

Scratch Built: Live Steam Garratt

BY

Bill Allen

Woodside, CA. USA

[\(Live Steam/Topic: Garratt build photos\)](#)

[\(Live Steam/Topic: Garratt Photos Boiler & Cab Construction\)](#)

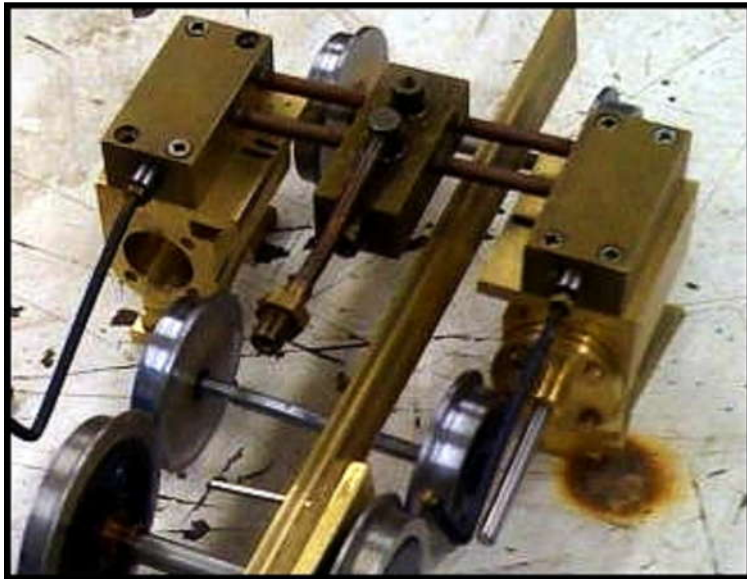
[\(Live Steam/Topic: Tools & Gizmos - building the Garratt\)](#)



The finished product.

Most of the photos in this month's issue of SIG on my Garratt build were not of high enough resolution for the article. The following shots show the construction of the bunkers and engine chassis. I'll post the boiler, cab and other build photos in a separate thread.

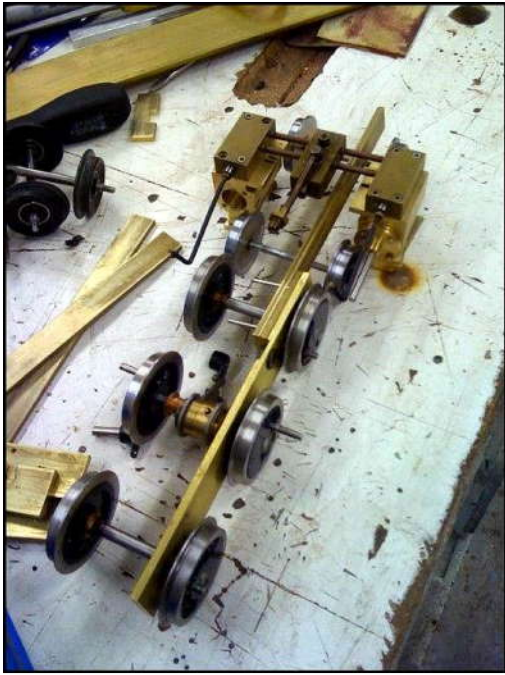
These are the cylinder blanks, which were cut out of 1x1 square stock. The 1/8" slots were cut with a table saw carbide bit and the rounding over was done on a router with a rounding over bit. They were cut to length on the table saw after the routing was done and bored out on the mill.



This shot shows the Ruby valves fitted on to the new 1/2" cylinders. The one on the right has the piston mounts and the one on the left is empty. You can also see the step down in the frame width where a SS dowel is sticking out at the bottom of the picture.

Not a great shot but here is one of the pilot wheels, which I turned out of some old LGB wheels I had laying around and were just the size I needed. The flange height was turned to match that of the Ruby drive wheels

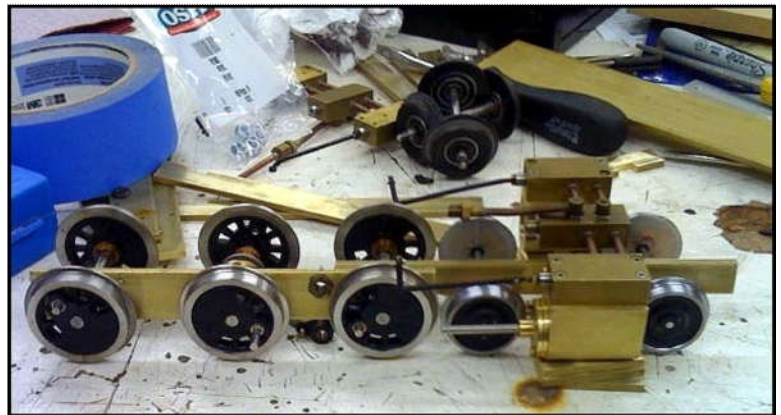




This is a good shot showing the Ruby drive gear in it's new home. I was originally going to try to use the Ruby frames but it was easier to make new ones and get the wheelbase where I wanted it.

You can see the step down for the pilot wheel clearance. The same thing was done on the rear for the pony wheels.

Side view checking height etc.



Chassis with pony wheels installed.

Cylinder cover made from brass and silver soldered together.



Finished cylinder and cross head

The rear bunker will hold the butane tank and water bath. As you can see the sides are made from Poplar, which gives them the rounded look. The rounding was done on the router and the recess for the brass covers was also done on the router.





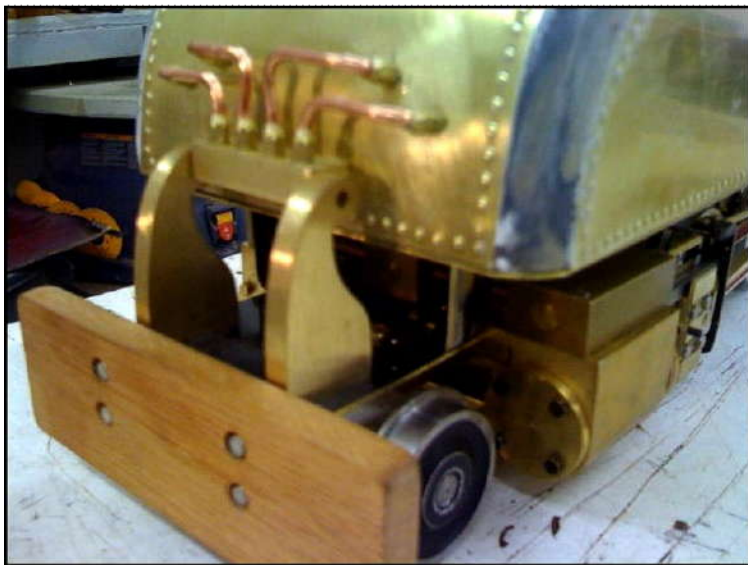
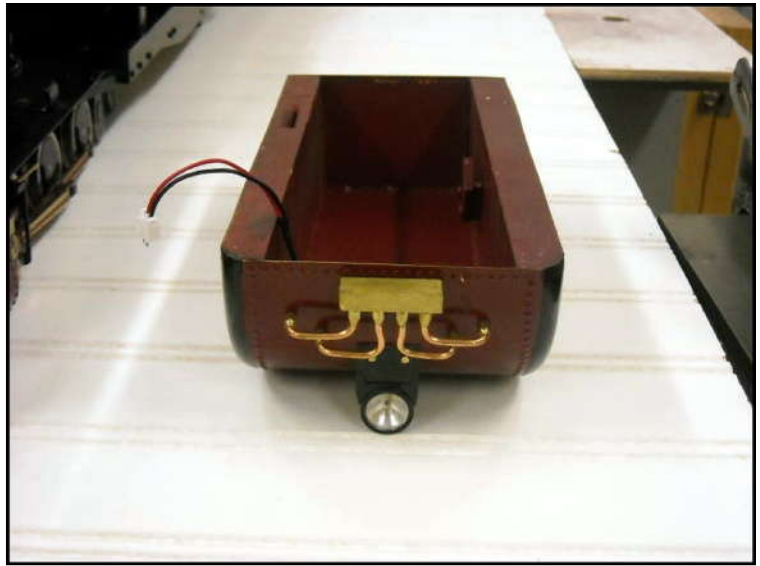
Another shot. The part between the two risers gets bent down to form the water bath and is soldered to make it watertight.

Gas tank was made from 2" copper pipe valves were hand made. Copper tube goes through the bulkhead and the silicone tubing covers it to make it watertight.



Coal load is from my C-16 and was cut down to fit notice the second lift ring which is actually the fuel adjustment.

Front bunker showing the headlight and the rectangular block is also part of the hinge mechanism.



A #2-56 screw goes in the hole for the bunker hinge pin. The bumper is mahogany.

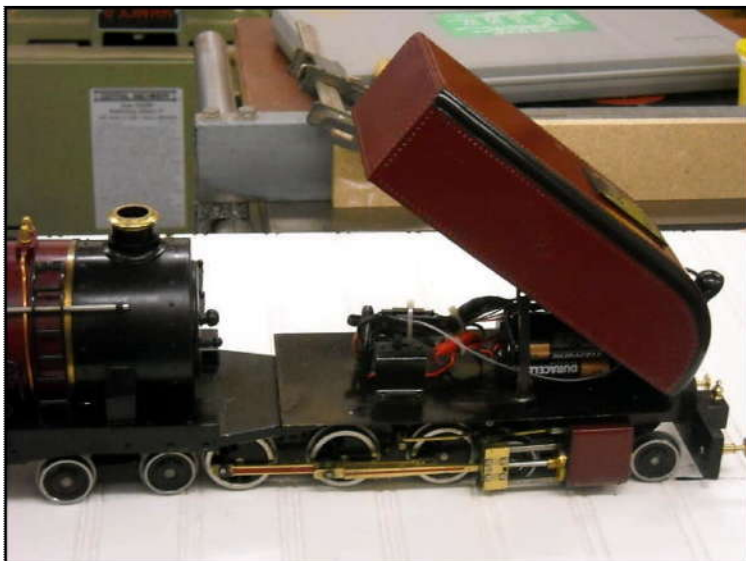
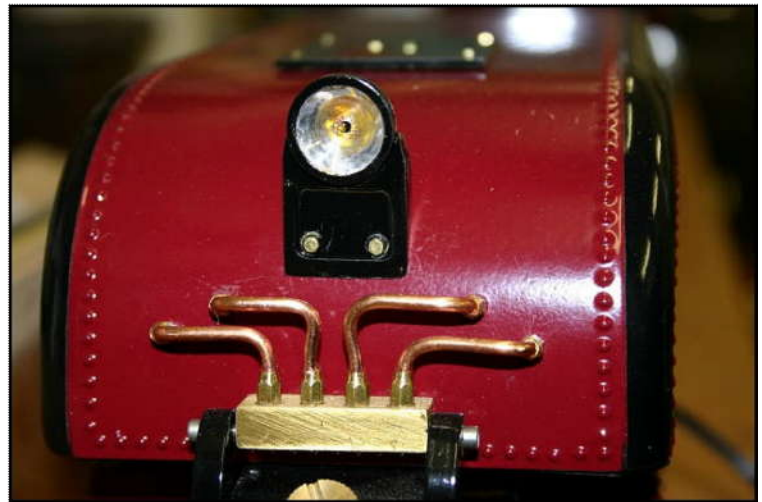
This close-up shows that the only part of the wooden structure showing is the rounded corner in black.





Scratch built headlight.

Painted front bunker.



Front bunker houses electronics.

Phippsburg Eric:

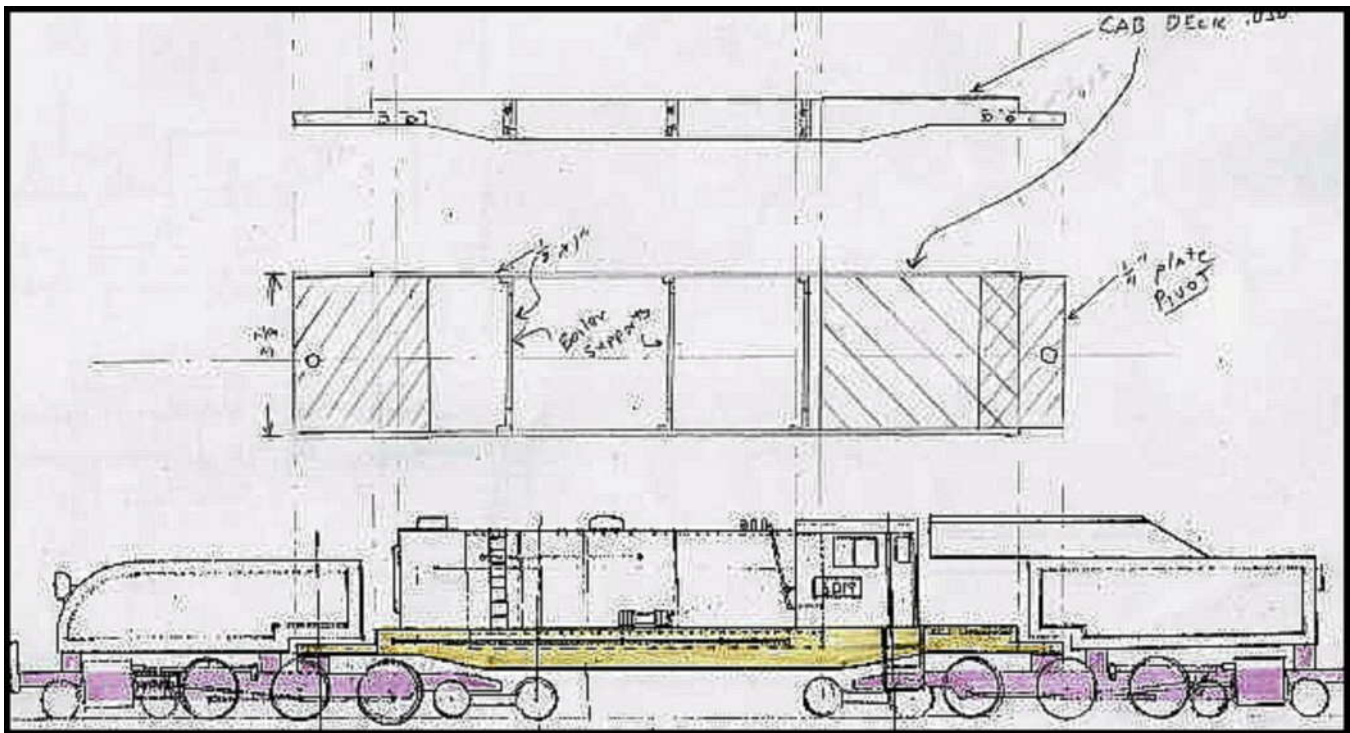
"In the article you said you milled the cylinder blocks using your woodworking router. Cool!"

Could you describe how you set it up and how you cut the brass? Did you run the router full speed? "Take small nibbling passes or cut in one shot?"

"I had wondered how I might make the basic blank for making cylinders...seems you have shown a way!"

Eric: I found that the brass cuts almost as easily as some woods. The table saw with a 50 to 80 tooth blade produces a near perfect finish (much better than a metal cutting band saw) the router was a 3 hp variable speed set in a router table. I have a Router Raiser height adjustment, which allows for accurate adjustments. I used a carbide bit at 50% speed and took off 1/8" at a time. After the bar was machined, I cut the cylinders to length on my home made table saw cut off table (a must for brass work) I discarded about 1" of the ends which is my practice because they usually have divots from the starting and finishing feed. I then cut to length; kissed them with an end mill to get the finish shown in the photo but later used a fly cutter to get a mirror finish

This is a follow up to this month's SITG article and the second thread. I will post one more on making the gizmos and then will be out of your hair for a while



Here is the original drawing made to 1:32 scale



Blowing off steam.

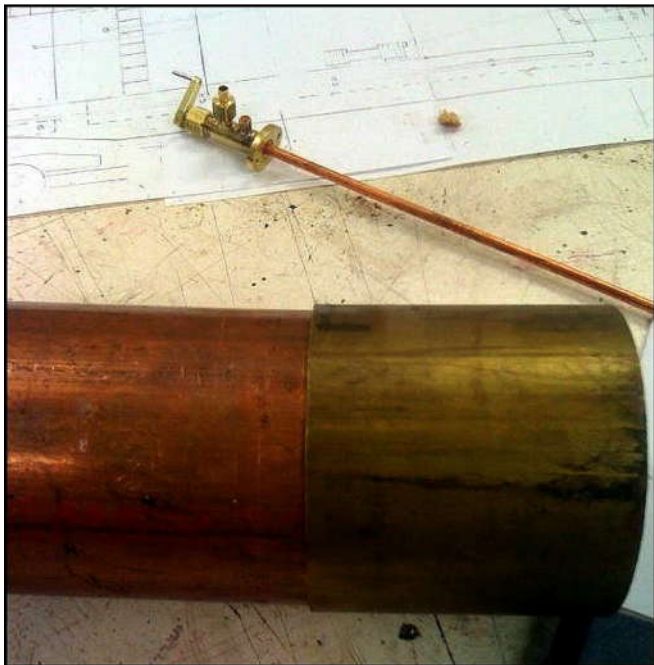
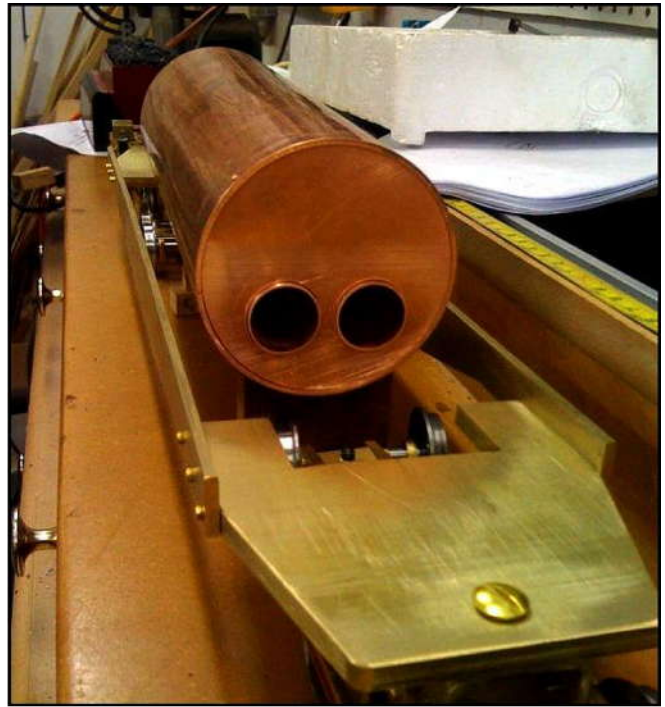


Mockup.



Boiler fittings.

Boiler placed on frame prior to soldering.



Luckily I was able to find a size brass pipe which fir perfectly over the boiler for the smoke box.

The inside washer for the smoke stack was ground to fit and silver soldered to the smoke box.





Smoke stack.

Stack flange and steam dome cover.



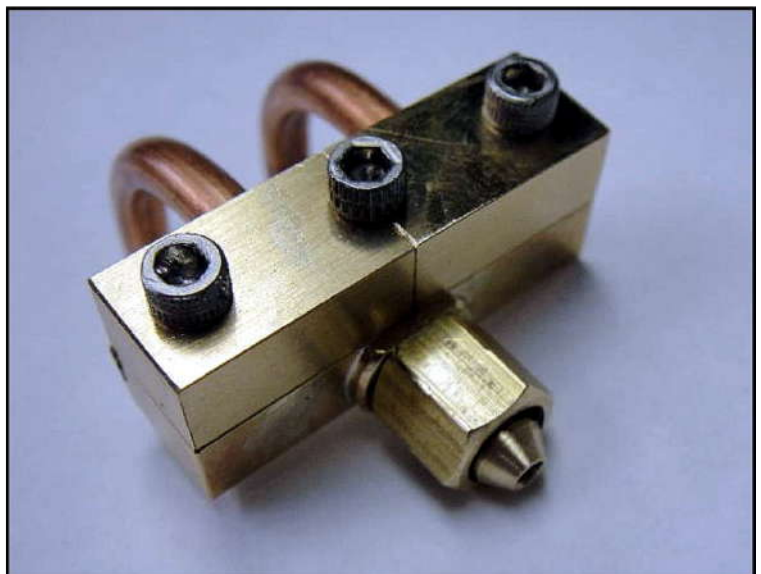
Boiler with wrap and smoke box attaches.

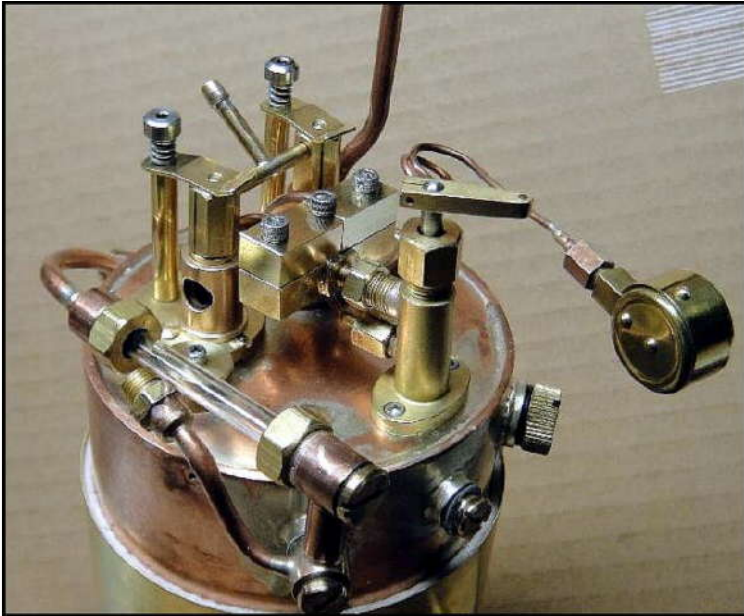
Looking at the boiler through the smoke box door tube on the left is from the super-heater and goes to the front engine. Middle tube is the front engine exhaust.



Spring-loaded clops keep the jets in place. Throttle valve, site glass and pressure gauge are shown.

Steam manifold attaches to throttle valve with hex nut on the bottom of the photo.





Back-head almost complete.



Low sheen engine paint dolls it up.



Burners with front and rear super-heaters, steam manifold and connection tubes. Note "U" shaped super-heater, which goes back to the rear engine.

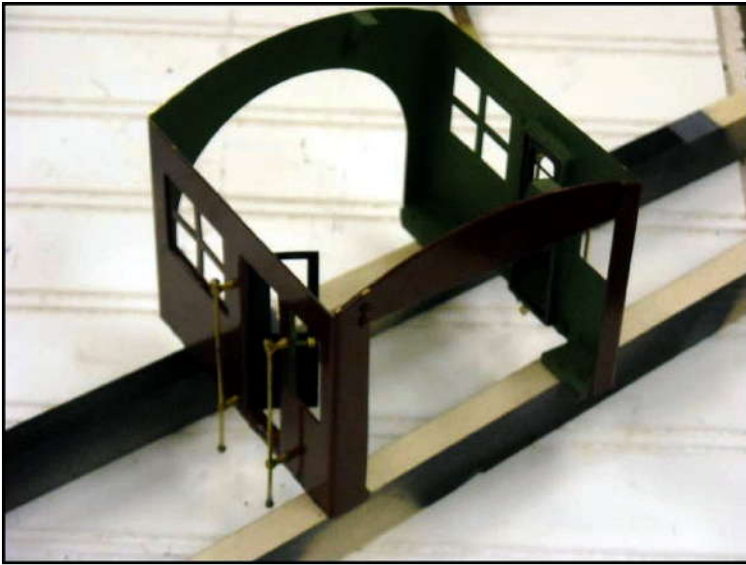
Rear super-heater coming out of the boiler.



This is a jig I made for the cab cutouts the router is set up with a carbide ball bearing pattern makers bit. The handle is used to raise or lower the router.

Cab is checked for clearance.





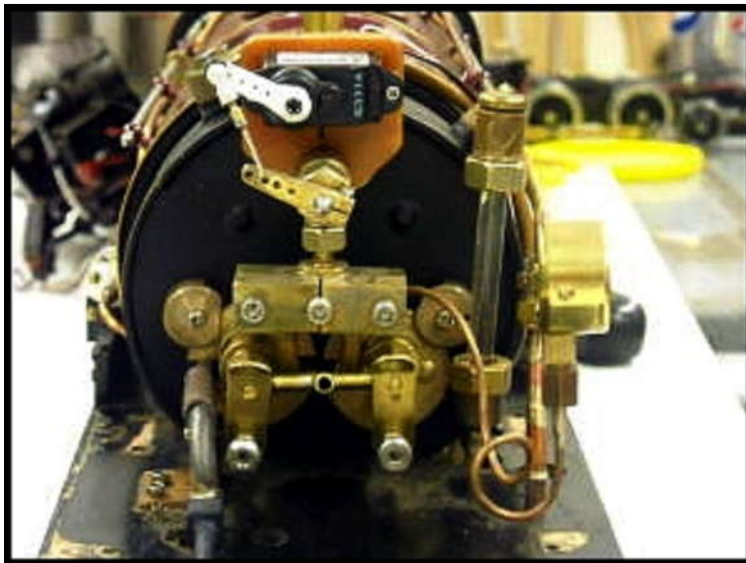
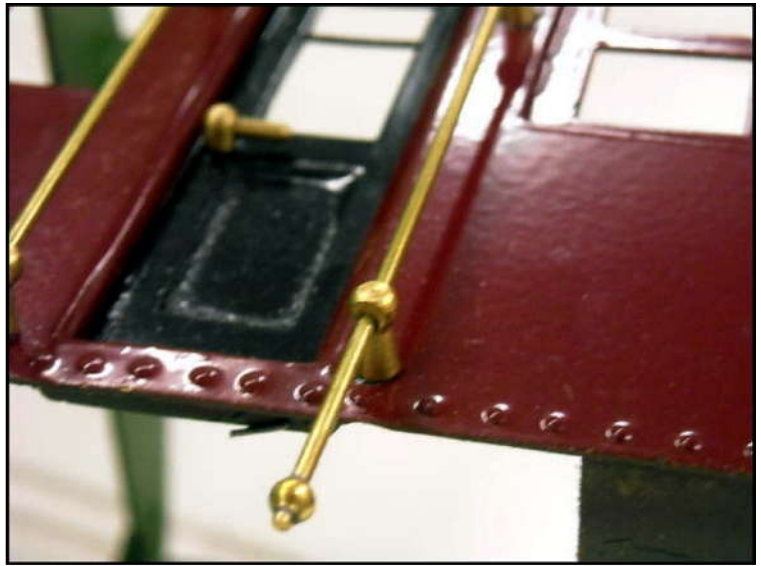
Cab detail.

1/16" OD tubing was soldered to the door and music wire goes through the doorframe for hinge.



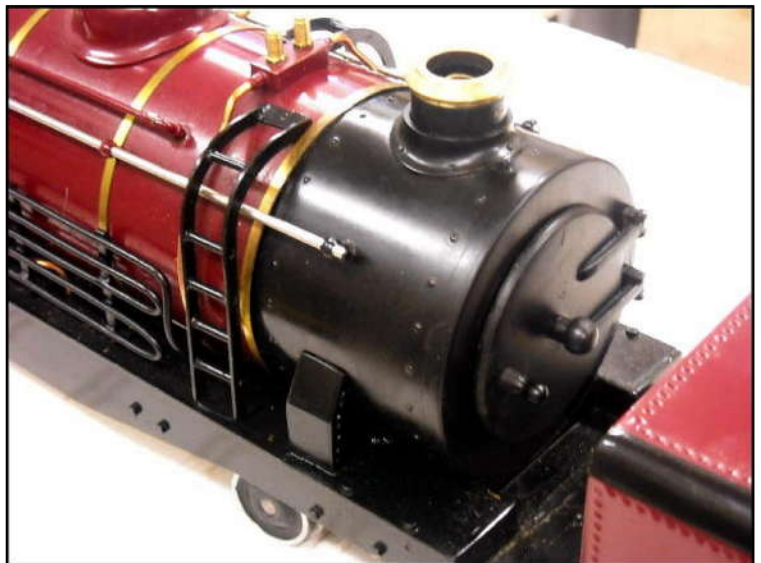
Steam gauge and door detail.

Grab handle mounts were turned on the lathe and threaded to #0-80 they were mounted first then the grab rod was slid through and the round ends, which were also turned on the lathe, were attached with JB Weld.



Finished back-head with throttle servo attached.

Finished front of boiler.

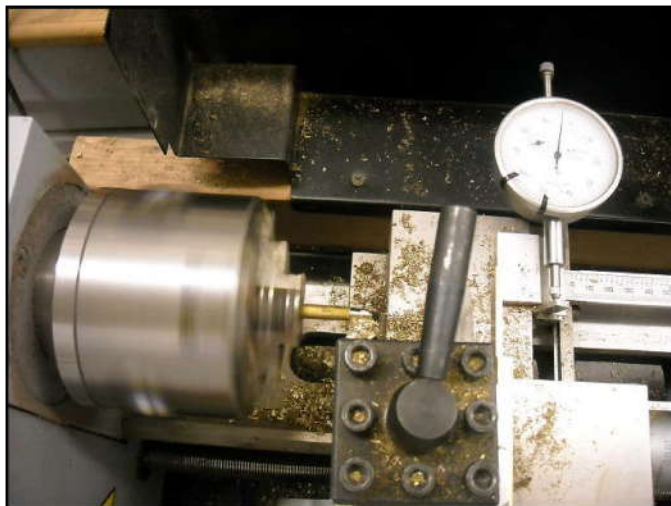
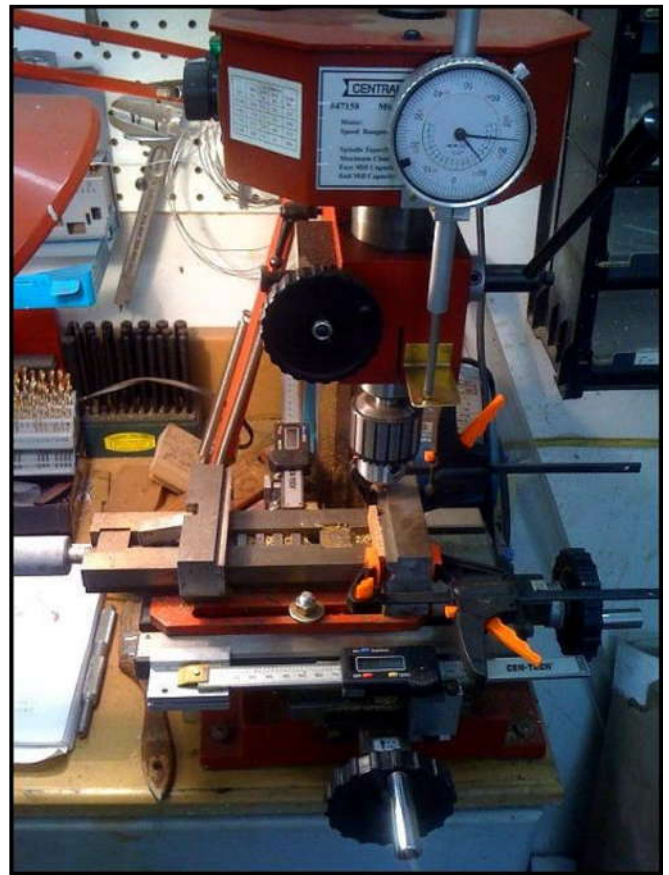




This is the third thread as a follow-up to my STIG article last month I have included most of the photos I have left.

Here is the Micro Mark lathe set up with a 6" caliper with the jaws cut off for lateral movement and a dial indicator for depth of cut.

The micro mill has two more digital calipers and a 2" dial indicator.



Cutting a support for the grab rail.

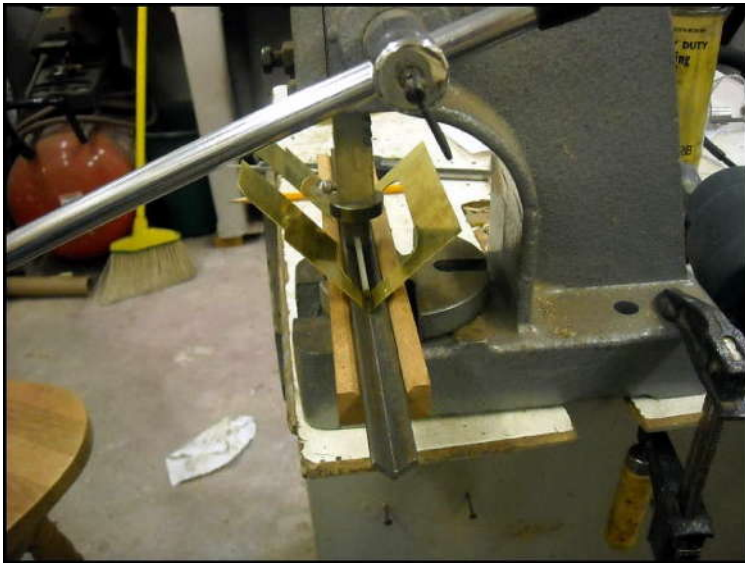
Here are some of the pieces cut on the lathe. The cutting tools on the right were formed with a Dremel cutoff tool mounted in a vise.



The grab rail is attached to the boiler wrap with a nut and the excess thread is then ground off. The 1/8" fiberfrax insulation (black in this photo) has a hole cut in it to accommodate the nut.

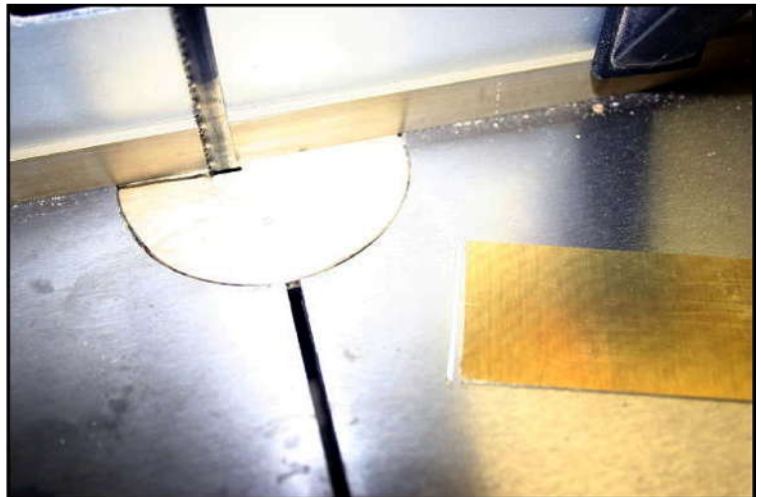
This is not the Garratt cab but you get the idea.





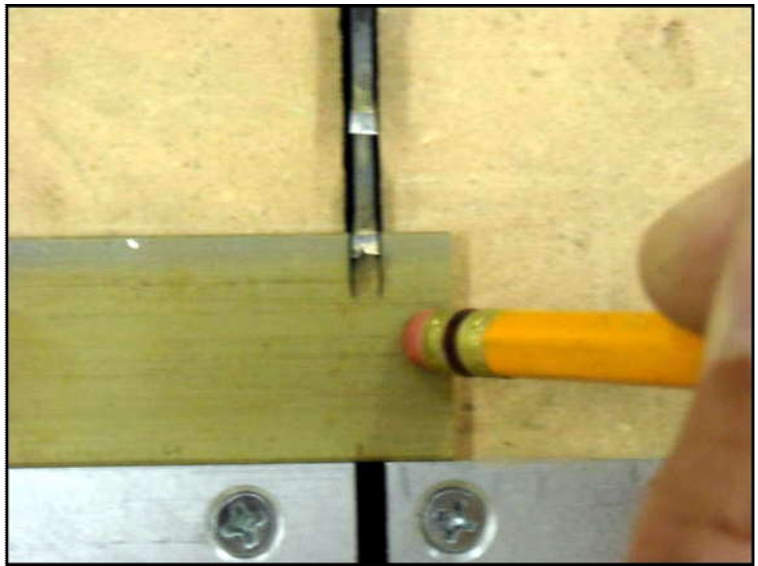
Perfect 90.

A brass strip is clamped to the band saw fence to prevent the .032" material from going under the fence.



A scrap piece of wood is used to push this piece through. The finished product is a .032" x .032" piece of square stock.

Here the table saw is used to cut some 1/8" stock. Note the pencil eraser used instead of the finger.



Setting up for multiple cuts.

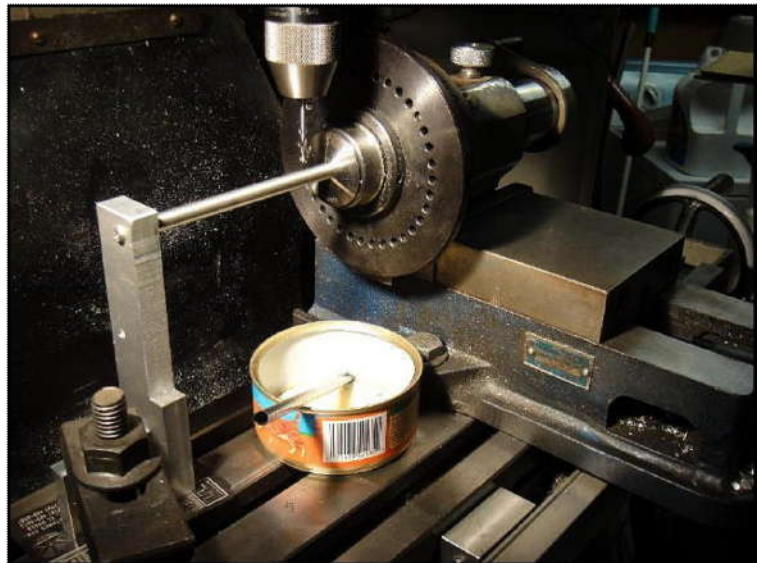
Setting up for a precision rip.





Router with pattern making setup, note the almost zero clearance between the table opening and the cutting tool.

Drilling the burner tubes on Dennis's mill.



Completed burner tubes.

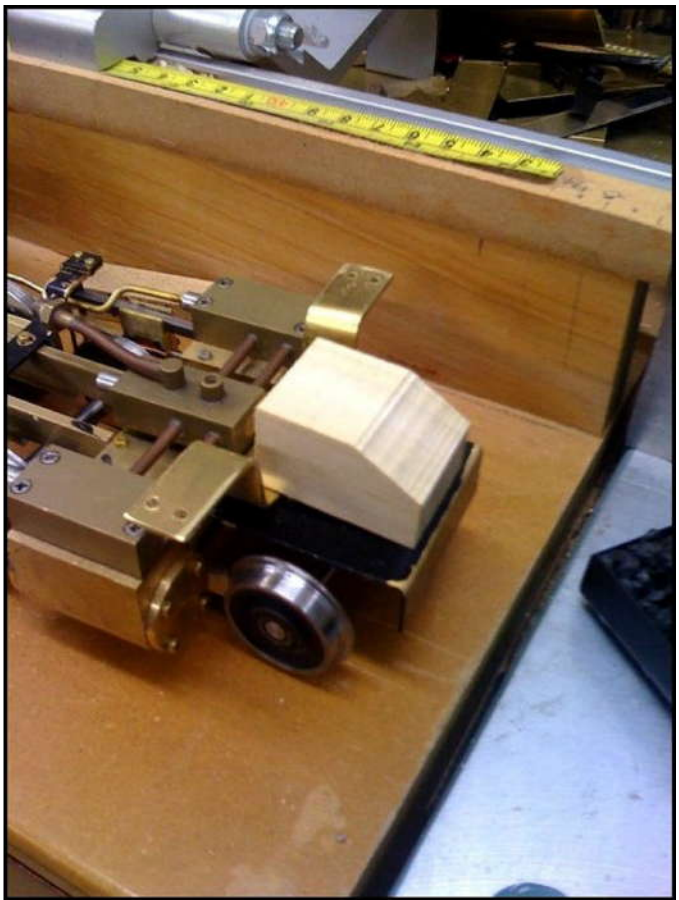


Testing the burners.

Mockup for dead leg lubricators. \Rightarrow



Oil level and inlet position. \Rightarrow



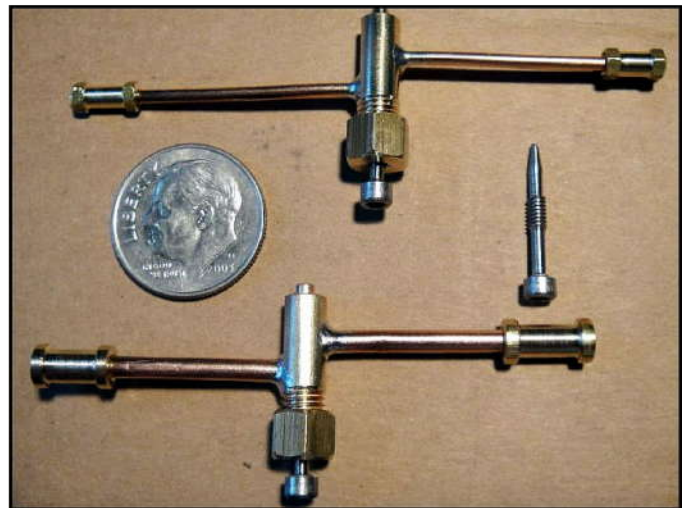
\Leftarrow Fitting in chassis.





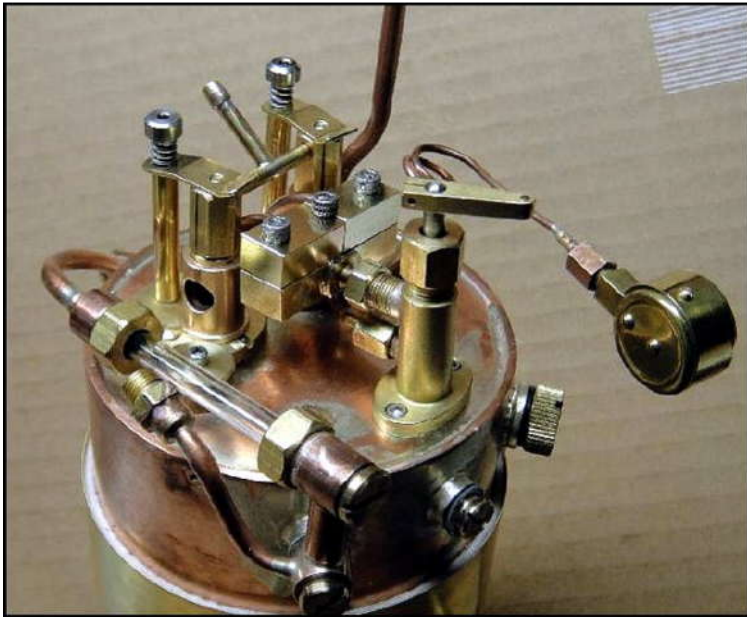
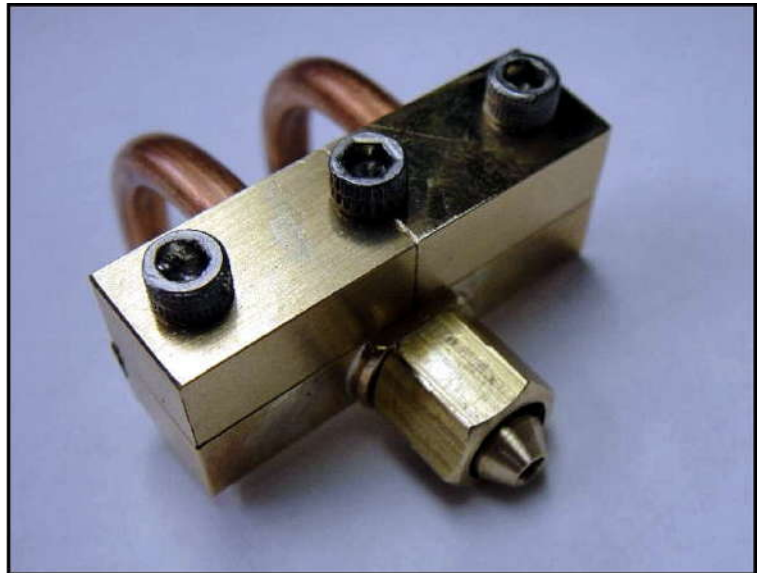
Finished lubricator mounted with adjustment valve on the left.

Lubricator valves. Needle is turned from a SS #2-56 screw.



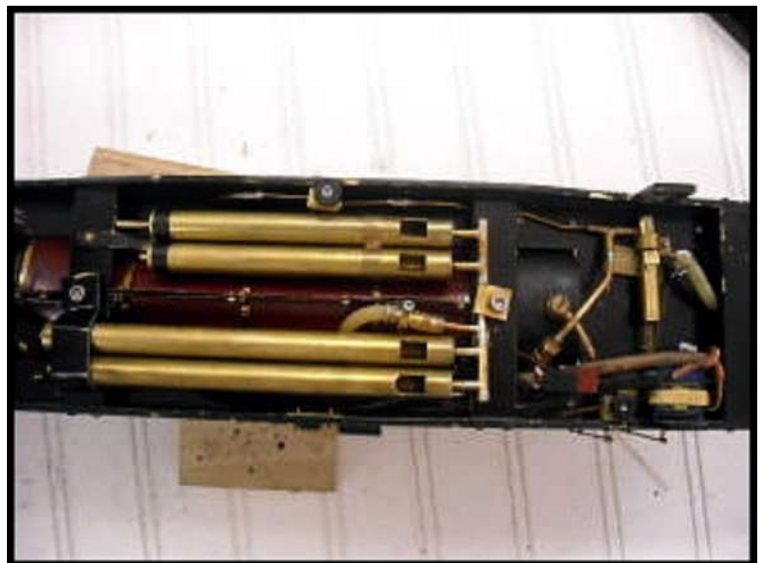
Boiler backhead showing throttle valve, sight glass, pressure gauge and spring held jets.

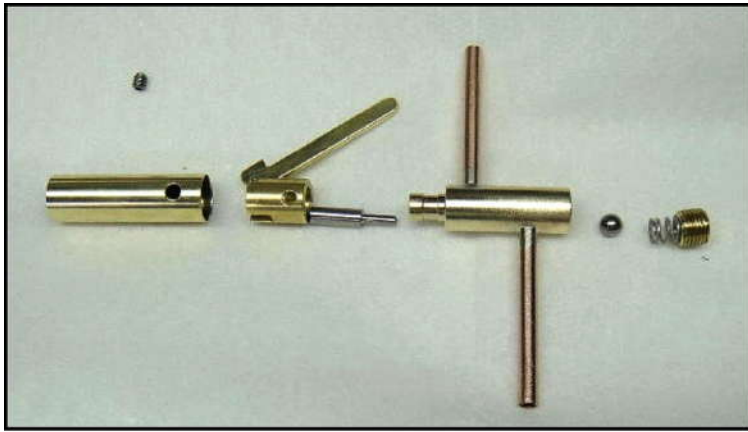
Steam manifold with o-ring seals between the two sections.



Backhead with most of the piping attached.

Whistles.





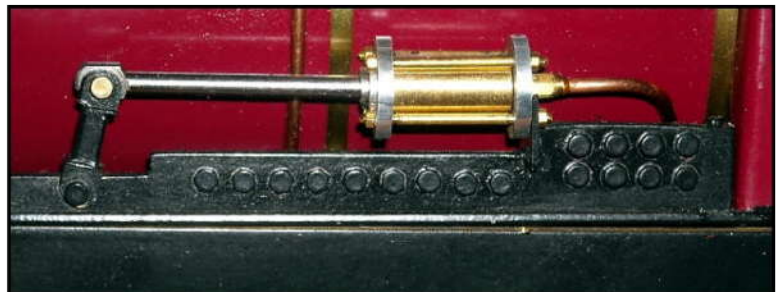
Whistle valve.

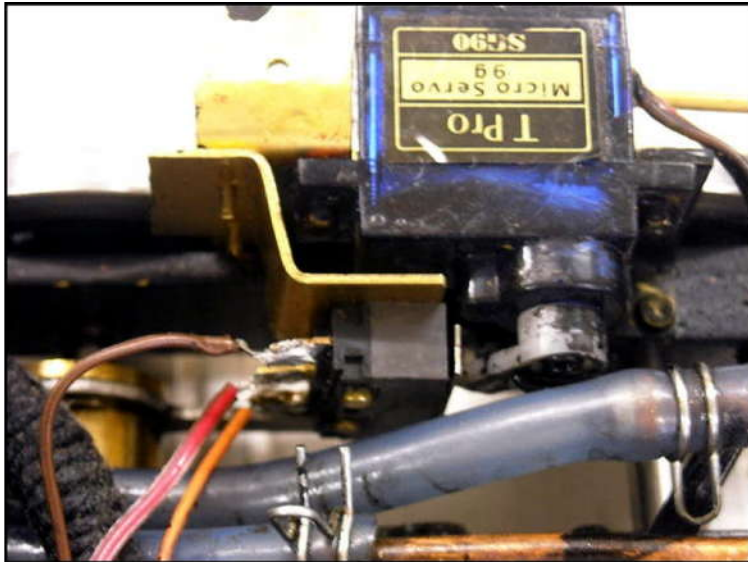
Assembled valve.



Garratt No. 409 reverser assist.

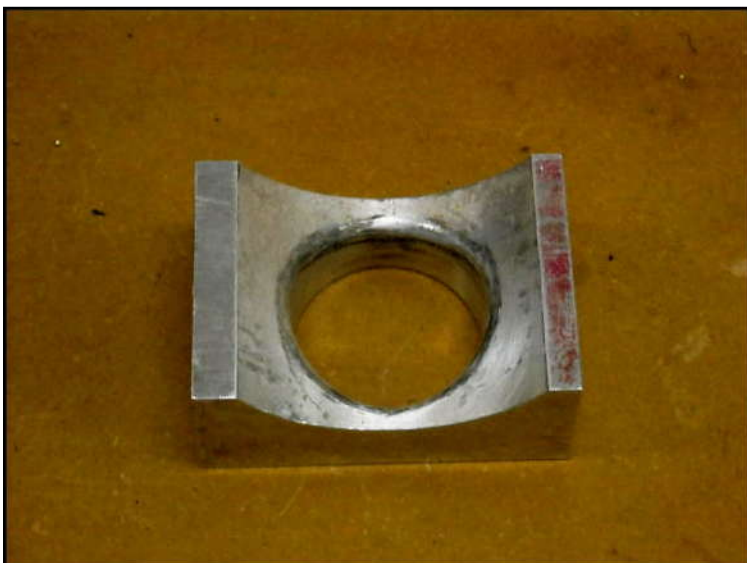
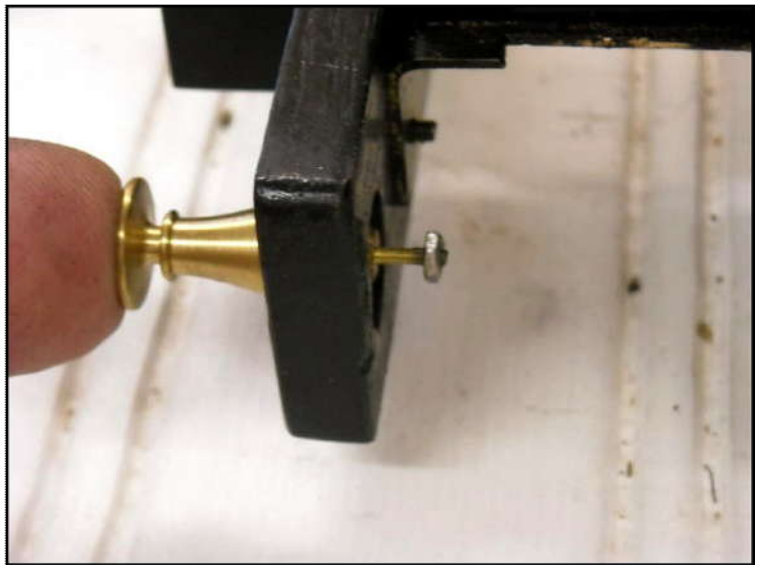
My version.





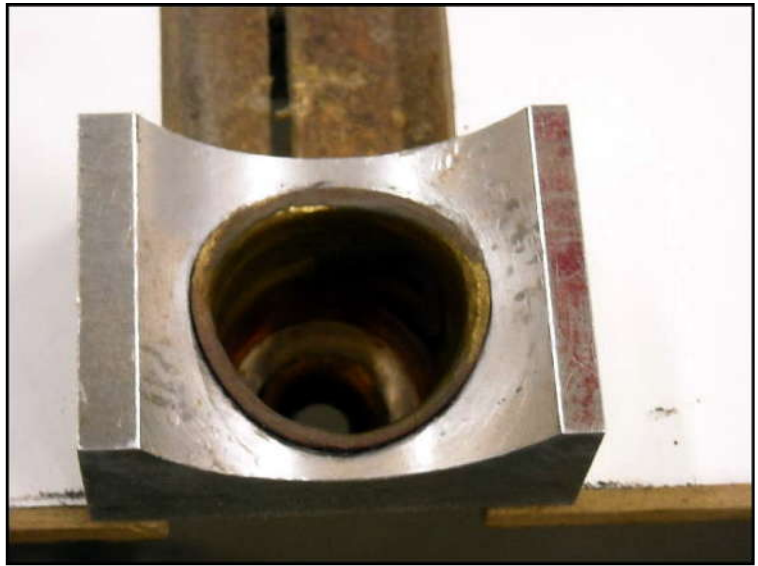
Here is the reverser servo and to the left is a micro switch, which is activated by the servo arm. This works the directional headlights.

Spring loaded buffers made and designed by Dennis.



Again Dennis came through designing this tool to form the steam dome cover.

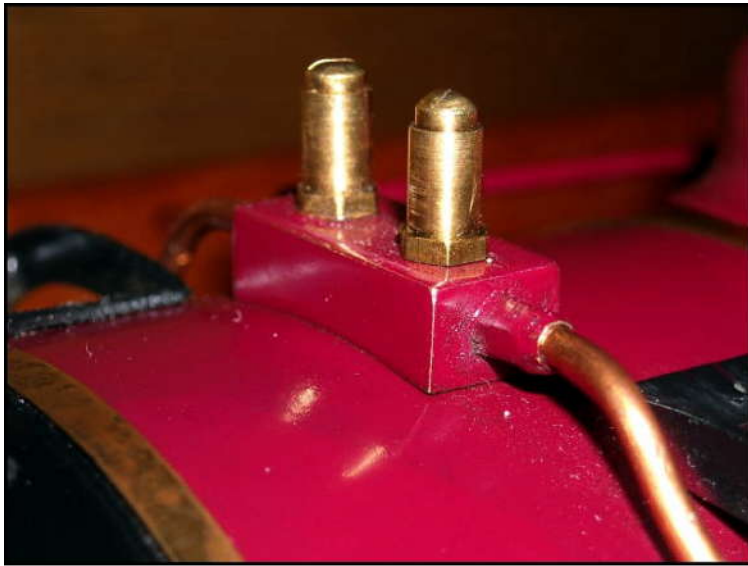
A few hits with a ball peen hammer and it is almost there.



The stack flange and dome were made in the same way. A thin coat of JB Weld is applied and then sanded prior to painting to cover the hammer dings.

This generator design was copied from a Garratt photo. The steam exhaust tube goes through the generator and the frame and is controlled by a valve under the frame. It looks cool when it is running and can be used as a boiler blow down also.





This is just for decoration. The valves were turned out of hex stock and the slot cut with a jeweler's saw.

This photo shows the three-piece stack and two-piece smoke box. Rivets are from Micro Fasteners.

