on the front wall of the steam chests, with the steam vent facing up on the cocks.

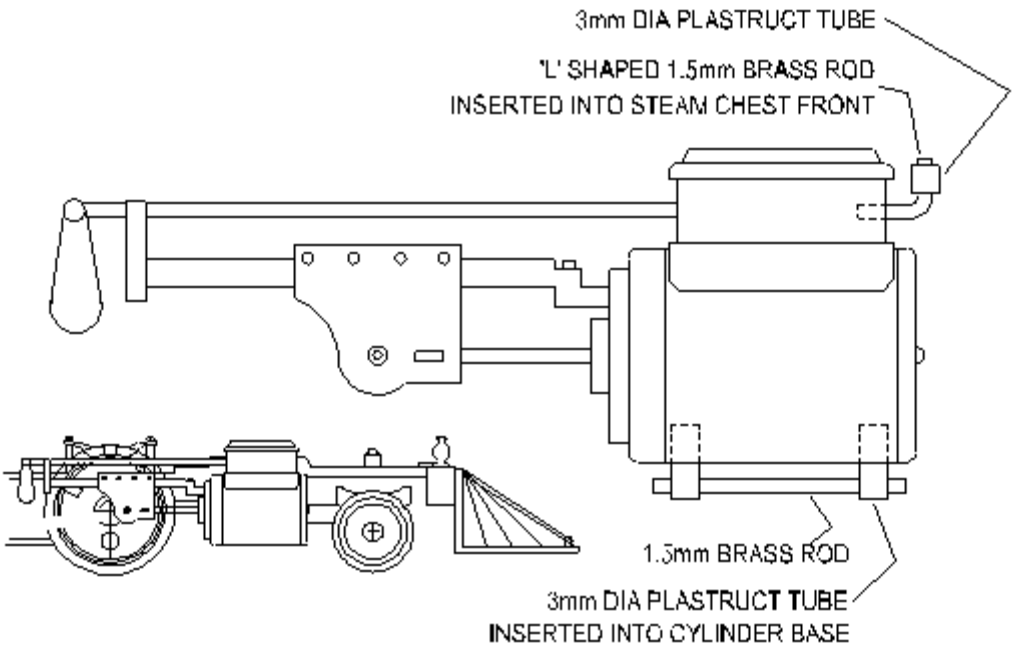
Steam cocks mounted to the front of the steam chests on our real life prototype 8-16-D, 2-6-0. 1879. The steam cocks are the brass fitments!! Note in the 1873 Genoa steam chest above, there is no steam cock on the front wall of the steam chest. I'm not sure, but I think the cock is the ornate orb like brass fitting on top of the steam chest...this unit is not the oil cup, because we can see the lubricator line to the top center of the steam chest right next to this cock...thus this version of Genoa had a Hydrostatic Lubricator in the cab.

Making the Steam and Drain Cocks

All you need, to make both types of cocks, is the 3mm diameter plastruct tubing and 1.5mm brass rod.

Drain Cocks
Drill two holes along the bottom center line of the cylinders, one at each end. Insert a 10mm long length of 3mm tubing into the hole, leaving 5mm exposed at the bottom. Check to make sure the tubing that penetrates the cylinder does not snag the pistons while running. Next drill a 1.5mm hole across each of the 3mm dia tubing, drill the holes about 1mm from the bottom of the 3mm tubes. Insert a length of 1.5mm brass rod between the cocks, leaving about 2mm to extend beyond the cocks...that's it...done. If you want to connect the control rod back to the cab, you can solder a 0.75mm brass wire to the inside face of the 1.5mm rod between the cocks and bring it up diagonally along the boiler sides to the cab...fit after the boiler etc is in place.

Steam Cocks
This is even easier...bend a length of brass 1.5mm rod into an 'L' shape, approx 5mmx5mm. Then insert a 3mm length of 3mm dia plastruct tube over the top of the 1.5mm rod. The inside of the plastruct tube is a perfect fit for 1.5mm rod. Drill a 1.5mm hole in the center of the front wall of the steam chests, and poke the 'L' shaped unit into the hole, fixing it with CA cement with the 'L' facing up...paint brass.



Fitting the drain cocks and steam cocks to the cylinders on the model.

Front end details

We fit additional hand rails and coupler release levers to the pilot beam of our model. This work is more appropriate to a 1920s version, where knuckle couplers are fitted to the pilot beam and safety standards required a hand rail along the pilot beam.

Hand Rail

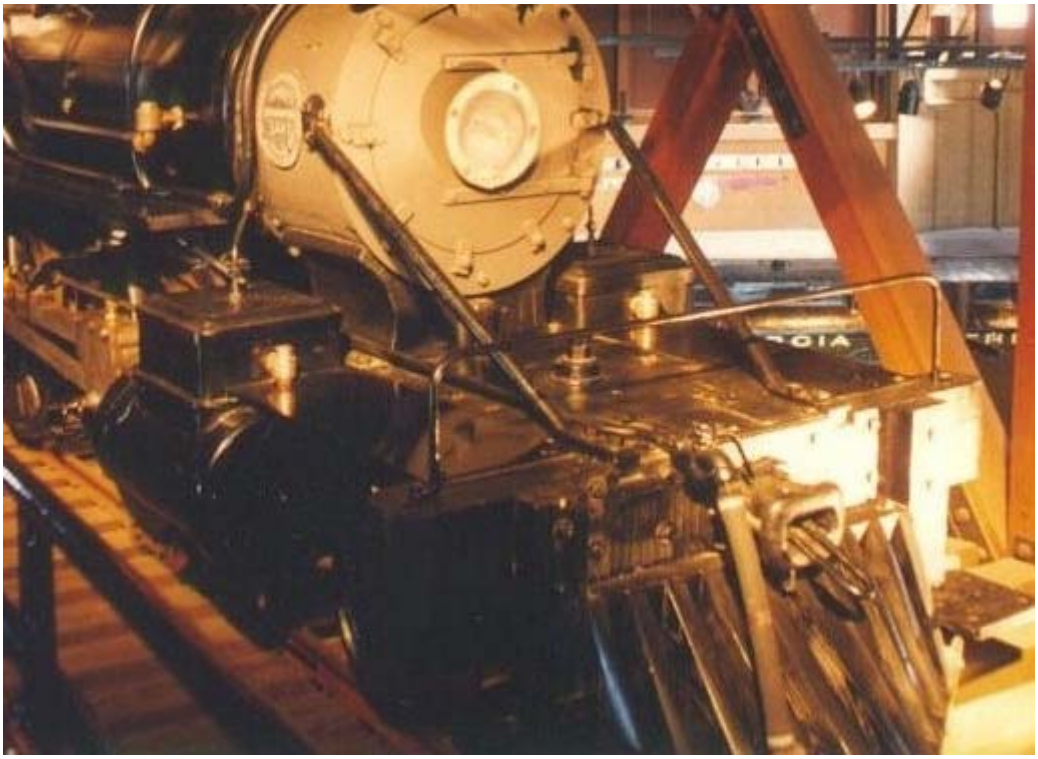
There are two holes at the ends of the pilot beam, where the brass flag stanchions would normally fit. Bend a length of 1.5mm brass rod into an upside-down 'U' shape. Place a 2mm slither of 3mm plastruct tubing onto the rod at both ends...these will form the bottom support for the rail and stop of the rail from sliding right through the stanchion holes. Once you have leveled the hand rail to correct height and alignment on the pilot beam, place another slither of 3mm plastruct tubing onto the ends of the brass rod poking through the stanchion hole under the pilot beam. This will lock the whole hand rail in place, lock both upper and lower 3mm tube slithers to the brass rod with CA...check model photo below.

Coupling and Release Lever

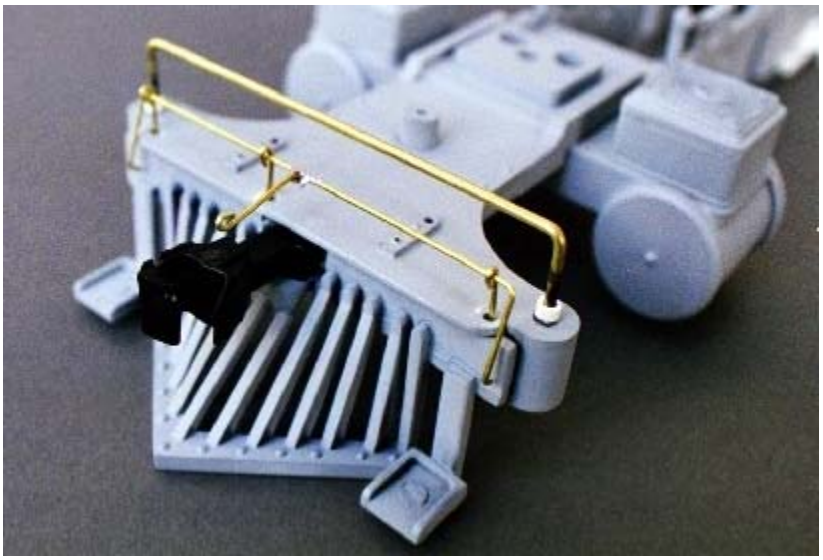
Not so easy. Fitting a coupling to the C-16 beam will require you to cut out the front central patch on the C-16 pilot and pilot beam and screw a coupling to the underside of the pilot beam. There isn't a lot of lateral play in the coupling so double heading etc will have to be done on wider radius curves...otherwise just glue a dummy coupling to the beam. I used a KD on the pilot model and fitted the actual coupler directly to the central pilot screw hole under the beam. I did not use the KD mounting pocket.

The release lever is made from 0.75mm brass rod, bent into a 'U' shape. Three small 'L' shaped wire stanchions are made from the same rod, drilled and inserted into the top pilot beam. Place the 'U' shaped lever into the upstanding 'L' stanchions and bend the top of the 'L' down over the lever with pliers. The release lever is now held on the pilot beam and can be rotated per

prototype. We then bend a 10mm length of 0.75mm rod over the center of the release lever (directly above the coupler) and solder horizontally into position. When you lift the release levers at the end of the pilot beam, the central soldered rod will lift, simulating the lifting of the coupler pin to open the coupler.



Fitted handrail on pilot beam. Note option for link and pin coupling...hence no coupler release levers.



The pilot hand rail, coupler release lever and pilot knuckle coupler installed.
Note the 3mm plastruct tubing at the base of the hand rail rod, holding the unit in place.

Locomotive Brakes

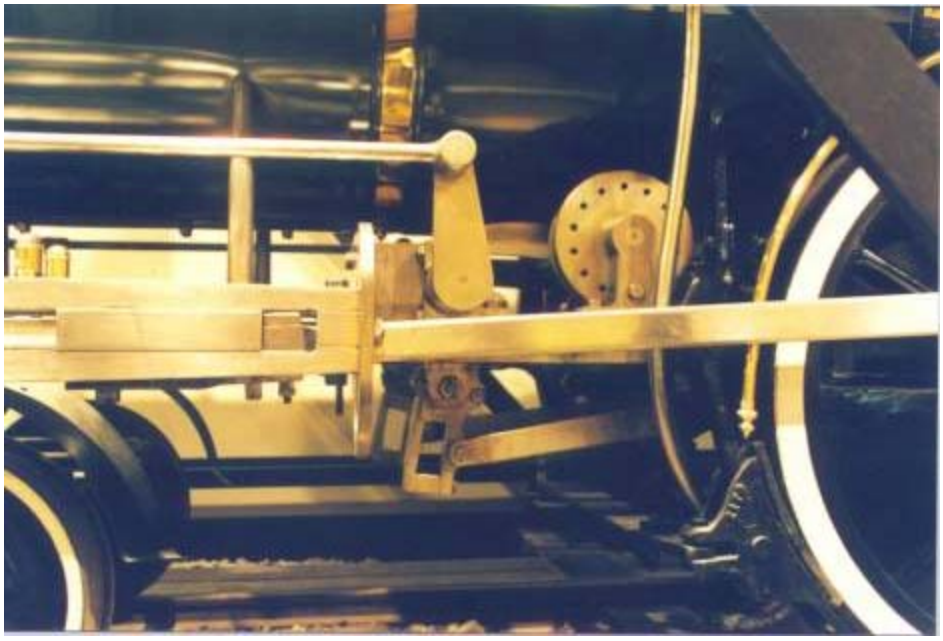
If you've chosen the post 1880s version of the 2-6-0, chances are your loco will have engine brakes. We've looked at how the brake cylinders for engine brakes might be fitted...now you have to choose if you want to add the brakes shoes as well and even the brake shoe connecting rods.

Brakes shoes and connecting rods for the brake shoes on an 8-22-D 2-6-0, NCNG #5.

My recommendation is to obtain either Precision scale brass cast brake shoes and hangers or Ozark castings. You could also make them from sheet styrene to look like the above picture, however, care must be taken when lifting the model not to break the darn things off!!

You can either glue the brake hangers to the side of the chassis frame, or try screwing them to the plastic frame or even screwing them back into the cast metal block. I'll leave that to you...a bit of trial and error might be needed.

Here's one last picture of valve gear, pistons, brake shoes and valve cranks...and another idea on how to fit the brake shoes. Connect two brake shoes to one cross beam and fix directly to the bottom of the metal motor block. Use 5min araldite to hold the cross beams in place and glue to one side of the block only, so you can still split the block for lubrication purposes. With this method, the brake shoes stay with the wheels when dropping the block out of the chassis, while the other way of mounting the shoes to the frame sides, will require you to bend the shoes out of the way when dropping the block out of the frames so the wheels don't catch the shoes on the way out.



A touch of class, an 1873 4-4-0 displays her details, Genoa, Cal State RR Museum.

Stay tune...the next adventure is all about boilers.....old boilers, new boilers and model boilers...
Coming to an internet site near you....
Fletch.