PGRS TRACKIN'

Newsletter of the Piedmont Garden Railway Society

February 2022

Editor: Scott Williams

As the winter and Covid continues to keep us pursuing indoor pursuits I have been working on my On30 trains mostly, installing, weathering and wiring track and building models for that layout module.

It's also a great time to consider installing a sound card to your large scale locos or maybe converting an engine to battery operation for easy operations this coming summer.

Now is also just a a great time to reglue loose or broken details, touching up some paint damage or adding details, and of course, a perfect time to check the lube in the moving parts.

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Fran Monahan sends out this notice to PGRS members.

***Fran is looking for some help with the club layout for the following shows:

Central Railway Train show

Feb 18th 12-6

Feb 19th 9-3

Rock Springs Church

207 Rock Springs rd

Easley SC 29642

Asheville Train show

Feb 25th 12-7

Feb 26th 9-5

WNC Ag center

Fletcher NC Hwy 280 (Airport Rd.) Exit 40 off I-26

Please give Fran a call if you might be interested in helping at the train shows with the club layout. 828-674-0707 or email him @ MargeMonahan2@gmail.com

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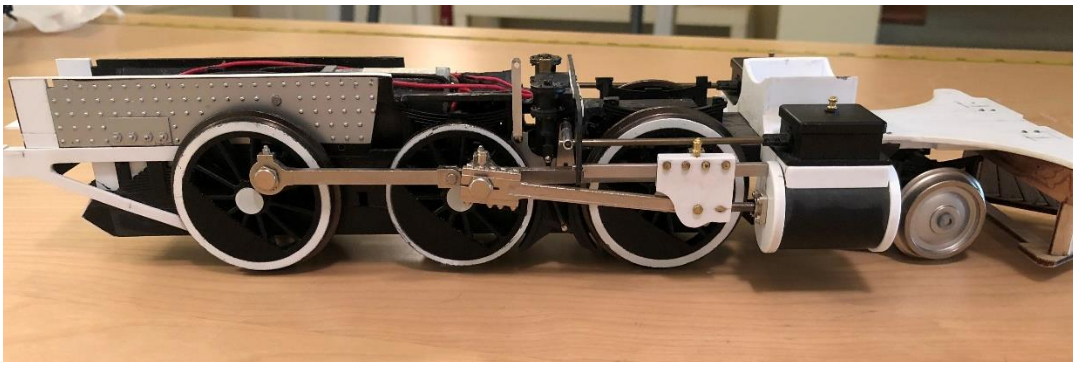
A Scratch Built DSP&P Cooke Mogul Build
By: Don (Doc) Watson

A few years ago my narrow gauge interests turned from the D&RG to the DSP&P. This was accelerated with my purchase of an Accucraft Mason Bogie. Before that I had purchased a couple of Hartford kits for DSP&P equipment. Another engine that always impressed me was the Cooke Mogul. I did own an LGB Mogul that was modeled after the Cooke but sold it since it wasn't a 1:20.3 scale model.

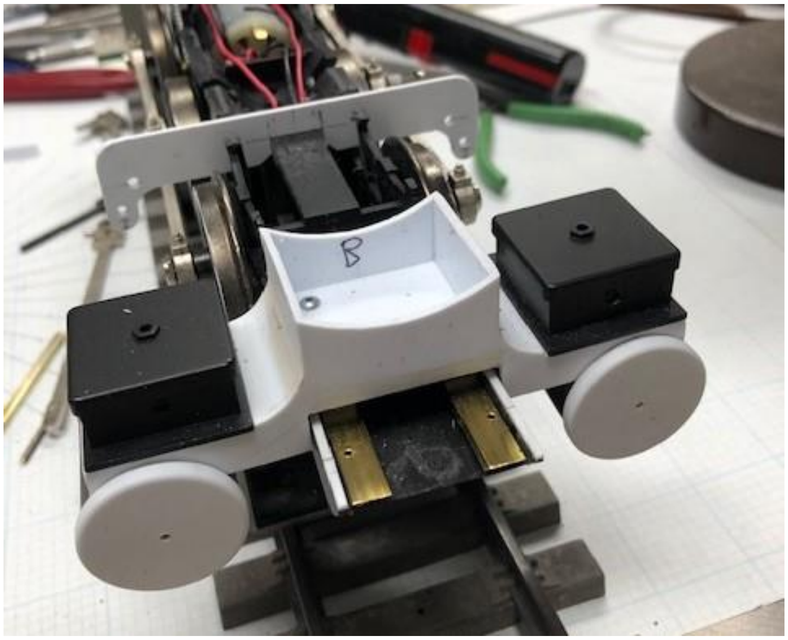
I started doing some research on the Mogul and found considerable help from David Fletcher and from Crain's DSP&P website. I selected DSP&P engine number 71 to model.

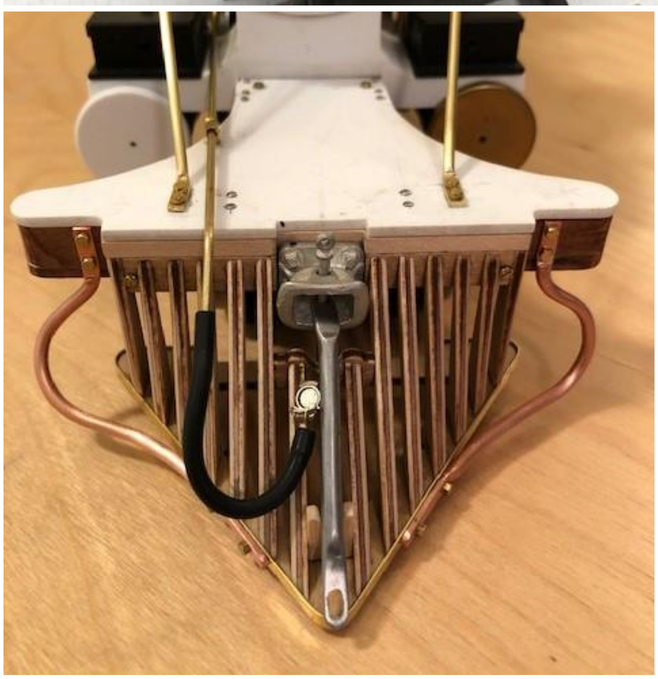
I found several scale drawings of #71 which enabled me to construct my model to pretty much exact scale. Of course, I was confronted with the usual issue of finding or, heaven forbid, building a chassis. So, I turned to an old favorite, the Bachmann Annie. The driver spacing wasn't exact for the Cooke Mogul but it was close enough. So I purchased one of Bachmann's updated chassis; however, it wasn't the newest with all metal gears. I'll have to live with it. To get the Bachmann chassis to fit the Mogul design, I had to do some heavy cutting and trimming. Here's what I started with,

And, here's how it ended up. It was now a 2-6-0. I added some styrene details to mimic the rear frame and added support for the rear platform bracket. I also added some styrene to extend the frame. This was necessary since the Mogul had a slightly longer frame. I had to completely redesign the front section of the drive rods. Shortening them was necessary because the new cylinders were set back from the original Annie position. I was also able to salvage the piston rods from a Connie. New cross heads were fabricated from styrene. The crosshead guide bar was also modified from a Connie. Next I added some additional brake detail. The brake cylinder is from Trackside Details and the brake shoes are from the Annie. The pilot truck is from a Bachmann C-19.

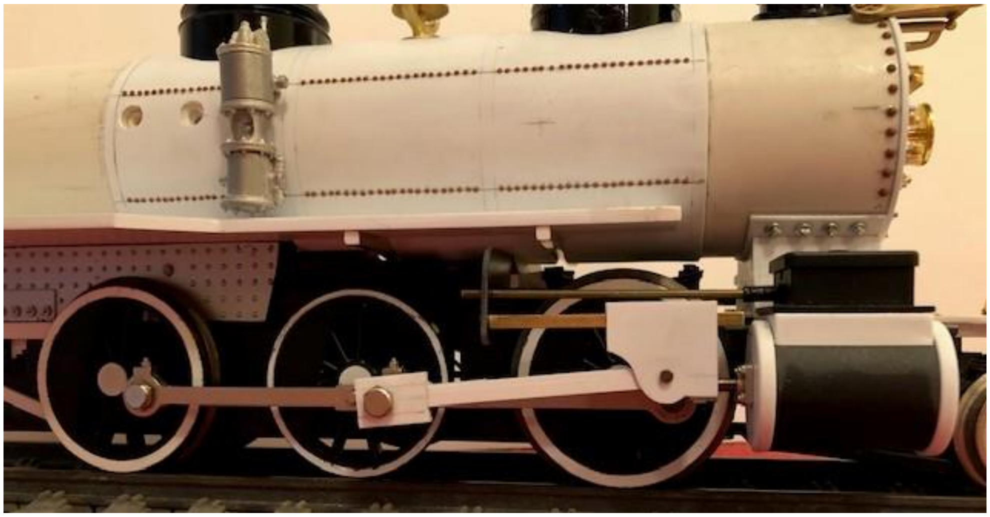


The next thing I did was to replace the pilot and boiler yolk. On the left is a photo of the fabricated cylinders and yoke. The steam chests are from a Connie. As you see from the photo, I added two brass strips to reinforce the front of the chassis since I had removed so much of the original chassis. You can also see the temporary crosshead support bracket. This was styrene and I later replaced it with a fiberglass version for extra strength. To finish up with the chassis, on the right is a photo of the pilot deck and pilot (made from a kit) with the Ozark Miniatures Link & Pin coupler and tow bar installed. The tow bar was fabricated from a piece of thick solder. I also wrapped the bottom of the pilot with brass strip. The rock guards are made from heavy copper wire. It took quite a while to gets the bends just right. 0-80 and 00-90 bolts were used to attach the guards.



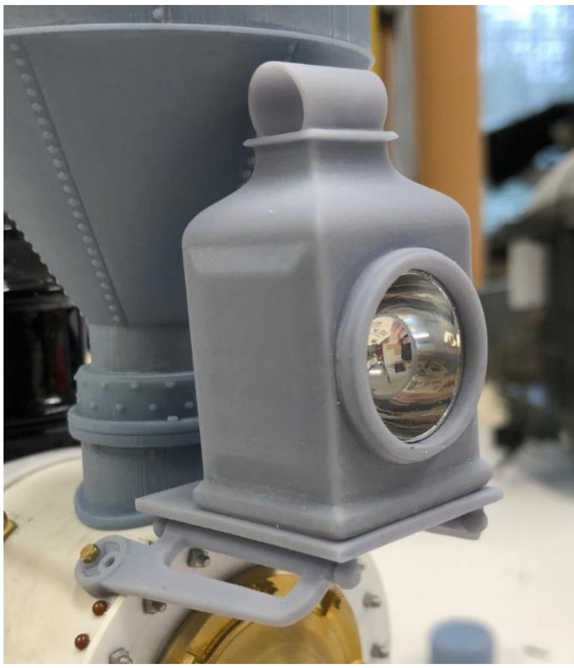


I was very lucky to find the right diameter PVC tubing for the boiler. By adding a styrene wrap, I was able to achieve a scale diameter boiler of 50”. Since there was quite a number of rivets involved, and to make life easier, I decided to construct the wrap separately. After cutting the styrene to fit, I took a straight edge and marked the positions of two rows of rivets. Then I predrilled the holes for the rivets and inserted Tichy plastic rivets (0.040). I then ran a bead of thin CA along each row and when it dried, I turned the sheet over and trimmed the rivet stems. To attach the wrap I started on the bottom of the boiler and glued the wrap along the edge and after that dried, I slowly worked my way around the boiler a couple inches at a time clamping as in went. The wrap is tapered at the rear because the bottom of the boiler was cut out at the back to allow it to slip over the rear of the chassis. Here’s a view of the wrapper installed. Not sure what you call it but you can see that the boiler yoke/cradle has an added styrene strip with NBW castings. This strip was glued to the boiler instead of the yoke to ensure a snug fit to the boiler. The rivets around the front of the smokebox are 0.080 Tichy plastic rivets.



Since I'm not a machinist and don't have a lathe, I cheated and bought a brass sand and steam dome set from Accucraft. They are almost the correct ones but not exact. They look pretty good. In the following picture I show the engine with the Accucraft domes and a temporary Accucraft stack and headlamp. I thought of using this stack until I was corrected by David Fletcher. He said my model required a Congdon stack and the Accucraft one was not correct. That eventually led to my involving my son who happens to be an excellent 3D artist with a very good 3D resin printer.
Since the Accucraft smokestack wasn't correct, I had to make a new one. I managed to dig up the original Patent drawings for a Congdon stack. From that design, I made scale drawings in the actual size I needed for 1:20.3. I didn't feel like scratch building a stack so I contacted my son. He took my drawings and printed a stack for me. How lucky can one be? On the left is the stack as it came off the printer. The stack was printed in three pieces. On the left is the completed and painted stack

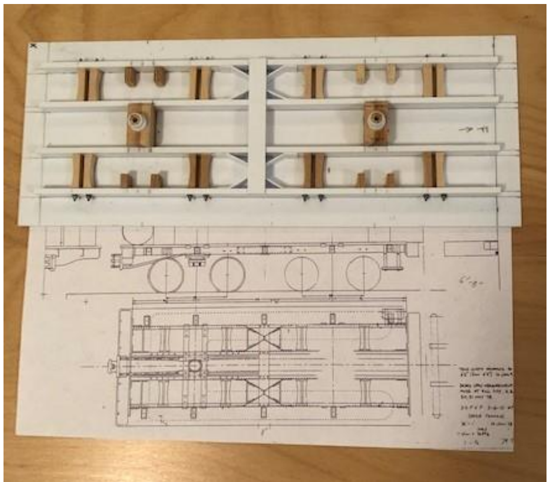

In addition, I had him print a new lamp and support bracket, on the left, from my drawings. I designed the lamp opening so that it would accept a lens assembly from a Bachmann Spectrum. The front of the smokebox, on the right, consists of two styrene disks, one cut a smaller diameter to fit inside the boiler, glued together. I needed to be able to remove the front to access a battery used for lighting. Ozark Miniatures NBW castings were added as was a Trackside Details smokebox door.



I decided to construct the cab entirely from wood to gain the effect of a very early Mogul design. Prior to metal cabs that is. The cab was constructed in two layers. The inner layer was made from 1/16" plywood and basswood strips.

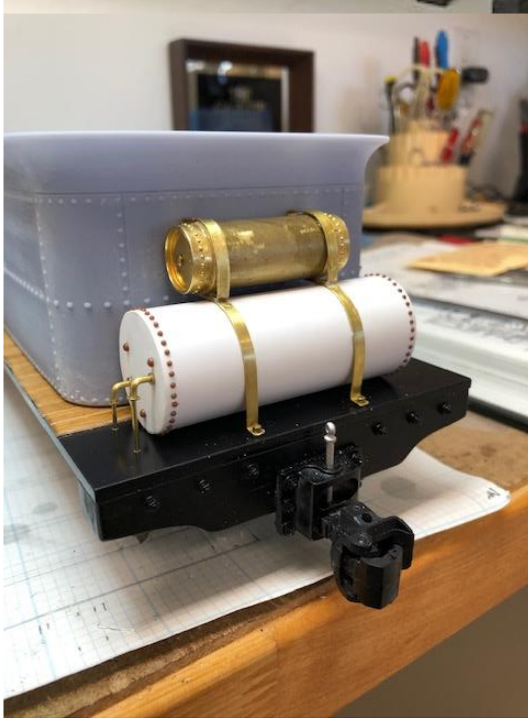
The outer layer was entirely basswood. All parts were stained golden oak and sprayed with a semi-gloss clear coat. On the left, is an interior shot of one of the sides. Brass channel strips have been added to allow a window to slide in. All window frames were made as separate units and glazed with clear styrene. The four doors were constructed from three layers of basswood. This design would allow the glazing to be inserted from the top. On the right, is a photo of the completed cab. The roof was made removable so that one could appreciate all the plumbing details. The roof covering was three strips of aluminum duct tape painted flat black. The grab bars were fabricated using brass rod and modified Trackside Details parts. All doors operate. Another thing to note is the brass strip that was added to the deck. These early wooden decks had metal edging added to protect the wood.

Now to move on to the tender construction. As it turns out, building the tender turned out to be almost as much work as the engine. Of course, there were many photographs of tender exteriors, but nothing showing the underside. I could have just done a minimum amount of work to the frame and who would have noticed, but for me that wasn't enough. The only thing I found, and I don't remember where, was one lousy drawing of a typical tender underbelly. I took the design and produced a scale drawing to create a build plan, shown on the left. The construction consisted of styrene strips and a few basswood pieces. In addition, notice the small brackets that run along the outside of the frame. Well, I made a drawing and had my son print a few. I wanted these because you could see them on the side of the tender. On the right, is a photo of the completed undercarriage prior to painting. The brackets are in grey.

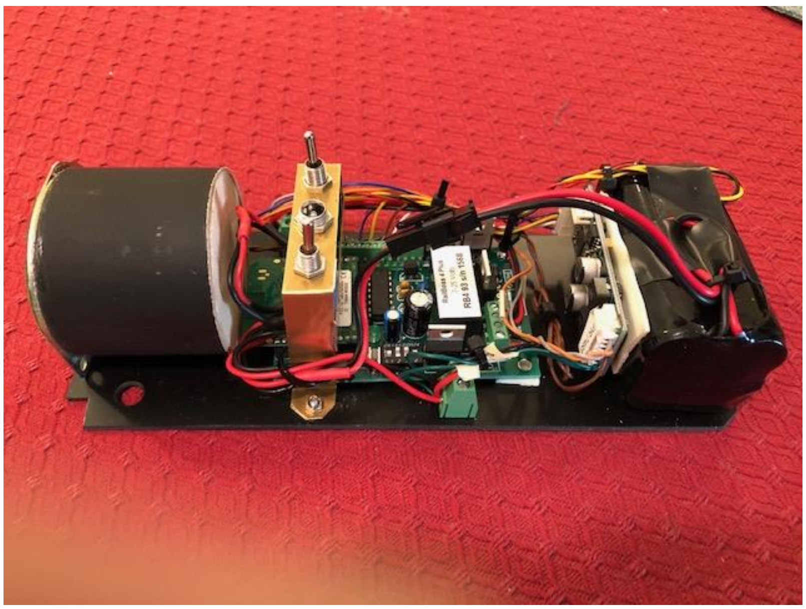


This is the completed tender chassis (rear view). Everything has been painted satin black and basswood decking planks have been added. I modified an Ozark Miniatures' link and pin coupler to accept a Kadee knuckle coupler. It turned out that the Bachmann Spectrum 0-4-0 trucks were perfect for the Mogul tender in every respect. Saved me a lot of work.

Making the tender shell lead to another call to my son. I didn't feel like bending and fitting another bunch of styrene. I created a number of scale drawings and forwarded them on. My son spent a lot of time figuring out how to break down the design so that it would fit in his resin printer an Epax X10. He ended up printing it in 6 separate sections which he indexed so a dummy like me could make sure they would all align. On the left, is the tender temporarily assembled to test the fit. This version of the Cooke Mogul had two tanks on the rear deck of the tender, shown on the right. The lower one was built from a PVC tube. The rivets were Tichy. I just happened to have in my parts cabinet a Trackside Details brass tank that was the correct scale. Both tanks are held together by the two brass straps and the whole unit is attached to the rear deck and independent of the tank shell. This allows me to remove the shell for access to the electronics.



Speaking of electronics, my original goal was to make this model battery operated R/C. To make life simple down the road, I decided to mount everything on a sort of sled that could easily be removed for repairs. From left to right: the enclosed speaker, a Railboss 4 receiver on the bottom (my favorite), a brass bridge to hold the on/off and volume switches and charging jack, a Phoenix sound card, and finally the battery. Nice, neat and compact.

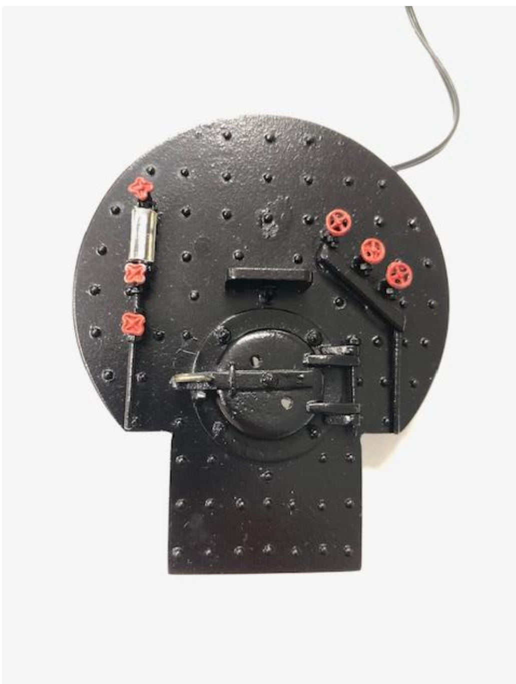


DSP&P tenders had many versions. Shape and size of tender toolboxes also varied. I chose a more vertical type rather than the more common horizontal style. They were made from styrene with fabricated brass hardware. To construct the coal load, I carved a piece of blue foam and inserted some lead weights so the unit would stay in place. To hold the coal load, I made a base that was cut out for the switches, tool boxes and top of speaker. I next added brass strips to hold the wood plank sides and back. I covered the foam with real coal using wood glue.

And the mostly completed tender prior to painting.

Here’s a couple of photos showing progress on applying details such as plumbing,

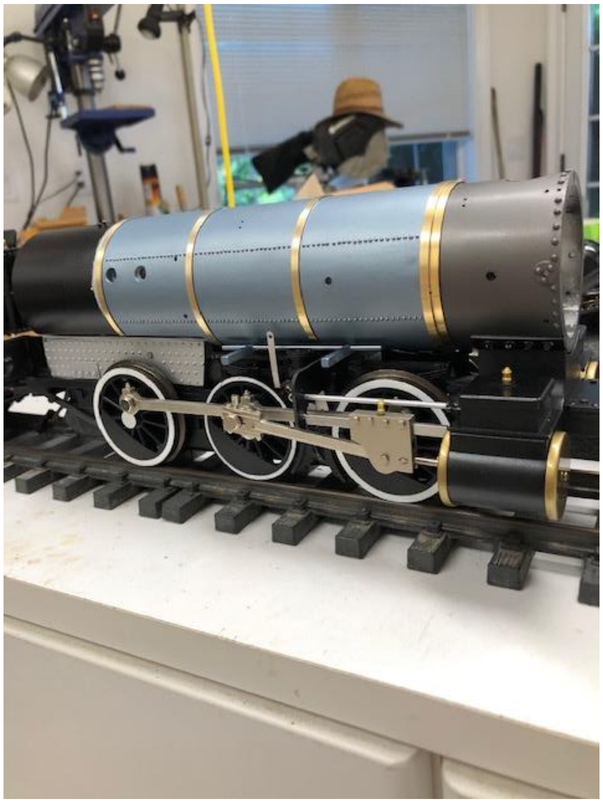
On the left, the painted backhead. Behind the firebox door is a switch that controls the cab light and headlamp. A removable 9 volt battery sits in the smokebox. That's the wire that goes to the front of the engine. I could have powered these items from the Railboss but I wanted to limit the plug connecting the engine to the tender to 4 pins. On the right, is the completed cab interior showing all the assorted plumbing. Since I could find no detailed drawings for the Cooke Mogul cab interior I used David Fletcher's drawings for his Porter and Baldwin Mogul interiors. Close enough I think. Most components are brass castings from TD. The lamp, which works, is from a ½ inch scale dollhouse fixture.



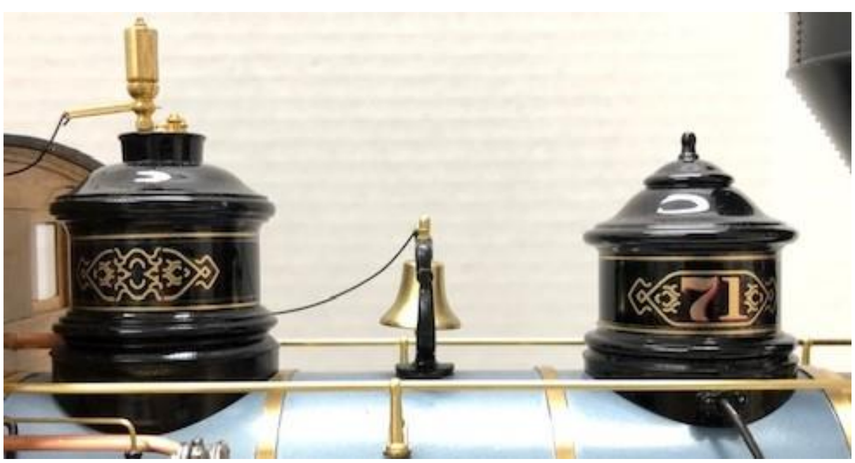
One's always trying to reproduce the so-called Russian Iron color on old steam locomotives. How to achieve this effect has been described to great extent and there are many disagreements. I do not intend to enter that discussion here. What I did was to paint the boiler with Floquil Gun Metal. One thing I might add is that I obtained 2 bottles of the stuff and found they were slightly different colors in spite of the fact that they both had identical color numbers. One was more grey and the other had a blue tint so, after several tests, I ended up mixing them to get the color I wanted. Below is the result. I achieved this finish, which is surprisingly similar to Bachmann's boiler color on their Spectrum Series, in the following steps. First, I sprayed the entire boiler with Alclad II grey primer with filler, sanded, sprayed primer again and sanded. Next I sprayed the entire boiler with Krylon gloss black.

Let me interject how and when I applied the brass bands. Etsy sells a variety of brass banding in various thicknesses and widths. They had one that fit my needs. The nice thing about it is that it comes in a roll so it's already bent and no need to go through that step. Before I painted and sanded, I glued on the bands then covered them with masking tape.

I next masked off the boiler section and sprayed the backhead with satin black and the smokebox with Alclad II Steel. After letting dry for a couple of days, I masked of the backhead and smokebox and sprayed the boiler. After several days, I removed the masking from the boiler bands and sprayed everything with Alclad II water base gloss paint. The great thing about the water base paint is that it gives the same hard, gloss coat without fear of interacting with the previous coats.



I wanted my decals to be as authentic as possible so I sent pictures of the drawings I had of the original engine to my son and he digitized them. The digitized drawings were then sent to Stan Cedarleaf (God rest his soul). Within a week I had my decals. And here are the results.



And, here is the result of 2 years of hard labor.

And, finally, the thing that made it all worthwhile. For those who are interested, you can contact my son at jon@watsonstudios.com.

- **Beautiful, amazing work Doc. Thanks for sharing your project with the club.**

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I stumbled across this older article in Classic Trains and found it interesting to review these 'Steam' terms:

Glossary of steam locomotive terms

By | November 14, 2011 **Compiled by Neil Carlson**

Back pressure
Back pressure is caused by the resistance of the exhaust steam exiting the cylinders. Overcoming this resistance represents negative work done by the piston and it decreases cylinder efficiency. On a large locomotive this can easily mean the loss of several hundred horsepower. To minimize it, it's important that the exhaust valve openings be made as wide as possible. The final choke point for the exhausting steam needs to be at the exhaust nozzle in the smokebox and not at the valves. Also see *Valve events*.

Blowdown valve
Boiler water contains dissolved and suspended solids. When the water evaporates these impurities remain behind and they collect as sludge and scale in the lowest part of the boiler — the two side water legs of the firebox. Valves, operable remotely from the cab, are located at the low point of each water leg. By opening them, this residue can be blown out of the boiler. Also see *Carryover*.

Blower
When a locomotive is standing or drifting, there are times when it is necessary to induce a draft to either lift some smoke or enhance combustion. This is done by operating the blower. It consists of a steam jet that is incorporated into the exhaust nozzle in the smokebox. It is aimed upward toward the base of the stack and when steam exits the jet, it induces a draft through the boiler and up the stack. This has the effect of stimulating the fire and raising the smoke above the engine. See also *Induced drafting*.

Carryover
Any contaminant — solid, liquid, or vapor — that leaves the boiler along with the steam and goes into the dry pipe is called carryover. Boiler water containing dissolved or suspended solids is the most common reason. Carryover can travel into the superheater tubes. It will often accumulate at the first bend of the tube right at the rear tube sheet. At some point, excessive accumulation will block off the steam flow and cause a failure of the superheater unit. Carryover can be minimized by chemical treatment of the boiler water, and by not carrying the water too high in the boiler. Also see *Blowdown valve*.

Booster
A booster is an auxiliary steam engine mounted on a locomotive's trailing truck, or on one of the tender trucks, which can be used during starting and at low speeds to boost tractive effort. At speeds up to about 20 mph, a boiler produces more steam than can be used by the cylinders, and some of it can be used by a booster. As the speed increases, this changes and the booster is cut out. A booster typically adds about 10,000 lbs. of additional tractive effort.

Brick arch
A brick arch is located in the firebox. It rests on arch tubes that extend from the throat to the back inside sheet. The arch, made of firebrick, rests on the arch but does not extend all the way to the rear sheet. It lengthens the path of the fire gases by forcing them backward under the arch, around the end of it, and then forward into the firebox/combustion chamber furnace volume. By lengthening the path of

gas travel, the fuel and air are better mixed and have more time to burn. It was very common in coal-burners, but, except in Canada, little used in oil-burners. See also *Firebox*.

Combustion chamber
A combustion chamber increases the furnace volume of the firebox. It extends from the front of the firebox, where the rear tube sheet would be located, into the barrel of the boiler. Its front becomes the new location of the rear tube sheet. The increased furnace volume provides a greater opportunity for the complete combustion of fuel. Once the hot gases enter the tubes, all burning ceases. The combustion chamber also adds additional firebox heating surface. Also see *Firebox* and *Tube sheet*.

Counterbalance
This is the weight added to a driving wheel to balance revolving or reciprocating weights. Three situations can require it:

1. *Rotational balance*. Weight is added to each driving wheel to counter the weights of the crank pin, side rods, eccentric crank, and the rotating weight of the main rod. The counterbalance added exactly balances each wheel.

2. *Reciprocating balance*. The reciprocating action of the pistons, crossheads, and the main rods will create a jigging and nosing motion. It is countered by adding some more weight to each wheel at the same locations as that added for rotational balance. This is called “overbalance” and it upsets the rotational balance. The reciprocating weights are only partially balanced. The Association of American Railroads recommended that just 31½ percent of the reciprocating weight be balanced. Since the drivers are coupled by the side rods, the same amount of weight does not have to be applied to each wheel; it can be distributed, if for example there is not enough room for it on the main driver. Too much overbalance could create a rotational unbalance that might cause high-speed wheel slips (wheels lifting of rail) and rail-pounding (dynamic augment).

3. *Dynamic balance*. This imbalance is created by the fact that effective forces of the rotating weights and the counterweight are applied at different points on the axle. For example, on the main driver, the pin and rods can be located 8 or 9 inches away from the wheel. These weights, and the wheel’s counterweight, are rotating in parallel but separate planes. If one viewed the axle as if they were in space, unattached to the locomotive, you would see it spinning end over end. When attached to the locomotive, it also causes nosing. The term dynamic balance comes

from the fact the unbalance becomes significant only with speed. It is balanced with weight placed on the opposite driving wheel. This is called cross-balancing. Not all locomotives had this and it wasn't done on all driving wheels. In later years passenger engines received cross-balancing as did some large freight engines with big heavy rods on the main driver.

Crown sheet
The crown sheet is essentially the top cover of the firebox. It is attached to the other interior sheets of the firebox and is supported by radial staybolts hung from the boiler roof sheet over the firebox. Being directly over the fire, it is in a critical location, as this is the hottest point in the boiler. Water is converted to steam here with tremendous vigor. It is absolutely imperative that the crown sheet remain covered with water at all times. Not doing so will permit the rapid failure of the metal, which in all probability will result in a boiler explosion. See *Firebox*.

Exhaust steam injector
This injector has two separate steam nozzles. One uses exhaust steam to begin the motion of the feed water to the boiler. The second nozzle uses live steam to provide the remaining necessary velocity to the water to overcome the boiler pressure. Like a feedwater heater appliance, the exhaust steam injector also pre-heats the feedwater using exhaust steam, and it has the advantage of recycling heat that would have otherwise been lost going up the stack. All exhaust steam injectors are non-lifting. Also see *Injector* and *Feedwater heater*.

Feedwater heater
This is an appliance that taps into the steam exhausted from the cylinders and then uses it to pre-heat the water being fed into the boiler. There were two basic designs. One was a closed system. It used a heat exchanger to transfer the steam's heat. In the process the exhaust steam condensed and it was run through an oil separator and then returned to the tender. The second design employed an open system in which the exhaust steam heated the feedwater by being directly combined with it. In both systems, a live-steam piston pump was used to force the heated feedwater water into the boiler. Feedwater heaters improved locomotive efficiency by 8 to 10 percent through recovering heat energy that otherwise would have gone up the stack. Also see *Exhaust steam injector*.

Firebox
The firebox is the furnace of a locomotive boiler. It contains a grate at its base if coal is burned, or a burner and firepan if oil is the fuel. The interior side, top, and back sheets of the firebox are surrounded by boiler water. The front opens to the

rear tube sheet. Air is drawn through the bottom of the firebox. For a coal-burner this is through the grate; for an oil-burner it is via a damper in the fire pan. It mixes with the fuel to support combustion. Much of this occurs in the furnace volume of the firebox where combustion of the fuel in gaseous form takes place. Heat absorption in the firebox is primarily through radiation directly from the fire itself. This is extremely efficient and steam generation at this end of the boiler is very high. See also *Combustion chamber*, *Brick arch*, *Crown sheet*, and *Tube sheet*.

Front-end multiple-valve throttle
A front-end throttle, as opposed to a dome throttle, is located in the smokebox between the superheater header and the steam pipes leading to the cylinders. Because of its position, it allows the superheater units to always be filled with superheated steam. The short distance between the throttle and the cylinders also provides a quick response to throttle actions. As the throttle is opened, operating cams open a series of poppet valves – each a bit larger than the last. This results in the ability to finely control the admission of steam to the cylinders.

Induced drafting
Exhaust steam from the cylinders is released through a nozzle at the base of the smokebox. This nozzle is set directly beneath the smoke stack extension into the smokebox. As the exhaust steam expands after its release, it entrains the smoke and other products of combustion and then pushes it all up the stack into the atmosphere. This action induces a partial vacuum in the smokebox, and as a consequence, air is drawn into the firebox. This air is needed to support combustion of the fuel. Importantly, this action is self-regulating. When the engine is working hard, and more air is needed for combustion, the heavier exhausts will increase the smokebox partial vacuum and automatically increase the volume of air drawn into the firebox. Good drafting is essential for a free-steaming locomotive. Also see *Smokebox*.

Injector
This is a device that forces water into a steam boiler. A jet of live steam is fed through a nozzle so that it strikes the feedwater. In doing so it imparts its velocity to the water. This moving flow of water now has enough force to overcome the boiler pressure and enter the boiler. There are two basic types of injectors. The lifting type is self-priming and may be mounted above the water level of the tender. The non-lifting type is not self-priming and must be located lower than the tender floor, but it has a greater capacity than the lifting injector. Injectors also pre-heat the feedwater so that cold water is not put into the boiler. See also *Exhaust steam injector*.

Limited cut-off
A full-stoke engine is capable of admitting steam to the cylinders for as long as 85 percent of its stoke. The steam in the cylinders would be acting as ram and would not be used expansively. Operation in this mode would be typical when starting a heavy train and at low speeds. A limited cut-off engine cannot admit steam for nearly as long. Cut-off after 60 percent of the stroke was typical. This allowed some use of expansive steam – even when starting. Obviously, less power can be developed with this arrangement, and to compensate for it, limited cut-off engines tended to have slightly larger cylinders than comparable full-stroke engines. See also *Valve events*.

Rated tractive effort (or tractive force)
The rated tractive effort for a locomotive is a figure of merit that is calculated from a locomotive's specifications. It is used to estimate the force the locomotive can exert at the rim of its driving wheels while starting and operating at low speeds. It is a widely published specification. For example, the AAR formula for a two-cylinder, full-stroke simple (as opposed to compound) steam locomotive is: $TE = .85 \times BP \times C^2 \times S/D$ where: TE = tractive effort (pounds), BP = boiler pressure (PSI), C = cylinder diameter (inches), S = cylinder stroke (inches), and D = driver diameter (inches).

Smokebox
The smokebox is located at the very front of the boiler. Its front has an airtight door; its rear is the front tube sheet. It is the place where smoke and other products of combustion are entrained with exhaust steam from the cylinders and the resulting mixture is ejected upward through the stack. Also see *Induced drafting*.

Steam circuit
The steam circuit is name given to the path taken by steam once it has been drawn from the top of the boiler by a collector and routed to the cylinders. On a modern locomotive with a front-end throttle, the various piping and appliances would include the following, in order: dry pipe, superheater header, superheater tubes, superheater header, throttle, piping to steam chests, and finally the piston valves. Good design practice called for minimizing obstructions, sharp bends, or anything that might restrict the steam flow. The object was to deliver steam to the cylinders with as little pressure loss as possible.

Superheater
The superheater adds additional heat energy to steam that has been generated in the boiler. Steam is drawn off from the top of the boiler and routed to a superheater unit, where it is no longer in contact with the boiler water, and then

the additional heat is added. This can increase the steam temperature by as much as 300ºF. The Schmidt superheater was the most common type used in North America. Its superheater units consisted of a series of bundled tubes that came from a header in the smokebox and then ran back into the boiler flues. Steam from the header entered these tubes and, after receiving the additional heat, it was returned back to the header and routed to the cylinders. See also *Tubes and flues* and *Steam circuit*.

Tubes and flues
The tubes and flues are pipes that stretch between the front and rear boiler tube sheets. Flues are larger in diameter than tubes because they contain superheater units. A typical tube diameter is 2¼ inches, whereas flues can run from 3½ to 5½ inches depending on the size of the superheater unit. Tubes and flues provide the boiler with the majority of its heating surface. They absorb heat by convection from the mass of hot gases passing through them. Also see *Tube sheet*.

Tube sheet
There are front and rear tube sheets for every boiler. They are welded in place to form the ends of the boiler's cylindrical pressure vessel. Holes are cut into the sheets for the tubes and flues that stretch between them. These are then welded to the tube sheets. The tubes and flues provide the structural integrity needed for these sheets to withstand the boiler's pressure. Also see *Tubes and flues*.

Thermic syphons
Thermic syphons are triangular water legs hung from the firebox crown sheet. The flat sides of the triangle are about 3" apart. The top edge of the triangle is flanged and open to water the space above the crown. The front edge is closed over. The rear edge opens to a 6" neck that continues forward beyond the triangle as a pipe that connects to a low point in the boiler such as the throat or base of the combustion chamber. Water at this low point is the coolest in the boiler and it is drawn upward through the broad sides of the syphons and on to the crown. Being directly above the fire and in the middle of the fire, the crown and syphons are at hottest part of the boiler. This greatly enhances heat transfer by having the greatest differences in temperatures between the heat source (fire) and the material (water) absorbing the heat. Testing has shown syphons can increase boiler efficiency by as much as 8 percent. Syphons also add valuable firebox heating surface.

Valve events
There are four valve events:

1. *Admission* – steam is admitted to the cylinder and it pushes against the piston.

2. *Cut-off* – steam admission is cut off and the steam in the cylinder is allowed to expand against the piston.

3. *Release* – the exhaust port is opened and steam begins to leave the cylinder. The piston reverses direction and then pushes the exhaust steam out the exhaust port. The resistance it encounters doing this is called back pressure.

4. *Closure* – the exhaust port is closed. Some steam remains in the cylinder and it is compressed as the piston pushes against it. The pressure of the compressed steam reaches that of the boiler pressure. This acts to cushion the piston as it slows and begins to reverse its direction of movement. The energy lost in compressing the trapped steam is regained at cut-off when the steam in the cylinder is allowed to expand. See also *Back pressure.*

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STEAM LOCOMOTIVE INSIDE

(1) WATER TANK
(2) COAL BIN
(3) THROTTLE LEVER
(4) FIREBOX
(5) SAFETY VALVE
(6) STEAM DOME
(7) BOILER FLUES
(8) SMOKE BOX
(9) SIDE ROD
(10) MAIN CRANK PIN
(11) MAIN ROD
(12) CROSSHEAD
(13) PISTON ROD
(14) PISTON
(15) CYLINDER
(16) PISTON VALVE
(17) EXHAUST PIPE

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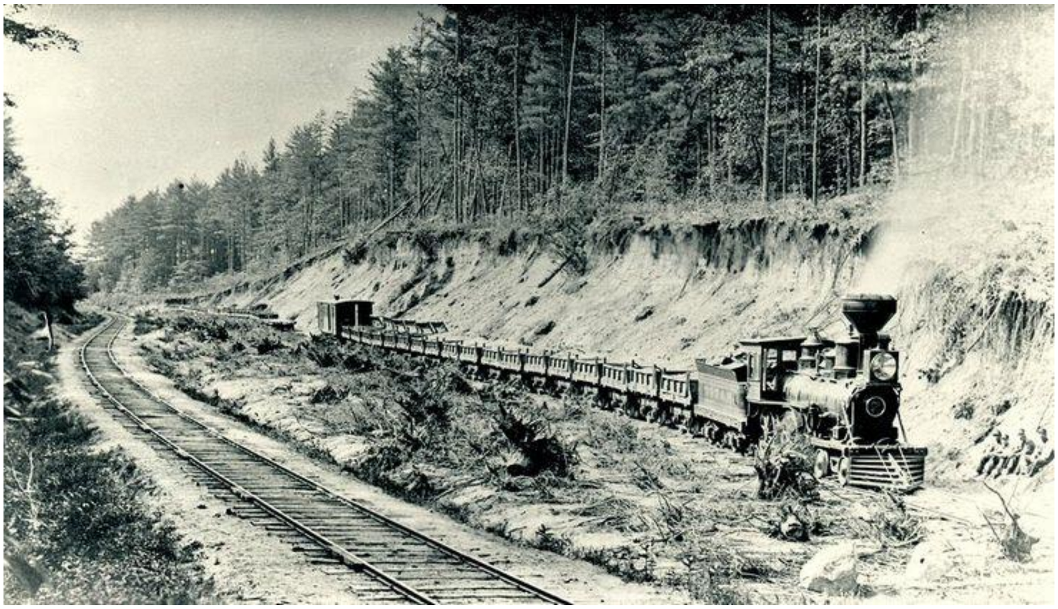

MEMBER PHOTOS:

Please send any idea, project, photo, something you found surfing on the Internet, etc., no matter how great or small they may be to your newsletter editor. We all love trains so…if it's about trains, and you've got it on your computer, chances are you won't be the only person who might enjoy viewing it.

Send your photos to: srwavl@outlook.com

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Membership:

Please consider sharing this newsletter with friends who might be interested and if they wish to become members ask them to contact our PGRS Secretary/Treasurer for a membership form.

Don Watson
125 Mistletoe Trail
Hendersonville, NC 28791

docwatson@morrisbb.net

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Train Lovers Luncheons:

The Asheville Train Lovers Luncheons on every 2nd Thursday of the month at the Post 25 restaurant in Arden, NC at 11:30.

Greater Greenville Train Lovers Luncheons for many months now. As before they are on the first Tuesday of every month at the A&P Restaurant in Greer starting at 11:30 AM.

Columbus Luncheons at Rural Seed have started up again at 12:00 on the Third Thursday of each month.

Please let Scott Williams know your time and place when you're ready to be posted in the Newsletter.

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Businesses associated with our club:

** **Jim Hendley has moved**. To reach him use the following number:

828-333-2523 and if the email above does not work try hendleyjim4@gmail.com

Peggy's Facebook page has more information. Apparently, she is closed for awhile due to a death in the family according to her FB page. Probably best to call before you plan to visit: 828-289-4429

https://www.facebook.com/The-Right-Track-Toy-Train-Museum-141291999274246/

FUTURE PLAN:

2022 - everything that is for sale in the museum - 20% off. Closed Thurs.

2023 - everything that is for sale in the - 30% off. Closed Fri.

2024 - EVERYTHING in the museum 40% off. Closed Sat.

Peggy plans to close the museum at the end of the 2024 season and sell the building