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STEAM IN THE GARDEN

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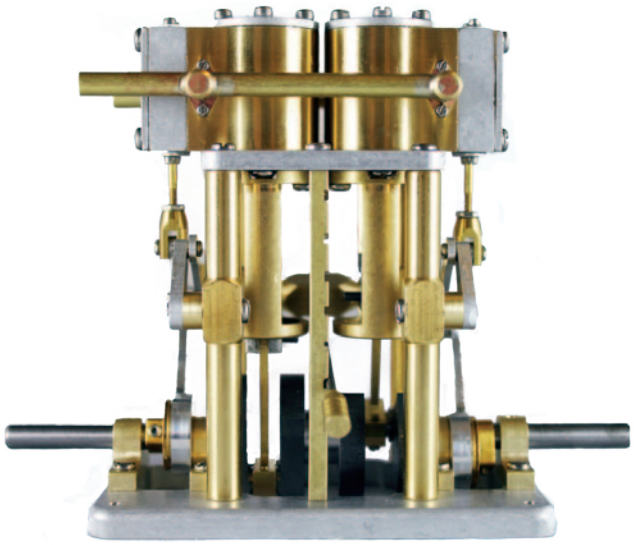

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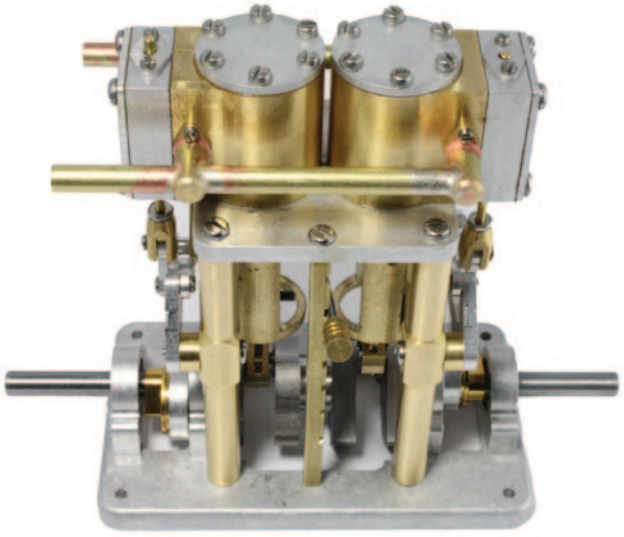

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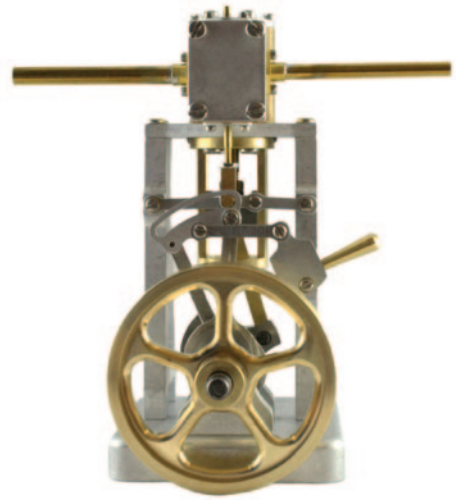

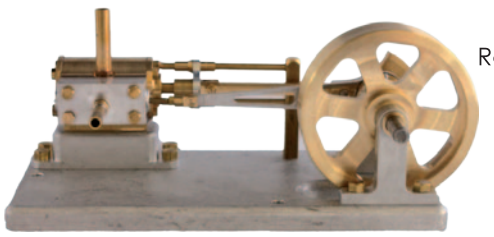

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STEAM IN THE GARDEN

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into trains, propelled by fire ...

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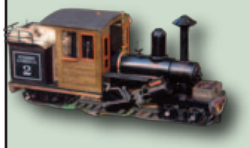
In This Issue

Live Steam Crawler - A Climax locomotive (sans trucks) takes off from the railroad **- by Les Knoll** **8**



A Whimsical Climax Part 2- A new approach to building the Hall & Hall #407 Climax **- by Bill Allen** **12**

Adams Radial Upgrade - Polishing a jewel with more details. **- by Derek Pollard and Chris Tolhurst** **18**

Freelance Consolidations - Part Six- Narrow Gauge 2-8-0 Tender and R/C install. **- by Les Knoll** **32**

Cover: After a year of anticipation, the Freelance Consolidation is ready for work at the Hobbiton Lumber Company Sawmill on the author's Rivendell & Midland Railroad. **- Photo by Les Knoll**

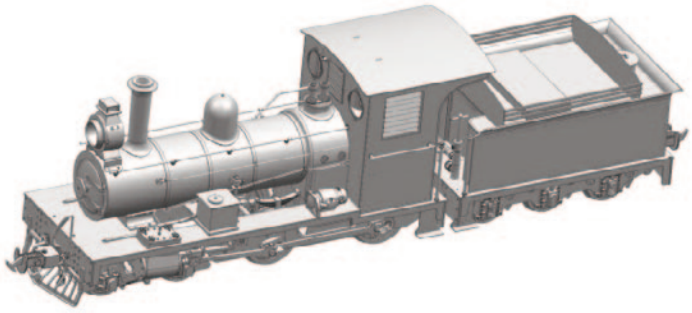
Also inside:

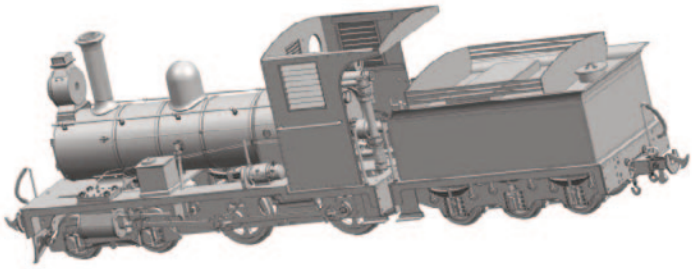
LATEST WAYBILL

Accucraft U.K., has announced "with regret" that they will no longer distribute the Aster line. They say "... it has become increasingly clear that the Aster agency has diverted our attention and energies away from our core business, Accucraft UK... However, until a new distributor is appointed, Accucraft UK will continue to support owners of current and older Aster models with its first-class parts and service backup."

It should be noted that Accucraft U.K. is an independent company that distributes to the Anglo/European market. This move will not affect Aster distribution and support in the U.S.

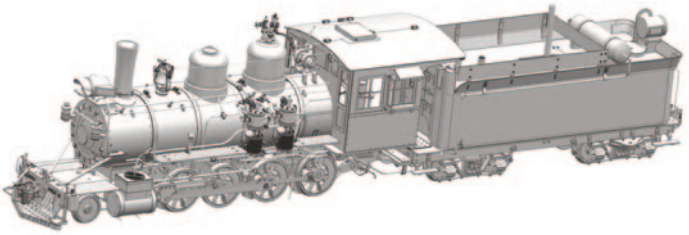
"Lawley" Progress





Progress is continuing on Accucraft U.K's 1/19th scale "Lawley," with CAD designs being developed for production. The prototype 4-4-0 ran on the Beira Railway and the South African Railway; versions of the model will be available in the appropriate liveries. The engine will be adjustable for either 32mm or 45mm Gauge, and will be supplied with a choice of glazed or louvred cab windows.

C-18 News



Any steamer who expressed an interest in Accucraft's upcoming Narrow Gauge C-18 should have received an informative email in July. The company apologized for delays in getting the project through the pipeline, citing international Covid concerns and shipping delays. Accucraft had aimed at getting both live steam and electric versions out before summer.

Benchmarks in their updated schedule include the following: Overseas parts to be completed in September of this year; first sample model to be shown at the National Summer Steamup in Lodi, California September 30th. Final assembly of first run in October, with delivery starting that month.

Reflecting Accucraft's association with Aster, stainless steel bodywork and machined parts are being made in Japan. Wheels and castings in Korea; boiler, painting and final assembly to be done in China. Due to their confidence in the high quality of the Japanese and Korean made components, Accucraft will also offer a kit version of the engine.

Unfortunately, due to large increases in shipping costs as well as in raw materials, Accucraft says that [they] "have no choice but to increase the retail prices on some of our projects, including the C-18. Rest assured that any existing pre-order with us or with a dealer will have their original prices honored. The increase will only apply to new orders. "

The July email also included several CAD perspectives of the new loco, as well as some photos of the prototype cab and tender.

(*Meanwhile, sources tell us that two sample prototypes of the Southern Pacific P-8 have arrived at Accucraft's Union City headquarters for testing and review.*)

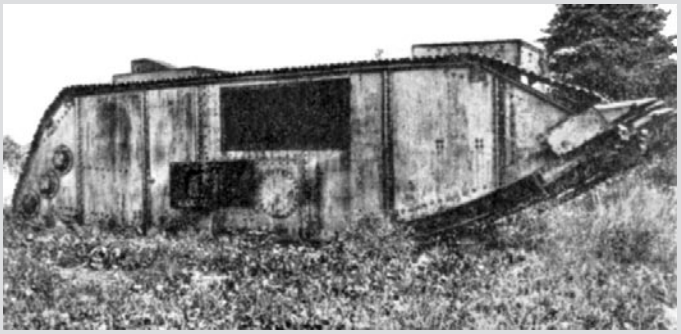
Live Steam Crawler

Text and Photos by Les Knoll, PE

Live steam modeling is by no means limited to railroad equipment. Steamboats have been popular for as long as steam locomotives have, and a variety of land vehicles have been built, too. My interest in a live steam powered land vehicle came about when a friend who was into 'Steampunk' models suggested I build a steam powered tank. Full size steam powered tanks existed during the First World War, so there was a prototype for this type of model. A web search showed me that live steam tank models had already been built a number of times and quite successfully, too. Most steam modelers are familiar with the Lombard log loader, another tread mounted steamer. At least one Lombard working model has also been built, a completely scratchbuilt model, including individually machined treads, lots of 'em! A fantastic project, but way beyond my machining skills.

Historic Land Steam Vehicles

Old Dinah steam tractor built by Best Company of San Leandro, Calif. Cost $4,500 and burned 250 pounds of coal per hour with a top land speed of 3.5 miles per hour. Dinah was used for only one year. It hauled borate ore from Borate to Daggett, California in 1901, and then to Ivanpah. Dinah broke down after 3 miles. In 1906 it was towed back to Ludlow, CA and sold. Today she sits on display at Furnace Springs, Death Valley. Photo Courtesy National Park Service, Death Valley National Park Service



The Steam Tank (Tracked) was an early U.S. tank design of 1918 imitating the design of the British Mark IV tank but powered by steam. The project was started by General John A. Johnson with the help of the Endicott and Johnson Shoe Company. Costing $60,000, expertise from Stanley Motor Carriage Company in Watertown, Massachusetts, that produced steam cars was called in to assist with the design and construction. The Steam Tank was meant to be a specialized flame tank to attack pillboxes; the original design had this weapon driven by steam.

A standard two-tread tank mechanism had been utilized by one builder utilizing a Tamiya tank chassis with an elaborate clutching and shifting transmission to enable one electric motor to drive left and right treads independently in order to steer. One lucky builder located a used one to convert to steam; otherwise a new kit with this drive would run almost $1,000, especially for the all-metal chassis kit which is necessary for a steamer.

Another modeler utilized a tank chassis from another source with two small steam engines, one running each tread. This concept showed promise, and the individual throttle control for steering by radio control was something I understood, but two individual steam engines again raises the price substantially.

Yet another option was a system similar to the Traxxas TRX-4 crawler truck, which is a four-tread model with steerable front treads or tracks. The four-wheel drive might be trickier to build, but the system of clutches for tank-like steering would not be needed. One steam engine and a steering servo up front is a much simpler design.

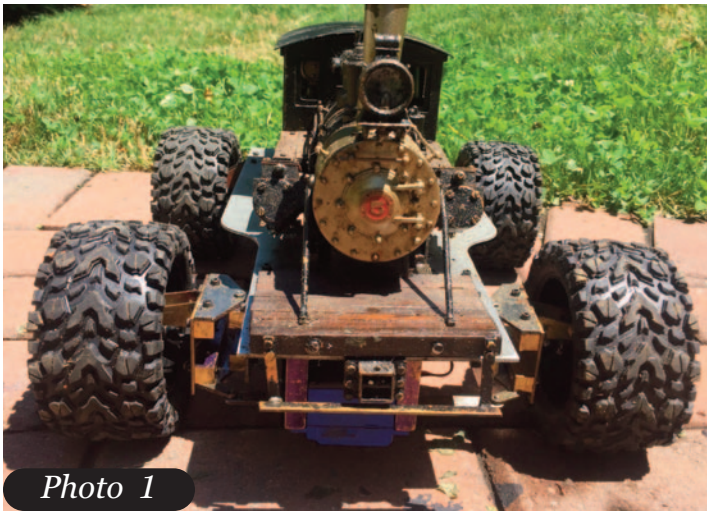


Photo 1

Photo 2

I saw this project as broken down into three parts: Boiler, engine, and land vehicle platform. I spent a lot of time at my local Hobbytown USA in Mooresville, NC looking at various electric and gas powered vehicles trying to determine the best way to incorporate steam power into them. I also looked on the internet for tank and crawler truck kits to power with steam.

I bought a Chinese manufactured electrically powered four tread tank chassis kit from the internet, and quickly found out where the phrase "Slow boat to China" comes from. There are slow boats FROM China, too!

While waiting, seemingly forever, for my chassis to arrive, I started to work out a propulsion system. Previous modelers had used marine and stationary steam engine components. I wanted in some way to use my locomotive expertise and maybe locomotive components to come up with a way to power this rig.

As it turned out, the method of propulsion was right under my nose, and I already owned it! My live steam Climax (*Steam in the Garden #95 September-October 2007)* outputs its engine power to a front and rear center-mounted driveshaft, just like electric R/C cars and trucks do **(Photos 1-3**). The Climax trucks could be removed and the remaining portion of the locomotive mounted on a land vehicle chassis. The center driveshaft could power the wheels using drive components from electrically powered models. Using the Climax as a starting point, most of the hard work was already done, and already working.

I eventually got the tank chassis kit and stripped it of the electric power components. Although it had four treads, two front and two rear, steering was still accomplished by having the treads on one side stationary (or reversed) while the other side propelled. This was not the way my vehicle was going to be steered. I replaced the sheet metal base in the kit with a custom designed aluminum base cut by Denver Waterjet, and made front and rear tread mounting assemblies similar to what came in the tank kit, except the front tread assemblies were made steerable, similar to the Traxxas TRX-4 electrically powered crawler truck which is equipped with crawler treads instead of wheels. All four treads were powered.

Photo 3

This attempt ended in dismal failure! The steam engine simply did not have enough power to drive the tank treads. This was mostly because the tread assemblies were inexpensively made and bound up a lot, which made them extremely inefficient mechanically. I looked into the treads used on the Traxxas TRX-4 crawler truck and these, too took a lot of power to drive.

I finally decided on using crawler truck tires instead of treads because of the lower rolling resistance. I was disappointed that my live steam tank would not be built as originally conceived, but I DID have something that had not been built before, a live steam crawler!

Utilizing the tank tread chassis I built, I modified the tread mounts to accept tires using components from Traxxas R/C vehicles. Traxxas is like Roundhouse Engineering in that not only do they sell completed ready-to-run vehicles, they also have all their individual parts available.

The final design utilizes rear wheel drive only. The Climax locomotive upper works mounts on the chassis plate and a twin-universal driveshaft drives a 15:1 worm gear to the rear axle. This is the same drive arrangement as on the Climax locomotive except it is rear wheel drive only and the final gear reduction is far greater than the 2:1 reduction in the Climax trucks. More reduction is necessary in the crawler because rolling resistance with soft tires is greater than metal wheels on metal rails, and because the Traxxas crawler truck tires are more than twice the diameter of the steel wheels on the Climax locomotive. The undercarriage with drive mechanism can be seen in **Photo 4**. The front

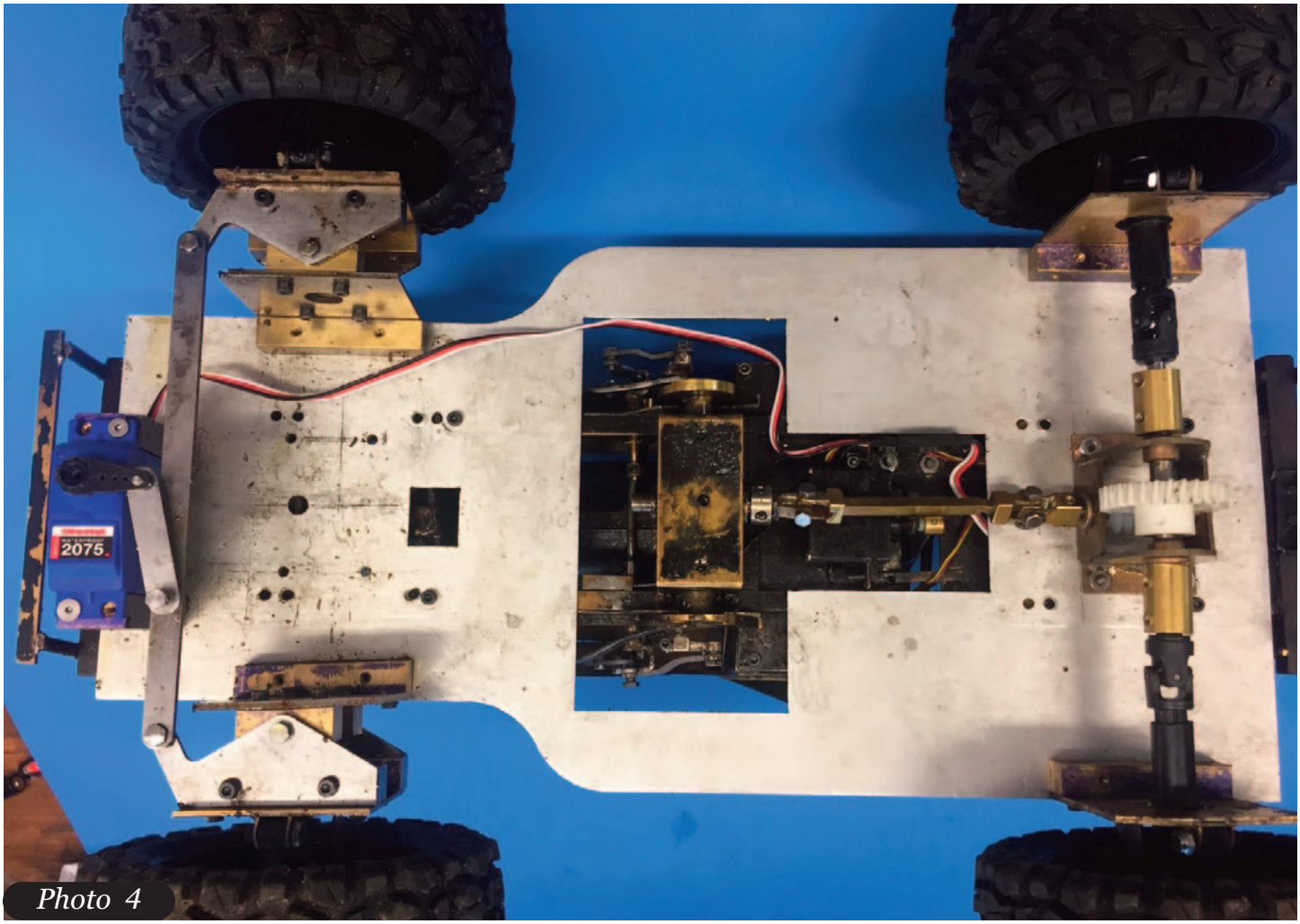


Photo 4

wheels are steered using a Traxxas 2075 steering servo, the same one that is supplied with their TRX-4 crawler trucks.

The steam crawler is radio-controlled just like the Climax locomotive, except that an additional channel is needed for the steering servo. A total of three R/C channels is used: throttle, reversing gear and steering. Since I had a four channel radio already in the tender of the Climax, it was a simple matter to run a cable from an additional servo channel output in the Spektrum receiver to the front-mounted Traxxas steering servo. The steam crawler is controlled with the same Spektrum DX-6 transmitter as my railroad models, except it requires an additional "model" slot on the transmitter to accommodate using two joysticks: one for steering/direction and the other for throttle. Provision also must be made in the transmitter settings for reversing the direction of the valve gear, since the Climax steam engine runs in reverse in order to power the crawler forward due to the worm gearing.

It took a bit of tinkering and tuning to get the steam crawler to run well. The land vehicle chassis still seems to put a greater load on the Climax power plant than the locomotive trucks do, but it does run and puts on quite a show with the twin-cylinder steam engine and valve gear churning away and steam plume billowing from the stack.

When I want my Climax locomotive back, it is a relatively simple procedure to remove the locomotive upper works from the crawler truck chassis and replace the locomotive trucks. It is less than a half-hour operation. It is also just as simple and quick to change from locomotive to crawler truck. Although both models run well, the Climax still seems happier being a locomotive.

Everyone that has seen the live steam crawler in operation loves it. No one seems to mind that it is infinitely slower than the electric crawler trucks or that any electric can easily outclimb it. This is all cancelled out by the "Cool" factor of this crawler truck being a live steamer.

A Whimsical Climax Part Two

Text and Photos by Bill Allen
Drawing by Scott E. McDonald

Building the Boiler

Performance

To me, the most important thing to a good running engine is the boiler. The cylinders and valves provide the torque, but without the pressure and volume of steam from the boiler, they will not go far. My first couple of engines I built had poker burner boilers. They had strong draw bar pulls but when I tried to pull numerous cars, they would slow down after a couple of minutes as the steam pressure dropped due to lack of production. To many live steamers, a half dozen cars is more than they would ever want to run, but after waiting at a RR crossing for 10 minutes or more, I realized that prototypical consists are much longer than that. Because of this, I always try to make my boilers capable of pulling any load with steam to spare.

After my poker burner experience, I did quite a bit of reading on the subject and found out that the heating surface of the boiler is the most important part of the design. My poker burner boilers had only the surface area of the poker tube to heat the water, and because of this all of my attempts to increase the poker heat production had limited results. Of all of the boiler designs I researched, I decided that the locomotive style boiler would be the best for me.

Whimsical Climax Series

- Part 1 - Frame & Cylinders
- ➲ Part 2 - Boiler
- Part 3 - Chassis
- Part 4 - Cab & Bunker

Locomotive Style Boiler

The locomotive style boiler has a firebox where the fuel is burned and flue tubes which go from the firebox to the smokebox where the hot fumes exit out the stack. The amount of heat (BTUs) produced by the different fuels is, in order: solid (coal), liquid (alcohol) and gas (butane). Although a coal boiler is the most efficient, it requires a more complex boiler design with wet fireboxes and constant refueling during the run. Because of this I decided against this design. The alcohol fueled boilers are the next efficient but the fumes hurt my eyes and sometimes cause my asthma to act up. The alcohol flame is not easily adjustable during a run

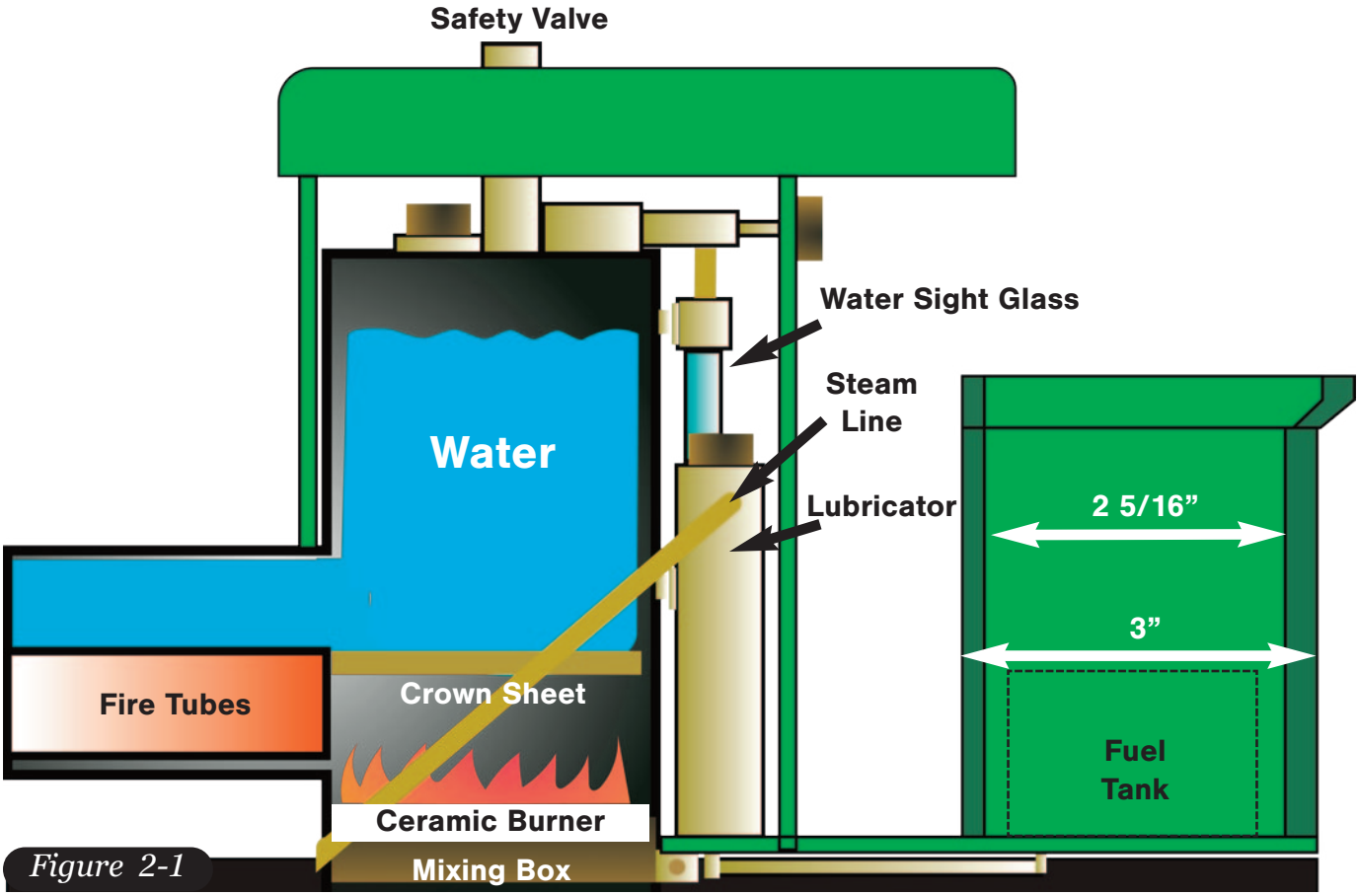


Figure 2-1

which was also a negative to me. I liked the adjustability of the gas burners but the low steam production and noise of the poker burners was not for me.

I decided that I would try ceramic burners in a locomotive style boiler. These burners had been used for years in vertical boilers and small locomotive boilers but not in any prodigious performers. I learned that the prevailing thought was that they were ok for light loads but that was about it. The burners that had been used consisted of a small ceramic plate with openings on the side or holes on the middle to let air in. They also used a drafted system which required a blower tube to draw the air out the stack and a battery-operated blower to use during warmup. To me, this seemed off because a properly designed gas system has air holes in the jet tube and draws air in before combustion. Drawing more air into the firebox after combustion does not improve the burn and the cold air just lowers the temperature in the system.

My idea was to have a large ceramic plate that covered all of the firebox bottom with a similar size mixing box, where the butane, gas and air are mixed prior to going through the holes in the burner. This makes the firebox sealed. To avoid any pressures or vacuums created by the heating process, the smokebox is vented at the bottom similar to a poker burner boiler. This gives a nice quiet burn which is similar in steam production to an alcohol burner. The trick to getting a good burn is getting enough air into the mix. The jet size needs to match the air holes in the jet holder and the ceramic box size. For small burners, I usually use a 0.010-inch jet with four 7/32-inch air holes in the jet holder. If the jet is too small the burn will be too weak and too big -- the rich mixture will be hard to pop back and the burn will not be intense enough. I solved that problem on my larger engines by going to two jet holders, which gives them more fuel and air.

Design

Figure 2-1 shows the drawing of my Tee-boiler, which is similar to the boilers used on the Class B. The Tee-Boilers got that name because they resembled a capital letter T laying on its side.

The boiler is made up of two components. The first is a large box which houses the ceramic burner at the bottom, the firebox in the middle, and a large water and steam reservoir at the top. The second

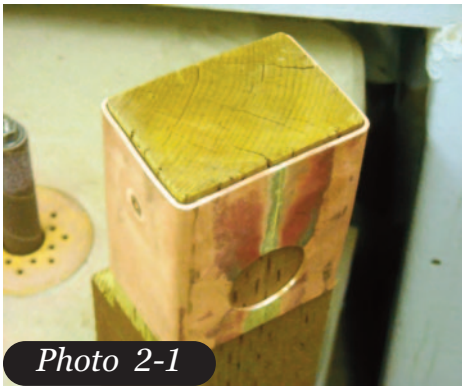
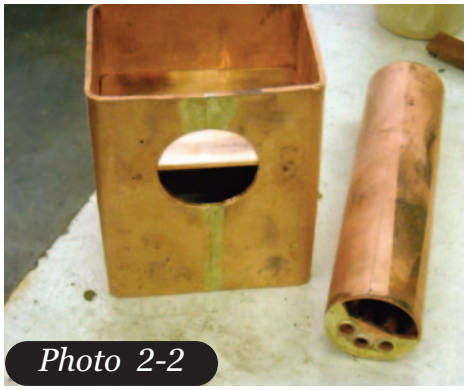


Photo 2-1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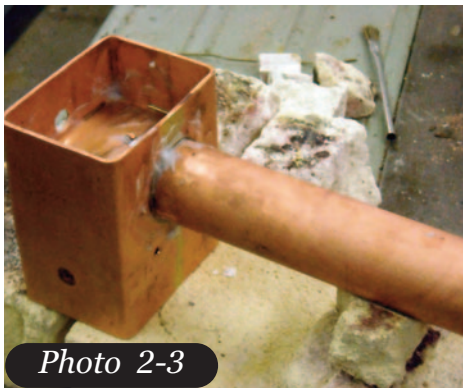


Photo 2-3


Photo 2-4

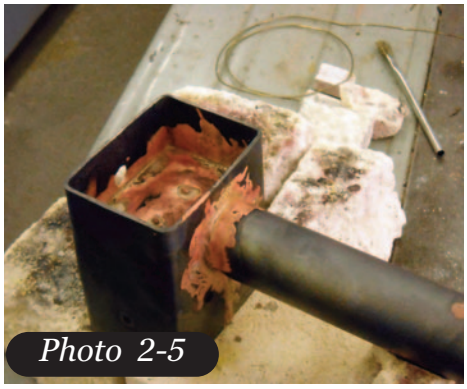


Photo 2-5


Photo 2-6

component is the boiler tube, which houses three flues and is a water reservoir also. This makes for a very efficient boiler as the large box is able to house a good size burner and the large water capacity means an axle pump is not necessary. My boiler does have a Goodall valve for adding water on long runs.

The ceramic burner is predominantly a radiant heat source but it does have some convective characteristics. If you look at the burner in **Figure 1,** you can see how it is facing up, directing heat to the crown sheet which is in contact with the water above it. The hot air and gases in the smokebox create convective heating to the crown sheet, the sides of the firebox and the three flues. Because the radiant heating is directed at the crown sheet and little or none to the firebox sides, there is no need for wet legs or backhead, as in a coal or alcohol fired boiler.

The prototype Climax locos collected steam off the top of the boiler as I did, but they then directed the steam piping through the front of the cab and down the outside of the cab to the cylinders. I didn't do that as I used a displacement lubricator in the cab and then directed the piping down inside the cab and out the corner of the cab. I still have the prototypical look on the outside, which I will cover later. Also shown in the drawing is the safety with the long extension which protrudes through the cab roof.

Construction

I start with the Tee box. I am making my box larger in proportion to a prototypical one as there is no need for room for the Engineer or Fireman. It will be 2-1/2 inches deep and 3-1/2 inches wide. I cut a bender-form from a four-by-four to my inside finish dimensions and rounded the corners. I then wrapped a sheet of paper card stock around it and cut it to fit. Then I cut a sheet of 3/32-inch copper sheet using the card stock as a template. The boiler tube hole will be at the seam which makes it easy to cut the tube hole with the band saw. I cut the hole a bit undersize and finished it with the spindle sander after it was soldered.

I cut the copper sheet to size and shape and then annealed it with a large propane torch till it was cherry red. The sheet was then soft enough to wrap around the wood former. The seam was then silver soldered, and placed back into the former to square everything up by gently hammering the sides to shape (**Photo 2-1**).

The tube is made from 1-1/2 inch copper pipe, with three 3/8th-inch flue tubes. The end plate or throat sheet is open at the top to allow water flow between the tube and Tee box (**Photo 2-2**). The

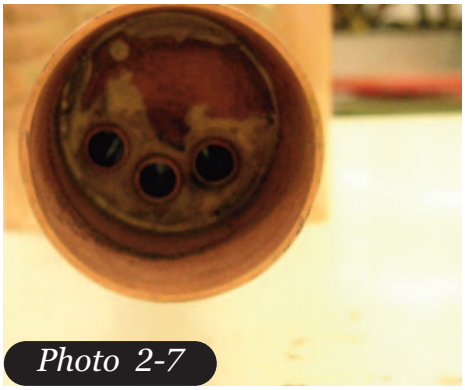


Photo 2-7

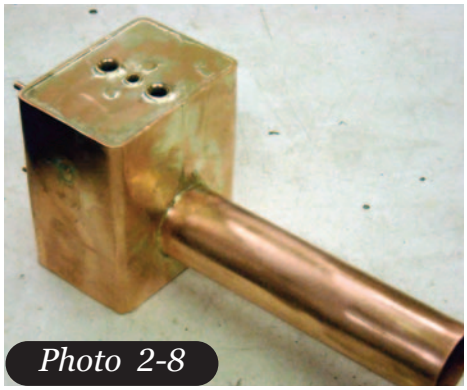


Photo 2-8


Photo 2-9

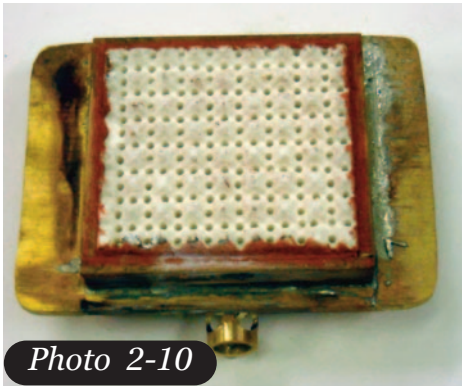


Photo 2-10


Photo 2-11

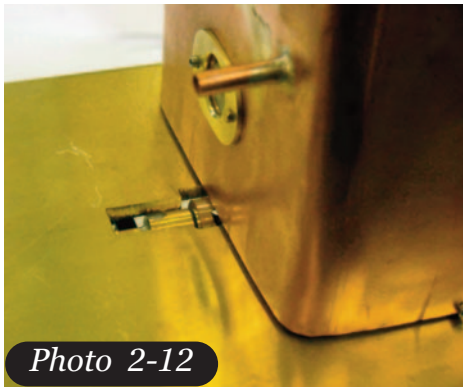


Photo 2-12

other end is sealed off to form the division between the boiler and smokebox (**Photo 2-7**).

Photo 2-3 shows the tube being silver soldered to the box. The tube is resting on a fire brick to keep it level. The joint is covered with paste flux and there is a ring of solder around the joint. Silver solder flows into joints easily if the right temperature is reached. By placing some solder on the joint, it will flow into the joint and through it to the other side, making a very strong connection. If the solder starts to climb towards one piece and not the other, it means one side of the joint is too cool and more heat needs to be directed towards that piece. Although this technique usually results in a complete fillet all of the way around the joint, hand fed solder may be needed to complete the job.

The crown sheet is at the top of the firebox and separates the burner area from the water and steam portion of the Tee box. Because it is a flat sheet, 5/32-inch copper stays are used to keep the boiler pressure from bending the sheet downward. As this is a fairly low-pressure boiler two stays are sufficient. Snippets of solder are placed around the crown sheet and rings of 1/32-inch solder are around the stays (**Photo 2-4**). Silver solder will run towards the heat so you can usually get the snippets to flow along the seam. I have what is known as a scratcher which is just a long piece of steel rod ground to a point at the end which can be used to push the solder around if necessary. My scratcher is made from a piece of a metal coat hanger.

Photo 2-5 shows the boiler after soldering the tube to the box and the crown sheet. You can see where the copper has turned black from the heat but is still fairly clean where the flux was.

Photo 2-6 shows the stays which keep the flat sides from bulging out from the pressure in the boiler. The two tubes on the right side are for the water sight glass.

In **Photo 2-7** you can see the front tube sheet. It is recessed in order to create a barrier between the boiler and smokebox. This makes for a little bit of a tricky soldering job but keeps a more prototypical look, versus having a separate smokebox pipe which would fit over the boiler at the joint between them.

Photos 2-8 and **2-9** show the finished boiler after pickling in citric acid and cleaned up on the wire wheel buffer.

Ceramic Burner

The ceramic burner for this boiler doesn't need to be that large because even though it will be pulling 13 heavy log cars, the speed will be slow. A single jet will be sufficient for this size burner. If you look at **Photos 2-10** and **2-11** you can see that

the burner box is smaller than the firebox opening; thus the use of a brass plate surrounding the burner box which fits inside the firebox. The boiler and firebox are above the frame but the smaller burner box fits between the frame rails. When I designed the burner, I estimated the size needed based on my prior builds. I figured that if it was low on steam production I could replace it with a dual-jet burner, but that wasn't necessary.

Photo 2-12 shows the boiler set on top of the cab floor with the burner below it and a slot cut in the floor for jet clearance. You can see the small round window in the firebox used to see and adjust the burner. If I had it to go over again, I would have made a bigger window as the small one is hard to see on a bright sunny day.

In the next installment we'll build a chassis for our Whimsical Climax.

Adams Radial Upgrade

By Derek Pollard and Chris Tolhurst

The Victorians and Edwardians built some beautiful looking locomotives. They were seldom built with ease of maintenance or crew comfort in mind and it would seem that classic lines and elegance were often more important. One such example is the Adams Radial tank locomotive shown above, resplendent in its London and South Western Railway livery. The model from Accucraft was eagerly anticipated and proved to be well worth waiting for, a beautiful model of a gorgeous prototype. It was particularly tempting in kit form as this facilitated making any changes.

But all commercial models are built to a price and there is always room for improvement "tweaks" on the part of the owner.

So as is now becoming a habit, the authors each bought one of the models (in kit form) and worked together on enhancements to the various components at our weekly workshop day over the course of several months. This article describes some of the enhancements we made over the course of the build.

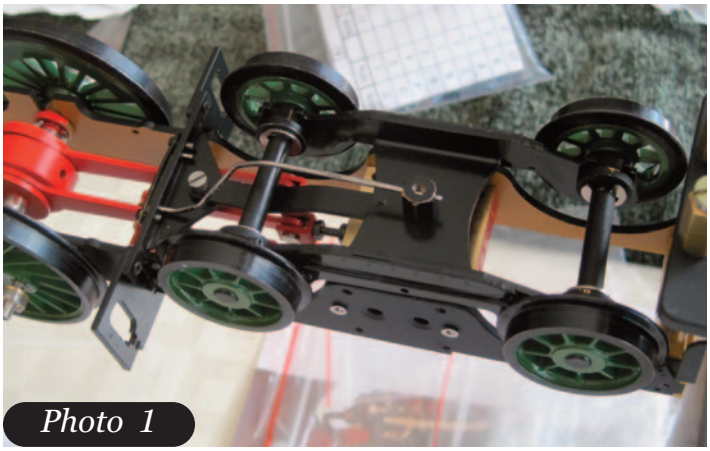


Photo 1

Centre Sprung Bogie

After a repaint of the inside frames (tan instead of red) we adapted the bogie mount to be centre sprung. In our opinion this results in a more stable and prototypical movement, particularly when entering a curved section of track. It was done in a simple way as the photo shows; piano wire mounted to the frames passes through a sliding stud at the bogie center. (**Photo 1**).

Cylinder Drains

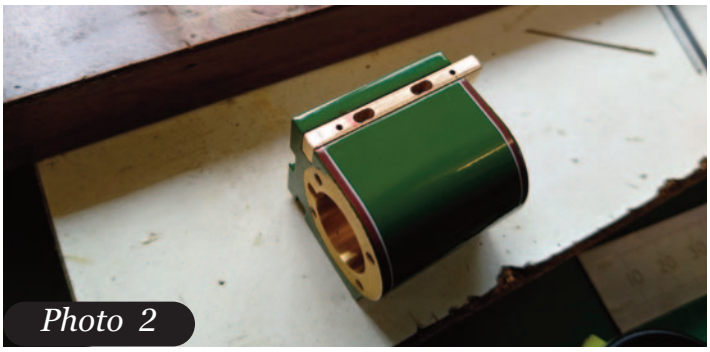


Photo 2

There is a convenient groove in the cylinder blocks which, formed the basis of cylinder drain valves, when a sliding valve was added and ports were drilled through to the cylinder ends. The slot is so convenient one even wonders if cylinder drains weren't considered and designed for at one stage. (**Photo 2**).


Photo 3

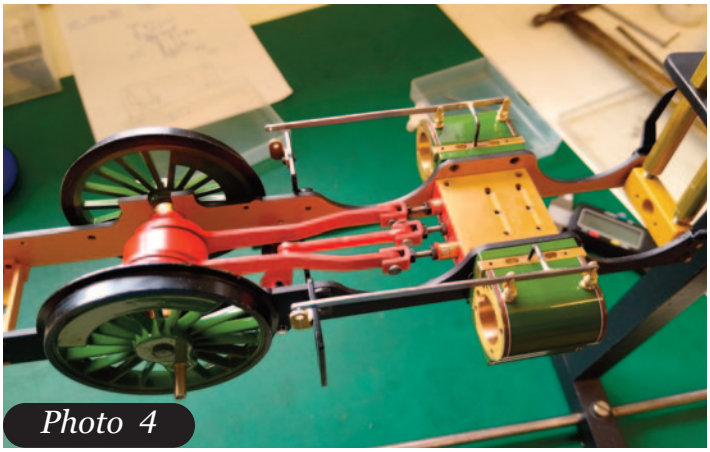


Photo 4

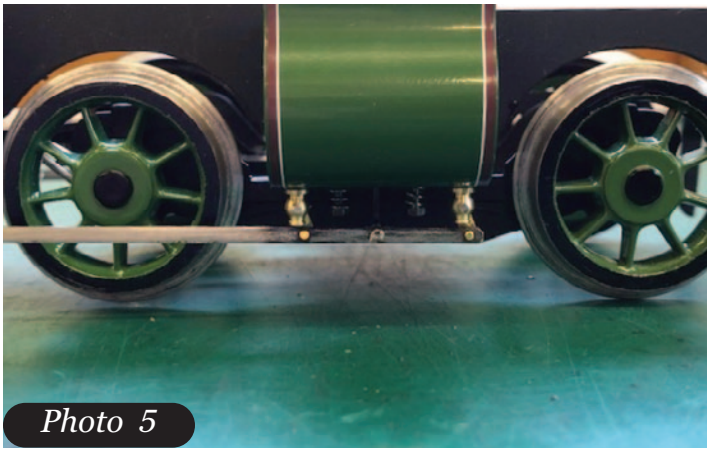


Photo 5

A linkage was taken through to the cab via a pivot crank on the weigh shaft. (**Photo 3**). The linkage operates both the working valves and the dummy drain valves added to the cylinders. (**Photos 4 & 5**).

Relocating essentials to the rear bunker

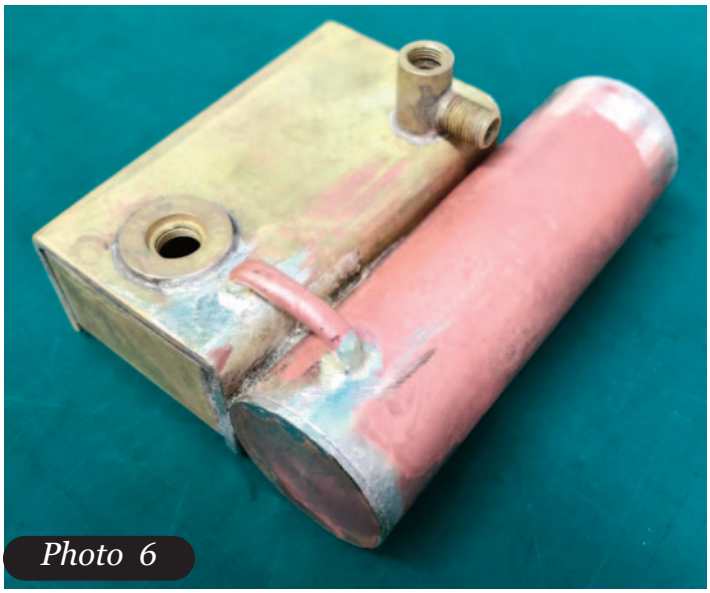


Photo 6


Photo 7

The rear bunker offered a convenient space to place not only an additional gas tank, (**Photo 6**), but also the lubricator tank (so the screw filler couldn't be seen), the water gauge drain valve and an ENOTS quick disconnect valve to enable easy topping up (**Photo 7**). The water bath had to be sacrificed.

Coal Load

The coal load supplied represents a full coal bunker and does seem to wobble a bit when in place! We removed the coal rails and water filler from the old coal load, and soldered them onto a

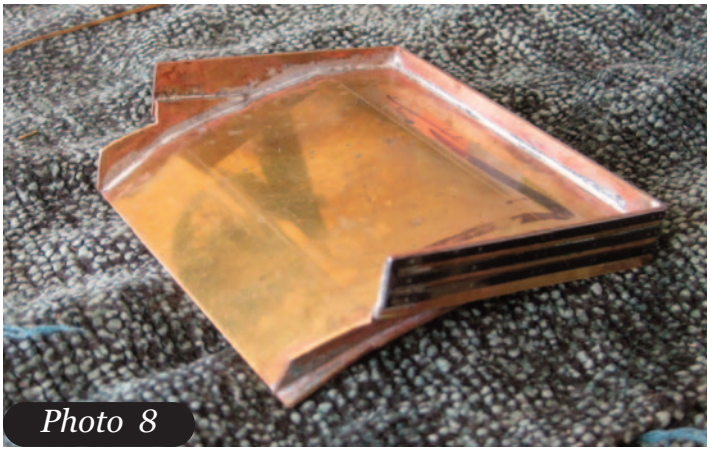


Photo 8


Photo 9

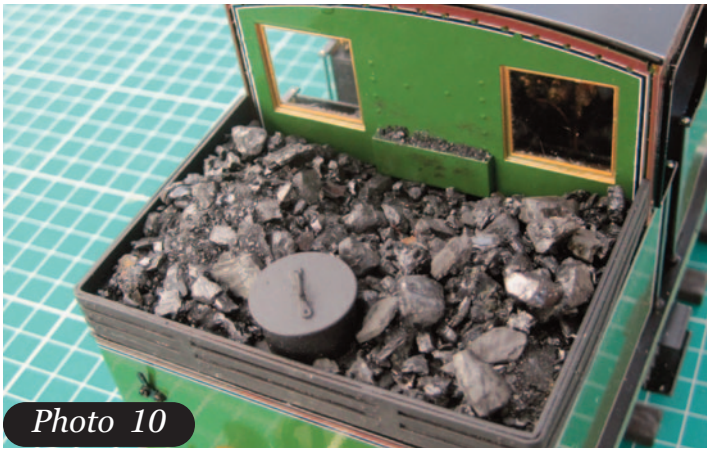


Photo 10

curved plate (**Photos 8 & 9**) which allowed representation of a coal load where half the coal has been used. As with all our coal loads we use real coal in sizes from "large enough to need breaking up" down to just dust, all secured with PVA glue, (**Photo 10**).

Detailed Cab

There were limitations on what could be done as far as detailing the cab was concerned. The boiler intrudes further into the cab than the real loco and, of course, there is a gas poker sticking out in the middle. However, we were able to fabricate a good, passable representation of the back of the cab, and to add a dummy backhead and boiler fittings to the front, (**Photo 11**). A wooden floor at the correct height was added as well, which also served to hide the pipework between bunker and boiler (**Photo 12**). The oil can on the left hand tank top within the cab is actually a handle allowing easy removal of the top when running .This enables the water gauge (which had been moved forward) to be easily seen even with the roof on.

The boiler vent has been added solely to aid initial filling of the boiler, rather like opening the blower on a Meths fired model.

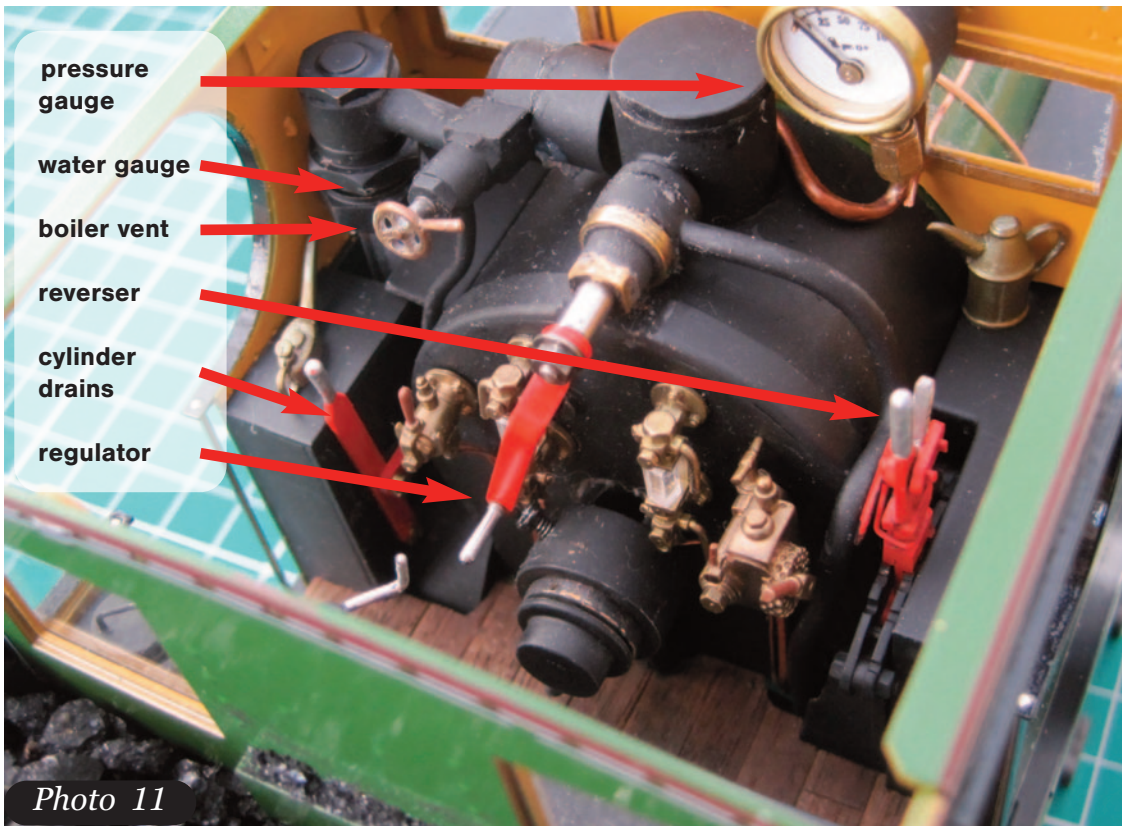


Photo 11

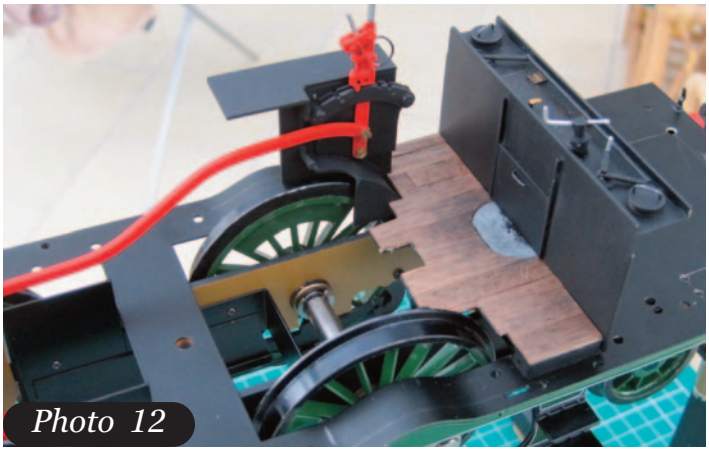


Photo 12

Reverser

The reverser that comes with the model is a generic Accucraft fitting which works well and is easily accessible but is not to scale. We wanted an accurate, scale representation with a lever-operated latch as per the real thing (**Photo 13**). The critical thing here was to ensure that the connection point for the reach rod resulted in an identical "throw" to the Accucraft original. Some simple trigonometric calculations enabled the reach rod throw to be identical to the original and the notches for the latches to be in the right place. The curved profile to the base is to enable a snug fit over the wheel splashers inside the cab.

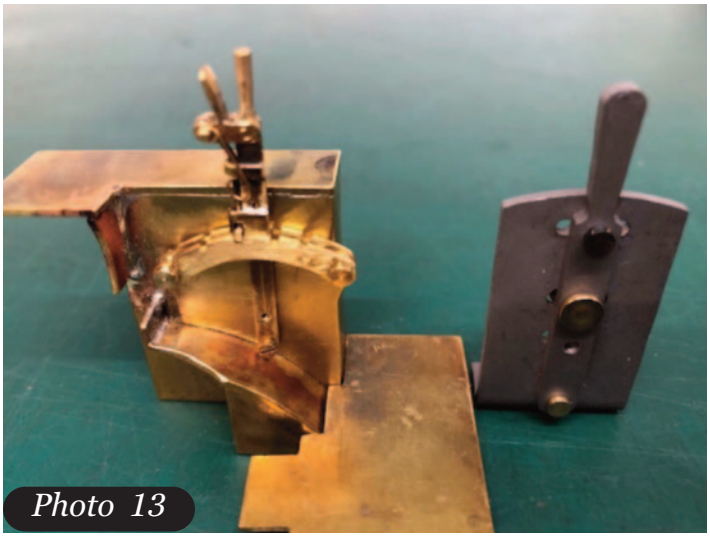


Photo 13

Chimney enhancements

The chimney as supplied has more or less the right profile but has a very narrow bore and no lifting holes. It was relatively simple to bore out the chimney and to add the four lifting holes, (**Photo 14**), very characteristic of this particular Drummond chimney. The chimney supplied by Accucraft had a step between the base and the main body. This was filled and turned down in the lathe.

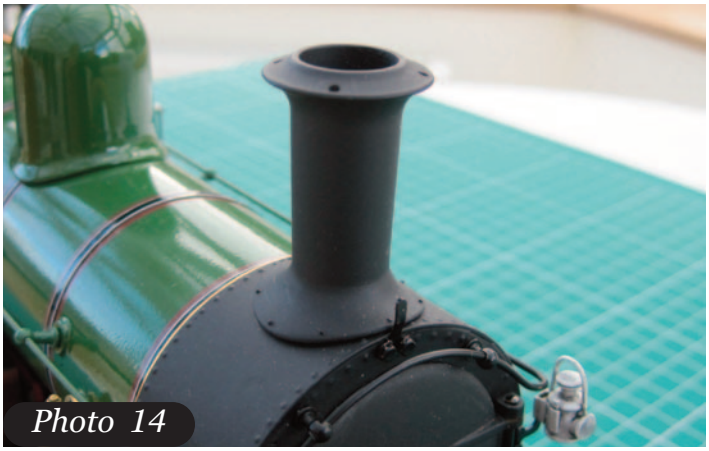


Photo 14

Draw filing rods

The connecting and coupling rods were draw filed to produce a more prototypical finish, **(Photo 15**.

Photo 16 shows the Dummy sanding pipes, draw filed rods and cylinder drain operating rod in place.


Photo 15

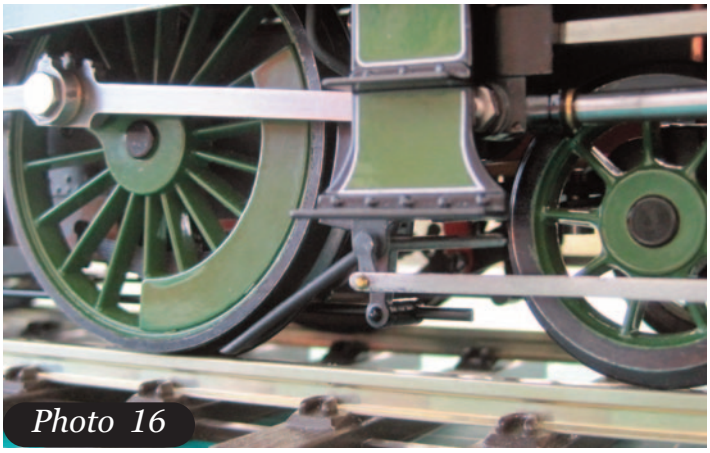


Photo 16

Passenger Stock

"Custom Carriages" supplied a rake of the lovely coaches that were appropriate for this locomotive in a contemporary livery (**Photo 17**). During the first years of the 20th Century LSWR coaches were

Photo 17

in Salmon pink and brown, fully lined in red and black.

Other work

During the period when this particular livery was in place (around 1905) the headcodes were changing from various patterns of discs on four lamp irons to combinations of diamonds and discs on six lamp irons. We produced these in sufficient numbers to allow some spares to be hung on the smokebox handrail as was the practice (**Photo 18**).

For many years after they were built, the Radials would have been kept in immaculate condition, with paintwork oiled and polished and brass and copper polished. To that end all the brass fittings were polished for three hours in a tumbler and the supplied brass pipes changed for copper ones. New whistles were turned on the lathe.

Well there you have it; a beautiful model made even better. In our opinion it's one of Accucraft's finest British outline models, and they run as beautifully as they look. At the time of writing they were still available so if you want one snap it up.

Photo 18

Paradise East Steamup 2021

Text by Kendrick Bisset

Photos: K. Bisset*, Scott E. McDonald**

Not Building, But Rebuilding

As many readers here know, Marie Brown has been hosting a steamup at her house, carrying on the tradition started by her husband Ron Brown, founding editor of *Steam in the Garden*.

This year, on July 9, she emailed Norm Ishler that there had been some damage to the track, and she was afraid that the gathering would have to be canceled (again).

Above: An errant lawn mower caught the edge of the trackbed, bending the aluminum composite material and attached track, and ripping the rails from the ties. — Marie Brown Photo

Norm and I have been helping with repairs to the track, so Norm forwarded the picture to me. On Monday July 10, I was able to make a quick trip to assess the damage. It appeared that with a bit of work the damage could be repaired, if Marie was still interested in hosting the steamup. An unequivocal 'yes' led to 'a little work.' The damaged track and piece of Dibond was removed. Back at the Bisset home, materials were ordered from Sunset Valley, and the Dibond was straightened.

New tie strips, rail, and rail joiners arrived on the 24th. Meanwhile, some of my family had arrived to spend a little time with us. On July 26, our grandson William Tollett joined me in a day trip to Newark Valley to repair the track, and Norm and Steve Vaughan met us there. Intense work over a few hours led to an apparently good, smooth track. The Steamup would proceed as scheduled!

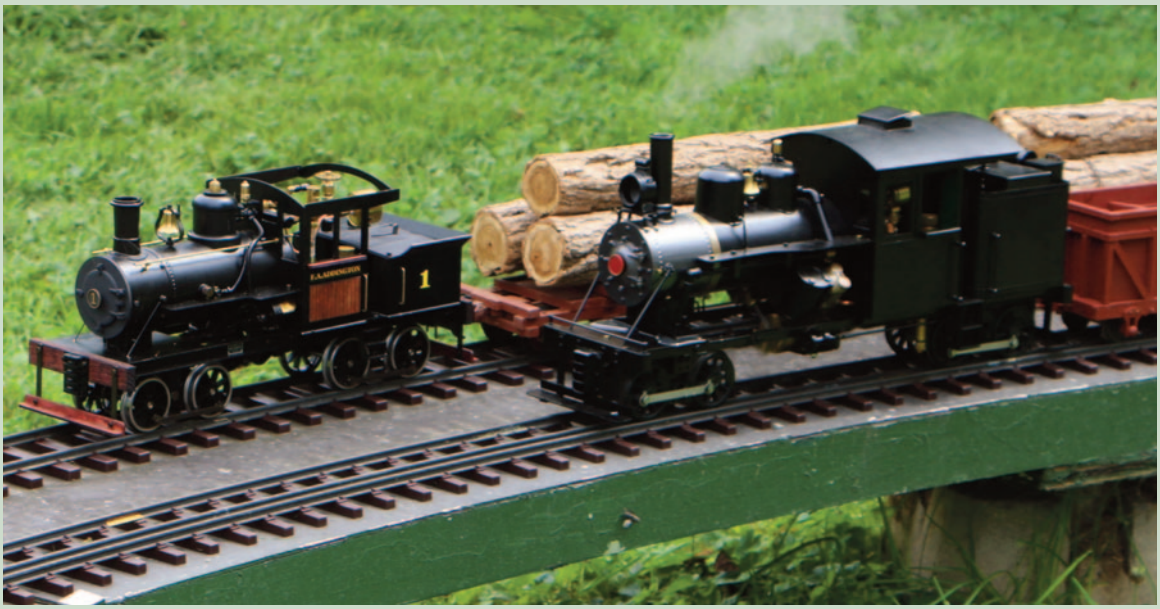
On August 19, Norm and I met at Marie's to do our usual pre-steamup tweaks, though with a few additional tasks. The two wood bumping blocks had rotted (one completely), and needed replacement. A few additional supports were added on the curved track sections, too. The track was leveled, and one support was shimmed. A couple of rail clamps that had been broken as the track was being adjusted were replaced.

As this was being written, trains were steaming, apparently happily, on the rebuilt track.

*Above: (l) Norm Ishler and (r) William Tollett working on the replacement of ties.**

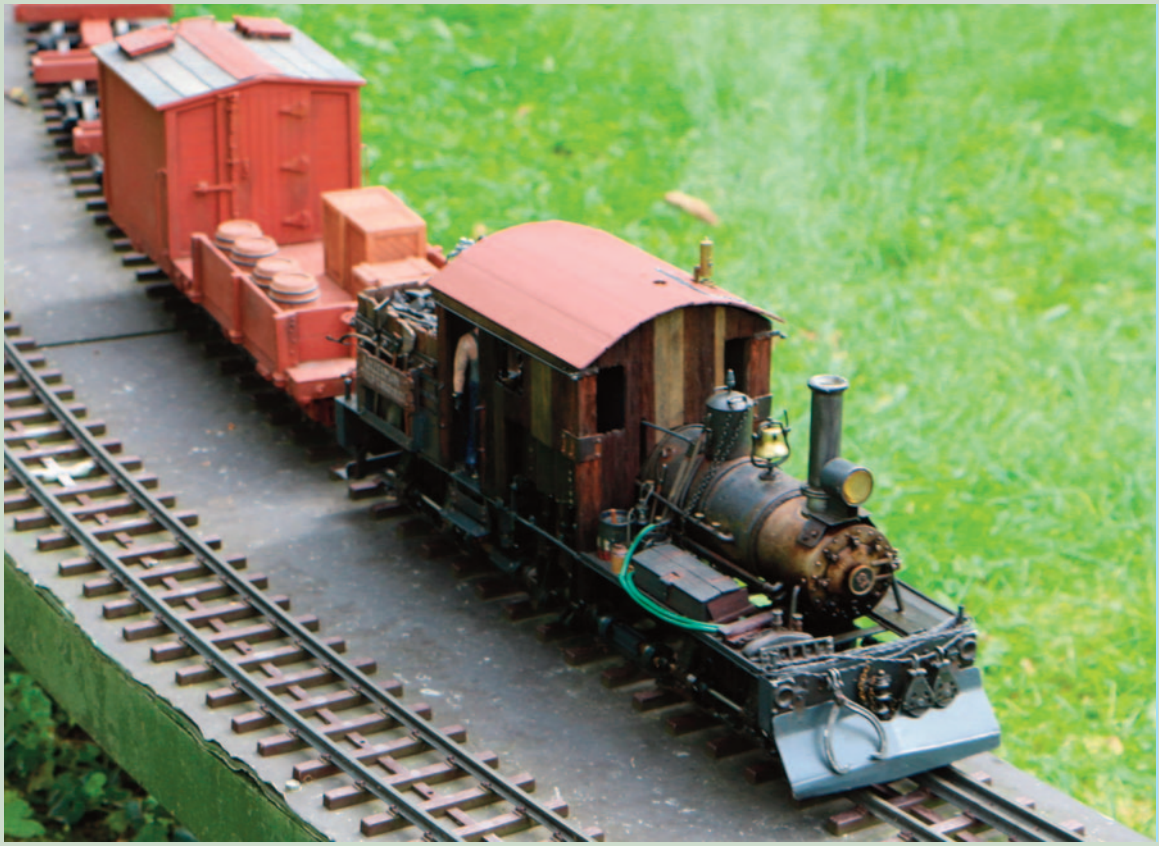
Left: (l-r) William, Steve Vaughn, Marie, Kendrick and Norm pose with the rebuilt section, ready to start steaming! — William Tollett Photo

*Right: Kendrick's East Broad Top Mikado in full steam pulling a PRR standard gauge box car with narrow gauge trucks, as was the practice of the EBT.***



*Left: Harvey Campbell's Regner Heisler being passed on the inside track by Scott McDonald's Freelance Heisler from the 2019 build series.***

*Right: Tom Bowdler's heavily detailed Accucraft Shay getting a smooth run in and over the new section of track.***



*Above: Harvey Campbell of Connecticut putting the finishing touches on his portable track which provided for more steaming opportunities.***

*Above: Lots of activity under the tent prepping locomotives. Only a small amount of light rain tried to dampen spirits, but we persevered!***

Bob's Bit's

Weekend Projects for Steamers
by Bob Sorenson
Photos & CAD by Bob Sorenson

Basic Boiler - Part 1

This is the first of a two-part series in which we will build a small Gauge One size boiler. This boiler is the very widely used, single flue type utilized in smaller butane fired locos such as the "Ruby." A boiler to this particular design was built a few years ago and ended up on one of my small single cylinder oscillator engines.

Photo 1 shows two completed examples. The three bushings along the top are for a safety valve, steam outlet and boiler fill. Not shown, underneath, are two mounting studs. The front of the smokebox has a decorative, non-functioning smokebox ring and door assembly that was finished later.

In the last issue of "Steam in the Garden" (September/October 2021, No. 175) we had a detailed discussion of silver soldering. Please refer back to that article. The boiler is all silver soldered construction using "Safety Silv 56", BAg-7 solder with Harris brand "stay-silv" flux, and the Sievert propane torch with the #2943 (medium) tip.

Construction starts by turning the bushings, shown in **Photo 2**. These are from bronze, either alloy 932 or 936. This bronze is often referred to as "bearing bronze". Any bronze is satisfactory, however bearing bronze is the friendliest to machine.

I decided to get with "modern tech" and try CAD. **Figure 1** shows my first ever CAD drawing, of the safety/steam/fill bushing. Substitute the 5/16-inch x 40 thread as needed for the job. Any thread under 5/16-inch or 8mm will fit this bushing.

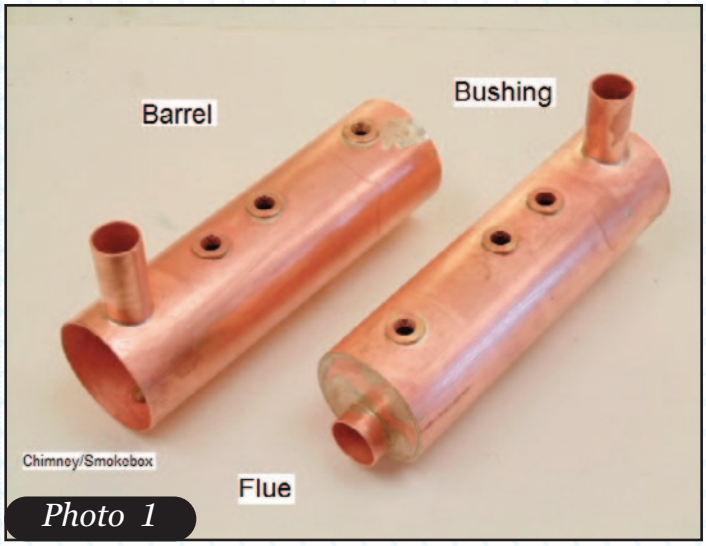


Photo 1

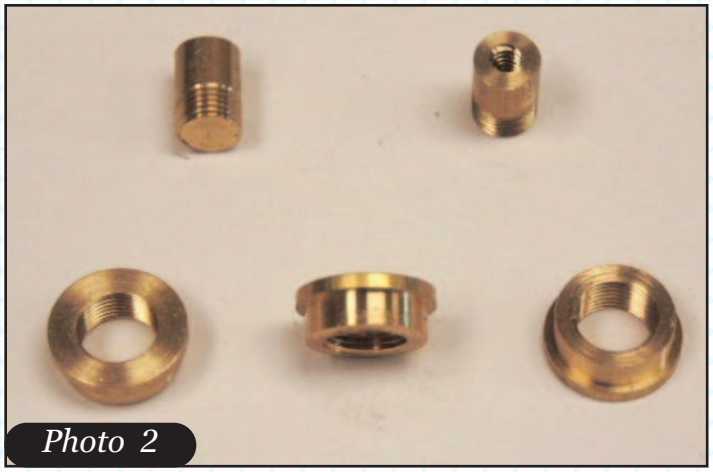


Photo 2

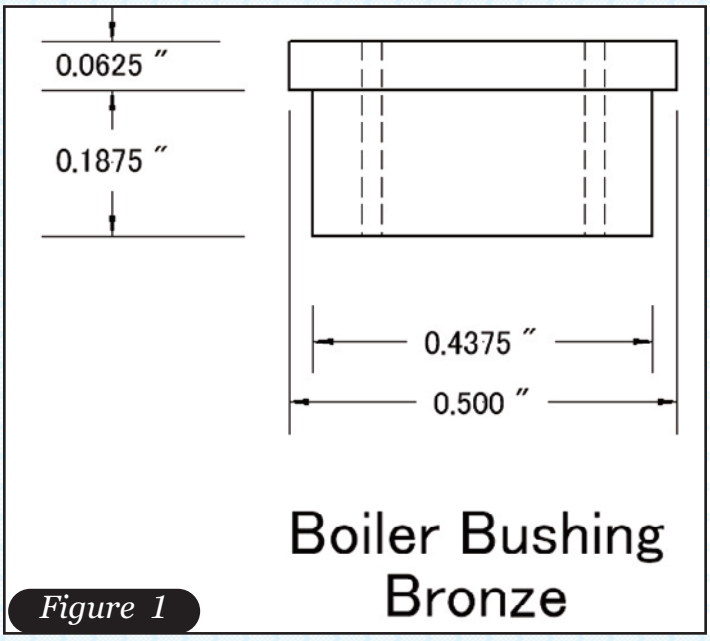


Figure 1

Next is the main boiler barrel, shown in **Photo 3**. This barrel is 1-3/4-inch diameter by about five inches in length. One option for the barrel is copper tubing, as was used for this build. Copper tubing comes in precise diameters and wall thicknesses. Tubing is available from McMaster-Carr, and is sold by the foot. Another option is standard copper plumbing pipe. Plumbing pipe comes in "nominal" sizes. For this boiler, use 1-1/2-inch pipe (actual diameter 1-5/8-inch) with "Type M" wall thickness (0.049-inch). Be very careful drilling the bushing and chimney holes. Copper is very grabby and unforgiving. Use a drill press, at low speed, with a vise and a multi-diameter drill as shown in **Photo 4**.


Photo 3

The center flue, **Photo 5**, is standard three-quarter inch copper plumbing pipe. The flue is enhanced with several one-eighth inch diameter copper "porcupines" that project from the inside of the flue into the water space. After soldering the flue assembly, very carefully examine it. If the porcupines leak, there is no way to fix them once the boiler is fully assembled. A good look with a magnifying glass will spot any leaks.

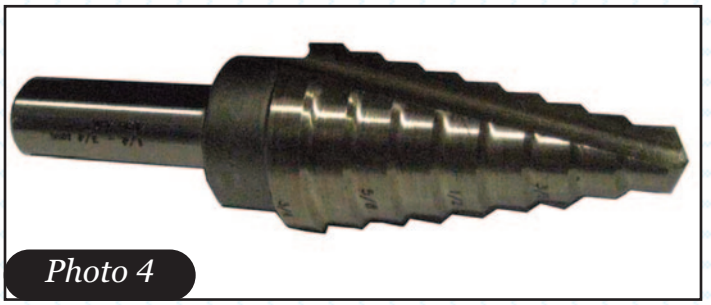


Photo 4

The final parts to fabricate are the end plates, **Photo 6**. These are from 1/16-inch thick copper sheet. Cut, file and size them for a nice sliding fit on the outside of the flue and the inside of the boiler barrel.

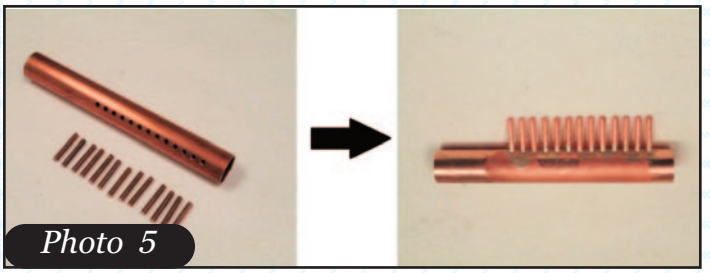


Photo 5

In the next installment, we'll solder the boiler together and test it. But before closing out here, let's discuss some safe boiler design considerations.

Safe boiler design is paramount. A very helpful source is the recommended practice from the Australian Miniature Boiler Safety Committee (AMBSC). The whole AMBSC code is in several parts. Part 3, "sub miniature", applies to boilers of this size. AMBSC Part 3 classifies boilers as

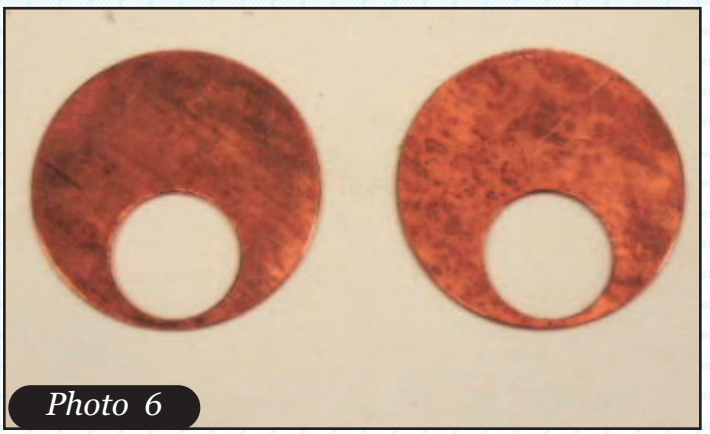
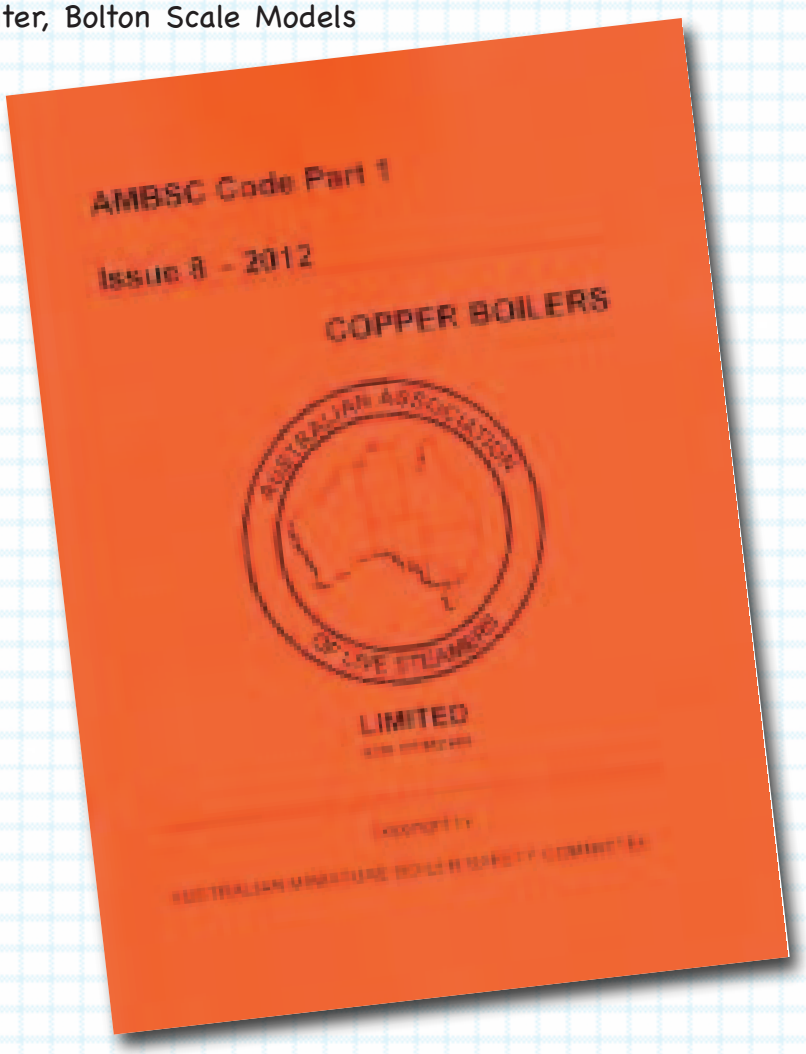


Photo 6

either Low Pressure (29 PSI max) or Medium Pressure (75.4 PSI max). Our boilers generally operate in the 40 to 50ish PSI range, so medium pressure. In a nutshell, AMBSC Part 3 specifies boiler barrel wall and endplate thicknesses. Barrels up to 60mm dia must have a wall thickness of at least 0.91mm. From 60mm to 77mm (max dia allowed) the wall thickness is at least 1.2mm. For flat endplates on boilers up to 51mm dia, use at least 1.6mm material. For barrels between 51mm and 77mm, use 2.0mm material. Part 3 calls for silver solder construction throughout with at least 15 percent silver content. Use only copper or bronze bushings. AMBSC Part 3 has very little specification for low pressure boilers. In Australia, low pressure boilers are mostly governed by local club inspector determination. If interested in more, the AMBSC practices are available from E&J Winter, Bolton Scale Models in Australia https://ejwinter.com.au/products/ambsc-boiler-codes?_pos=1&_sid=7416db3b8&_ss=r).

See you next time.

AMBSC Boiler Codes



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$119/Car

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RTR $5250

D&RGW C-18
1:20.3, Butane Ceramic
$3095-$3395

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Kit $1249, RTR $1499

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Kit $559, RTR $599

Jackson & Sharp Coach
1:20.3, Ball Bearing Trucks, Lighting
$295/Car

Drop Bottom Gondola
1:20.3, Plastic Body, Metral Trucks
$220/Car

3-Bay Hopper
1:20.3, Plastic Body, Metral Trucks
$150/Car

Box Car
1:20.3, Plastic Body, Metral Trucks
$170/Car

Wheel & Tie Car
1:20.3, Plastic Body, Metral Trucks
$150/Car

Gondola
1:20.3, Plastic Body, Metral Trucks
$140/Car

Open Ended Gondola
1:20.3, Plastic Body, Metral Trucks
$140/Car

Long Logging Car
1:20.3, Plastic Body, Metral Trucks
$110/Car

“Talyllyn” Railway 0-4-2ST
1:19, Butane Fired
RTR $1700

Quarry Hunslet 0-4-0T
1:19, Butane Fired
RTR $1600

‘Cranmore’ Peckett
1:19, Butane Fired
RTR $1795

War Dept Hunslet 4-6-0
1:19, Butane Fired
RTR $1900

Emma 0-4-4
1:13.7, Butane
RTR $1095

Forney SR&RL & WW&F
1:13.7, Butane or Coal
Butane $3200, Coal $4200

2-4-0 7.5” Gauge Ride-on
2.5” Scale, Coal Fired
Kit $12,000 RTR $18,000

Decauville 0-4-0T
1:13.7, Butane Fired
RTR $1650

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THE WORLD'S LARGEST STORE FOR MODEL STEAM TRAIN SUPPLIES

ACCUCRAFT · ASTER HOBBY · MAXITRAK · J&M MODELS · ARGYLE LOCO WORKS · AMS

USRA Mikado Light
1:32, Alcohol Fired w/ 6 Free Cars
Kit $3900, RTR $5000

GWR 43xx 2-6-0
1:32, Butane, Green and Black
Kit $2695, RTR $2895

Chinese QJ-Class 2-10-2
1:32, Butane Fired
RTR $4500, Electric $4150

DeutscheReichsbahn BR38
1:32, Alcohol Fired
DB/DR RTR $5400

GWR 43XX
1:32, Butane Fired
Kit $2695, RTR $2895

Kerr Stuart 'Victory'
1:32, Butane Fired
RTR $1100

"Train Bleu" CIWL Sleeper
1:32, Brass
$950/Car, $3800/Set of 4

Japan National Railway
1:32, Coach and Observation
Coach Kit $680, Obs RTR $1545

40' Reefer Car
1:32, Plastic Body, Metral Trucks
$119/Car

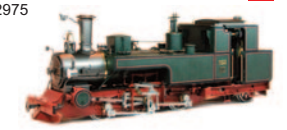
AAR Box Car
1:32, Plastic Body, Metral Trucks
$119/Car

C&O Steel Caboose
1:32, Brass
$450/Car

Pennsylvania Caboose
1:32, Brass
$499/Car

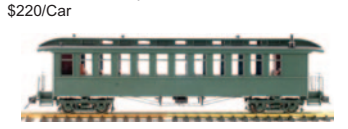
Dora 0-4-0T
1:20.3, Butane Fired
Black, Maroon, Blue & Green
RTR $499

Saxonian IIIK
1:20.3, Butane Fired
RTR $2975



Jackson & Sharp Combine
1:20.3, Ball Bearing Trucks, Lighting
$295/Car

Jackson & Sharp Coach
1:20.3, Plastic Body, Metral Trucks
$220/Car



40' Reefer Car
1:20.3, Plastic Body, Metral Trucks
$119/Car

Tank Car
1:20.3, Plastic Body, Metral Trucks
$160/Car

Flat Car
1:20.3, Plastic Body, Metral Trucks
$140/Car

Logging Disconnects
1:20.3, Plastic Body, Metral Trucks
$120/Car

Short Logging Car
1:20.3, Plastic Body, Metral Trucks
$120/Car

Short Flat Car
1:20.3, Plastic Body, Metral Trucks
$70/Car

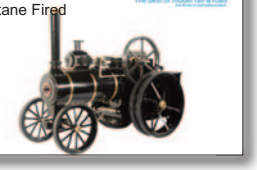
Iron Mountain Car
1:20.3, Plastic Body, Metral Trucks
$60/Car

Short Caboose
1:20.3, Plastic Body, Metral Trucks
$170/Car

Lawley 4-4-0
1:19, Butane Fired
TBA

Sentinel DG6 Lorry
1" Scale, Butane Fired
RTR $1580

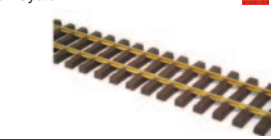
Allchin
1.5" Scale, Butane Fired
RTR $3800



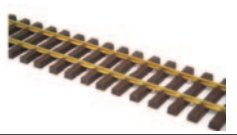
Fowler Ploughing Engine
1" Scale, Butane Fired
RTR $5295

Kerr Stuart 'Wren' 0-4-0ST
1:13.7, Butane Fired
RTR $1775

Code 250 Rail
Brass Rail System



Code 332 Rail
Brass and Alum Rail System



West Coast 1" Rail
Steel, Rail System

Freelance Consolidations Part Six

Text, Photos & Drawings by Les Knoll, PE

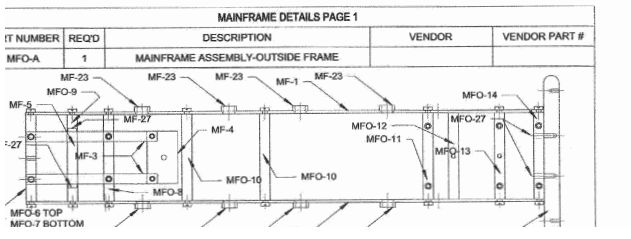
TENDER

We have come to the final installment of our Consolidation project. The tender is the final portion of the construction of the basic locomotive, and the optional radio control gives the operator the added bonus of a remote control for ease of use on ground based railroads and for operations and switching; something this locomotive is quite good at!

The previous section on cab fabrication gave you a taste of the sheet metal work involved in the body cosmetics of locomotive building. You will be honing these skills even further with the construction of the tender. As with previous segments of the project, the major tender components can be purchased pre-cut from Denver Waterjet in Denver, North Carolina. A set of parts available from Denver Waterjet along with rivet punching templates is shown in **Photo 6-1**. Denver Waterjet has cutting data on file for TN-6 through TN-10. Other parts are bar stock, non-sheet metal components or sheet stock components easily cut from brass stock available at a local hobby shop or McMaster Carr and K&S.

Freelance Consolidations Construction Series

- Part 1 - Intro & Mainframe
- Part 2 - Lower works
- Part 3 - Smokebox
- Part 4 - Plumbing, Boiler and Steaming Accessories, Steam Test
- Part 5 - Cab and Sheet Metal, R/C
- ➲ Part 6 - Tender & Radio Control



Editor's note; All drawings for both versions are available online at www.steamup.com After logging in with your User Registration, (free), follow the "Workshop Plans" menu.

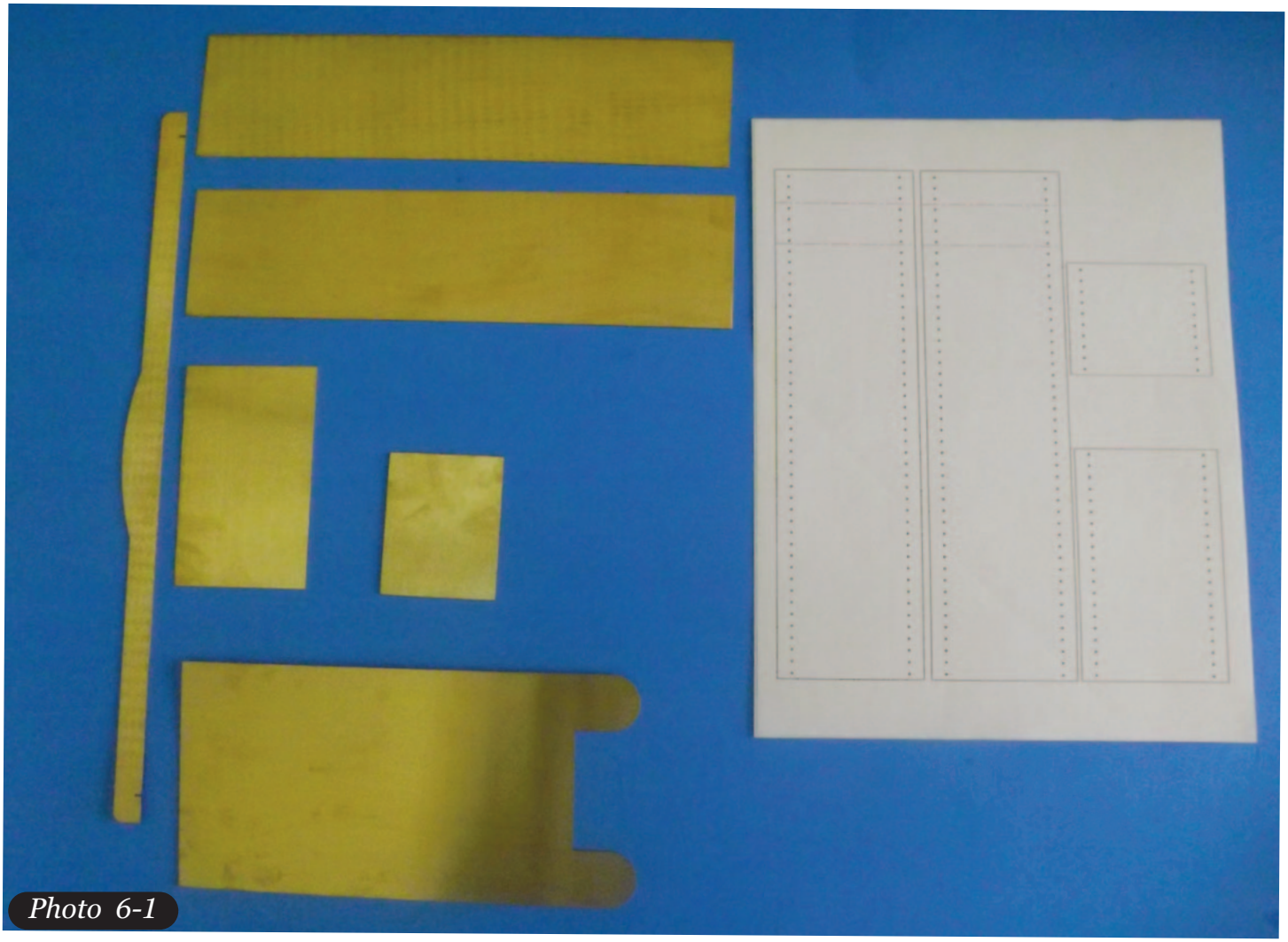


Photo 6-1

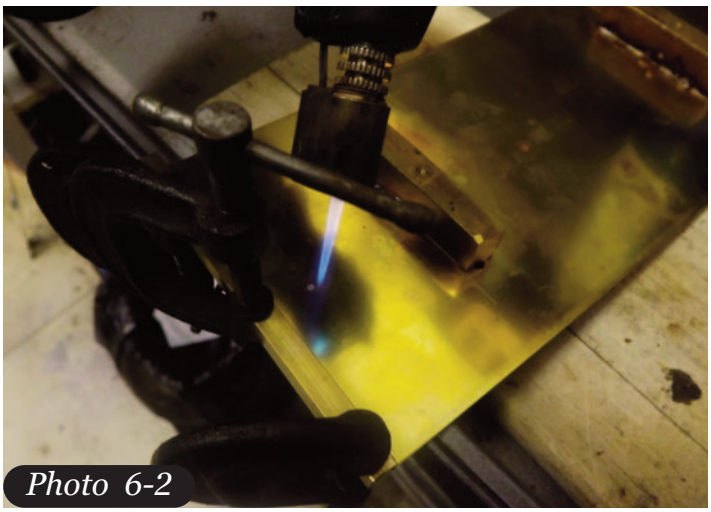


Photo 6-2

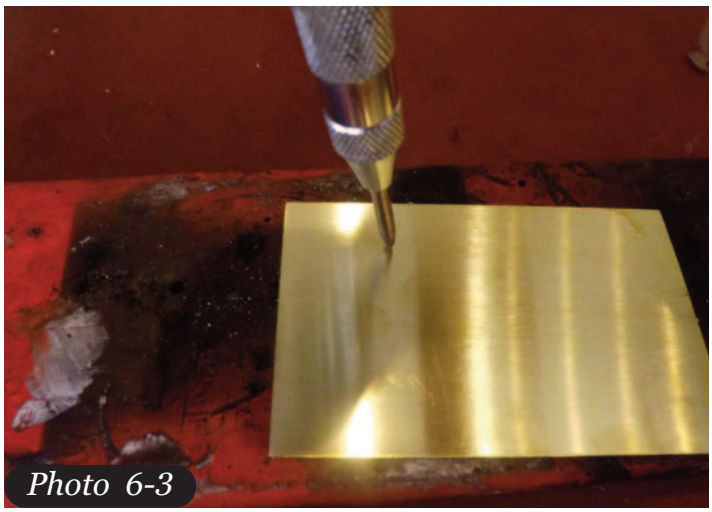


Photo 6-3

The tender consists of two major assemblies: the base, Assembly TN-16 **(Figure 6-7)**, and the shell, Assembly TN-17 **(Figure 6-8)**. All assemblies are torch soldered using the smallest torch that will satisfactorily do the job. I have used the Bernz-O-Matic butane fueled hobby torch on this project, and on the sheet metal work on all my scratch built steamers. You can see it in action in **Photo 6-2**.

Base TN-16 is built up on a 4.00-inch x 9.25-inch piece of sheet brass. The 4.00-inch wide sheet available from K&S requires only a length cut to fabricate. Other brass components are torch soldered to the edges of this sheet to essentially frame out the base and reinforce it structurally. Components can be individually clamped then soldered as shown in **Photo 6-2**. Be sure to align the holes in

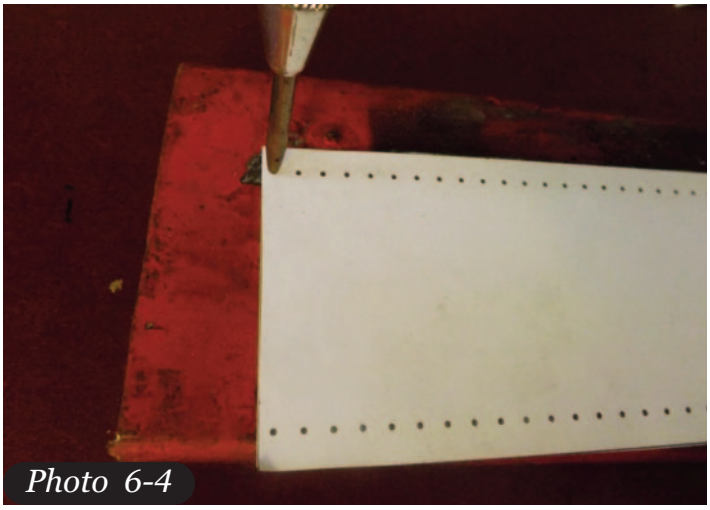


Photo 6-4

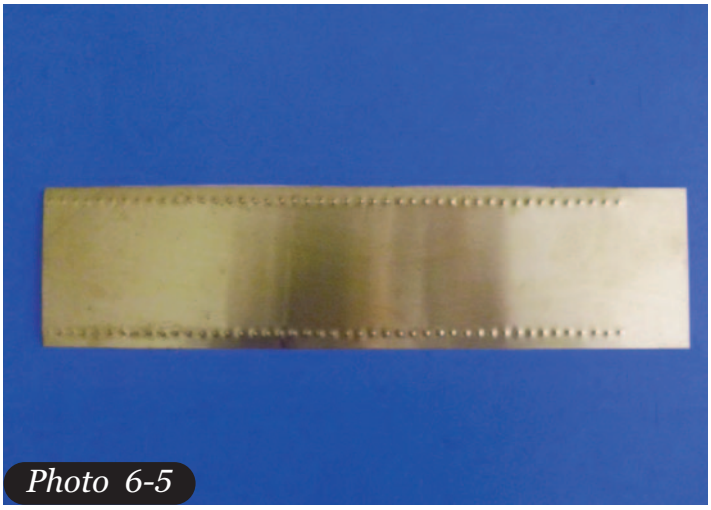


Photo 6-5

TN-3 with those of TN-1 before soldering TN-3 in place. It is best to tack solder TN-3, TN-4 and TN-5 in place then make short joints alternating from end to end to avoid problems with excess expansion. Use just enough heat to melt the solder onto both parts and try for a smooth even bead. (See **Figure 6-1**.)

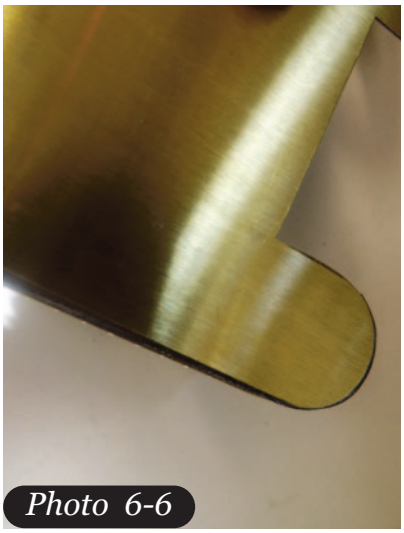


Photo 6-6

The bolsters TN-2 are attached with whatever screws are used to attach your trucks. These screws are removed after soldering the bolsters and used to mount the trucks. Be sure to tap the bolsters TN-2 to match the screws of whatever trucks you are using! The M3 tap shown in the drawing matches up with the Accucraft trucks used here, yours may be different if you choose different trucks.

The tender shell TN-17 is the most challenging sheet metal assembly in the entire project. The tender sides TN-6 are first cut to size (or purchased pre-cut from Denver Waterjet), then rivet detail is added in the same manner as was done for the smokebox. Rivets are best punched with a spring loaded center punch which gives a repeatable punch force. To determine the correct punch adjustment for the desired rivet depth, use a test piece of the same thickness (in this case, 0.016-inch) as the sheet to be punched. Start with a low setting on the punch and increase punch force until the desired rivet size is obtained (**Photo 6-3**). Using

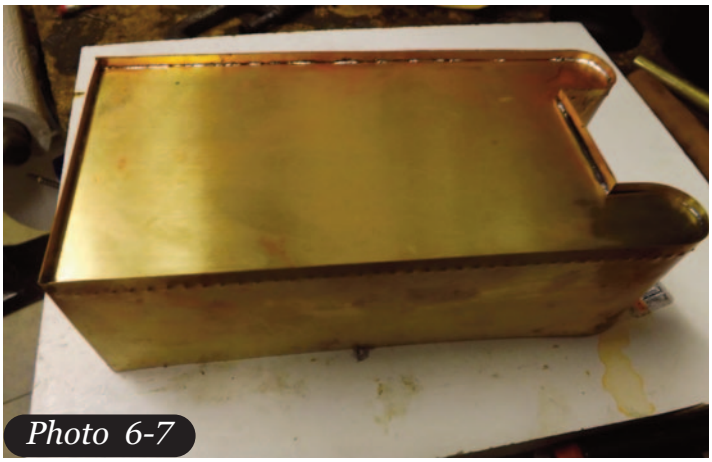


Photo 6-7

the full size templates on Tender Details Page 2 (**Figure 6-2**), transfer the rivet pattern to both TN-6 pieces as shown in **Photo 6-4**. A completed in-the-flat TN-6 is shown in **Photo 6-5**. The same riveting process will apply to TN-7.

When the rivet detail is complete, roll the end of TN-6 with the rivet detail on the outside, opposite to the side on which the rivets were punched. **Figure 6-2** contains a full size rolling template. Rolling is best done over a wooden dowel or mandrel somewhat smaller than the desired radius. I used both a 3/8-inch dia. dowel and 1/2-inch dia. dowel to roll the 0.483-inch radius called for on the drawing. The design of the tender deliberately includes that 0.625-inch straight section before the radius since common manufacturing processes call for lead-in stock before a roll begins on a sheet. In our case, this lead-in stock is also part of the finished piece. You can check the accuracy of your rolling either with the template on **Figure 6-2** or placing TN-6 directly on TN-9 and checking for fit as shown in **Photo 6-6**.

As with the components on the base, assemble, clamp and tack the two sides TN-6, rear TN-7 and

front TN-8. Start with small solder tacks and make sure parts fit correctly, then gradually apply longer beads, progressing from both ends of each seam evenly to avoid problems associated with thermal expansion. Brass expands a lot when heated, and its effects can be significant with the thin sheets we are working with here. If you have completed a section and are concerned with either expansion or completed solder joints melting, wet rags can be placed over areas you want to be kept cool. Since all soldering on these assemblies is done with a torch, be careful not to get your torch near the rags since, wet or not, they can heat up and catch fire quickly!

Solder the mounting strips TN-13 to the inside of the tender on the underside. In addition to being used to mount the shell to the base, they add some rigidity to the shell assembly. Finally position TN-10 and solder from the inside. A completed shell assembly is shown in **Photo 6-7**. The completed tender is shown in **Photo 6-8**. A piece of black plastic 3.00-inch x 4.375-inch can be placed in the tender as a simulated coal load. Some black PVC plastic sheets have one side with a finish that nearly simulates a coal load. If you want the real thing, get a few lumps of actual coal, and break them up into small pieces. Coat the plastic sheet with JB Weld and sprinkle the coal pieces onto it. Allow the JB weld to cure and you have a genuine coal load.

Tender Assembly TN-0 (**Figure 6-9**) puts the whole thing together. The shell TN-17 is positioned on base TN-16. The four mounting hole locations in the base TN-16 are transferred to the mounting strips in the shell TN-17, drilled #43 (0.089-inch) and tapped 4-40. Four 4-40 x 0.375-inch socket head cap screws are then used to mount the shell to the base.

The tender drawbar TN-12 is a bent and drilled strip with a 4-40 partially threaded screw turned into it then trimmed. The excess thread and head are removed. Note that you could also bend the strip first and put in the holes after the fact. This was a manufacturing process most often used at the first design job I worked at, and I believe it to be sound in a lot of cases. This strip is so thick that you may want to bend it by putting the strip in a vise and pounding it over with a hammer. However, this could distort the part and the hole locations may not wind up where you intended. Consider drilling after bending as an option. The top view of part TN-12 in **Figure 6-6** gives you the information needed to do this. The unthreaded portion of the screw acts as the drawbar coupling pin. You might consider putting thread locker in these threads as the attachment is permanent. The drawbar attaches to the underside front of the tender base.

The trucks used on the prototype tender are Accucraft AP13-015. With their fine brake detail they look exquisite on this tender and are right in period with this locomotive. For now they have been left their original reddish color, but that may change as painting of the model progresses. Other trucks can be used as well, but bear in mind that the mounting screws and hence the tap specifications of bolsters TN-2 may be different, and the coupler mounting may have to be adjusted to maintain NMRA coupler height standards.

The couplers used on the tender are Kadee #779 sill mounts. These are the handiest mounts I have found since you need no space under the lower works or tender base for draft gear. They are sold in pairs, so you might want to make an extra TN-11 coupler mounting plate and attach one to the front bolster of your locomotive as well. All my own locomotives have functional couplers mounted front and rear since I often do switching operations as well as continuous operation. Round 'n' round gets boring after a while.

RADIO CONTROL

Speaking of operation, that brings us to the final segment of this project, installation of radio con-

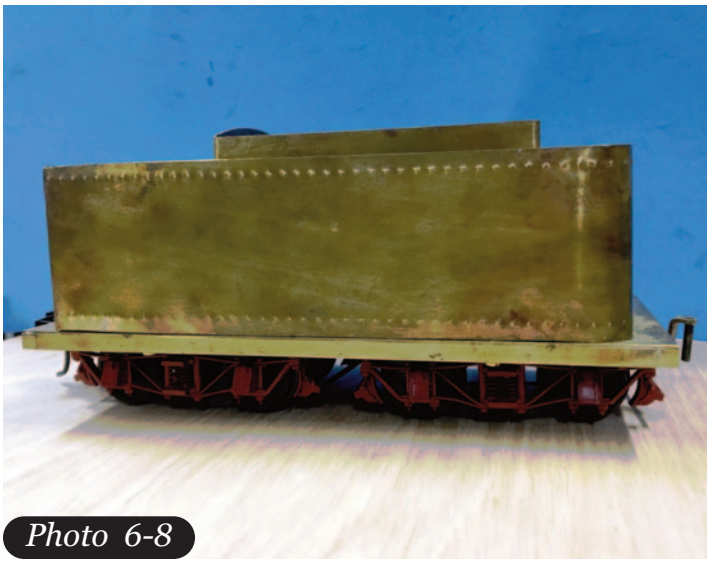


Photo 6-8

TENDER DETAILS PAGE 1				
PART NUMBER	REQ'D	DESCRIPTION	VENDOR	VENDOR PART #
TN-1	1	SHEET, BRASS .030 x 4.00 x 10.00	K&S	253*
TN-2	2	BAR, BRASS, 375 X .500 x 2.00	MCMASTER CARR	8954K194
TN-3	2	TUBE, BRASS, 250 X .250 x 8.750	MCMASTER CARR	8859K46
TN-4	1	SQUARE, BRASS, 250 X .250 x 4.00	MCMASTER CARR	8951K13**
TN-5	1	SQUARE, BRASS, 250 X .250 x 4.00	MCMASTER CARR	SEE ABOVE

* 1/2 FOOT LENGTH COVERS BOTH PIECES
**ORDER 1 FOOT LENGTH FOR TN-4 AND TN-5

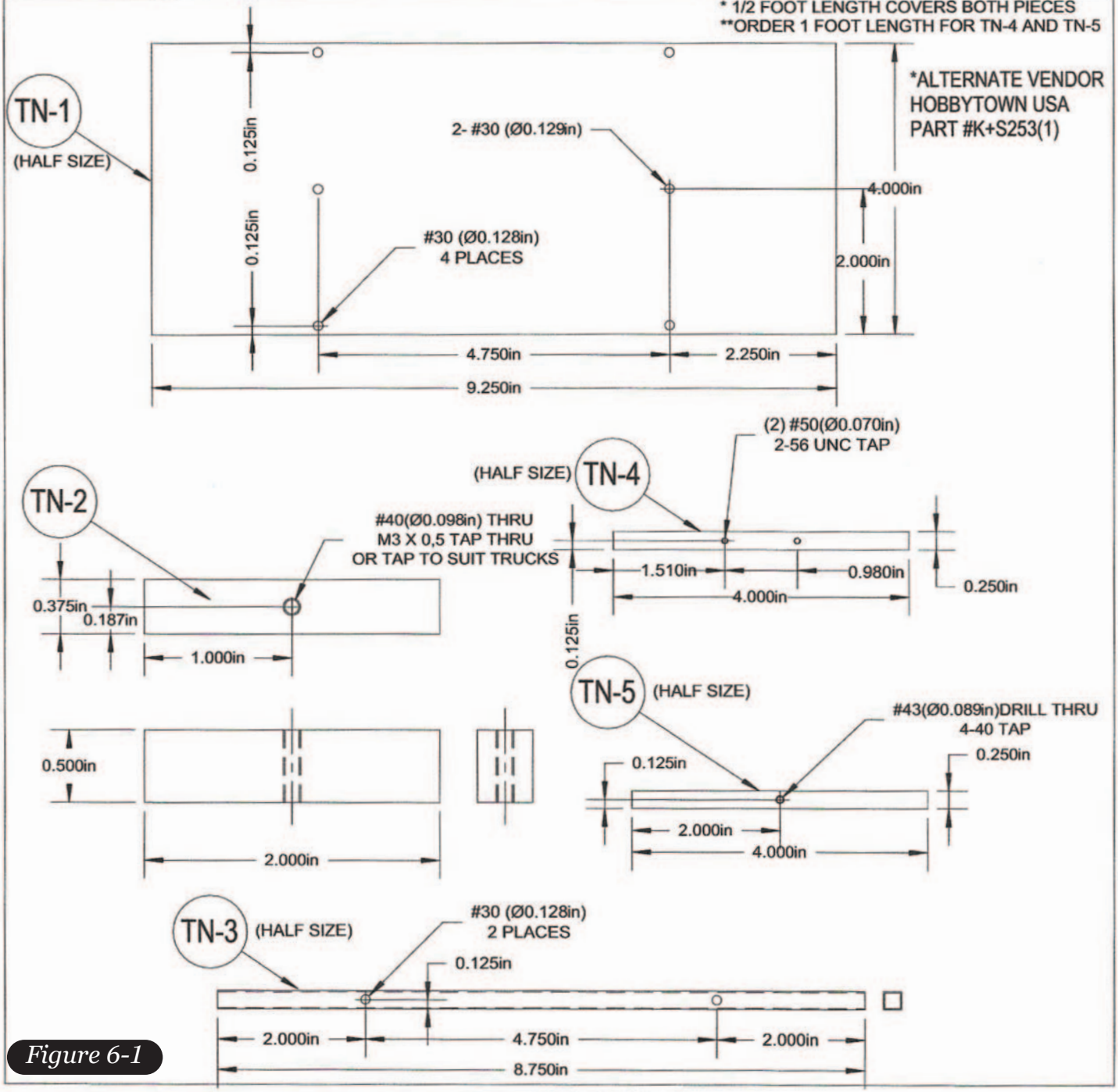


Figure 6-1

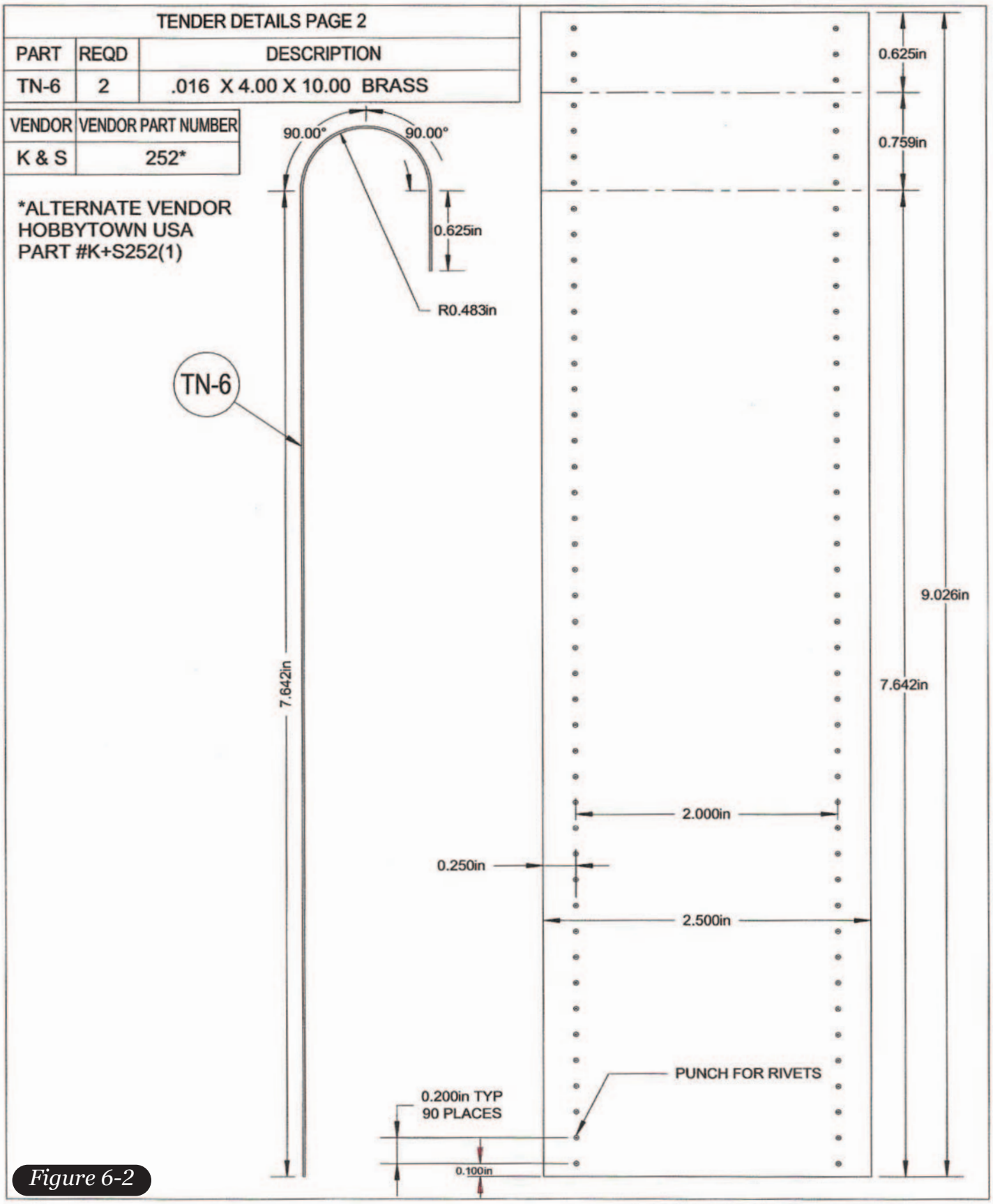
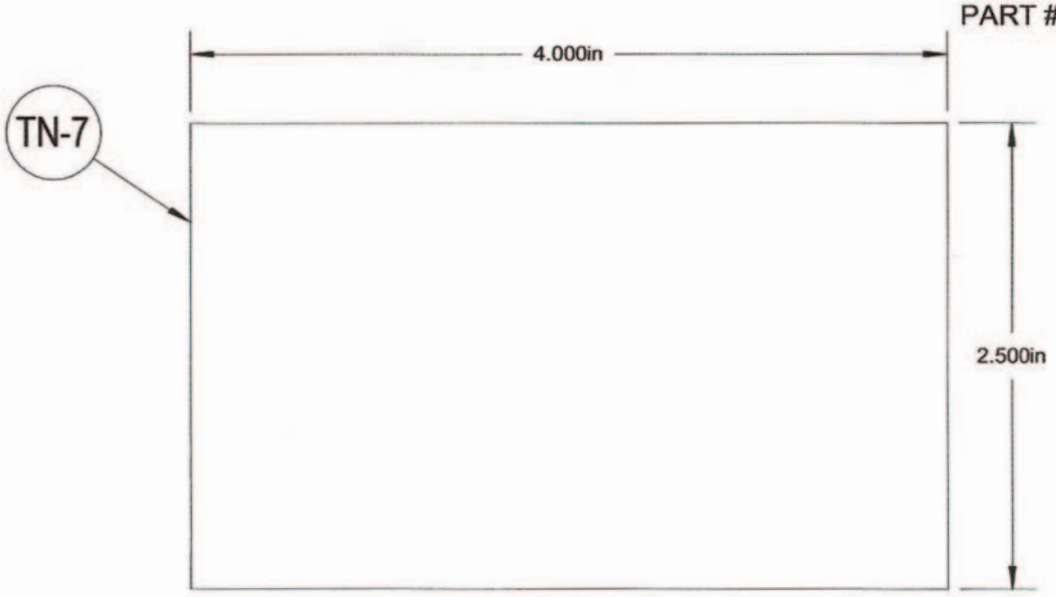

TENDER DETAILS PAGE 2
PART
REQD
DESCRIPTION
TN-6
2
.016 X 4.00 X 10.00 BRASS
VENDOR
VENDOR PART NUMBER
K & S
252*
*ALTERNATE VENDOR
HOBBYTOWN USA
PART #K+S252(1)
90.00°
90.00°
0.625in
R0.483in
TN-6
7.642in
0.625in
0.759in
9.026in
7.642in
2.000in
0.250in
2.500in
PUNCH FOR RIVETS
0.200in TYP
90 PLACES
0.100in

Figure 6-2

TENDER DETAILS PAGE 3				
PART NUMBER	REQ'D	DESCRIPTION	VENDOR	VENDOR PART #
TN-7	1	SHEET, BRASS .016 x 4.00 x 10.00	K&S	252*
TN-8	1	SHEET, BRASS .016 x 4.00 x 10.00	K&S	252*

*ALTERNATE VENDOR
HOBBYTOWN USA
PART #K+S252(1)



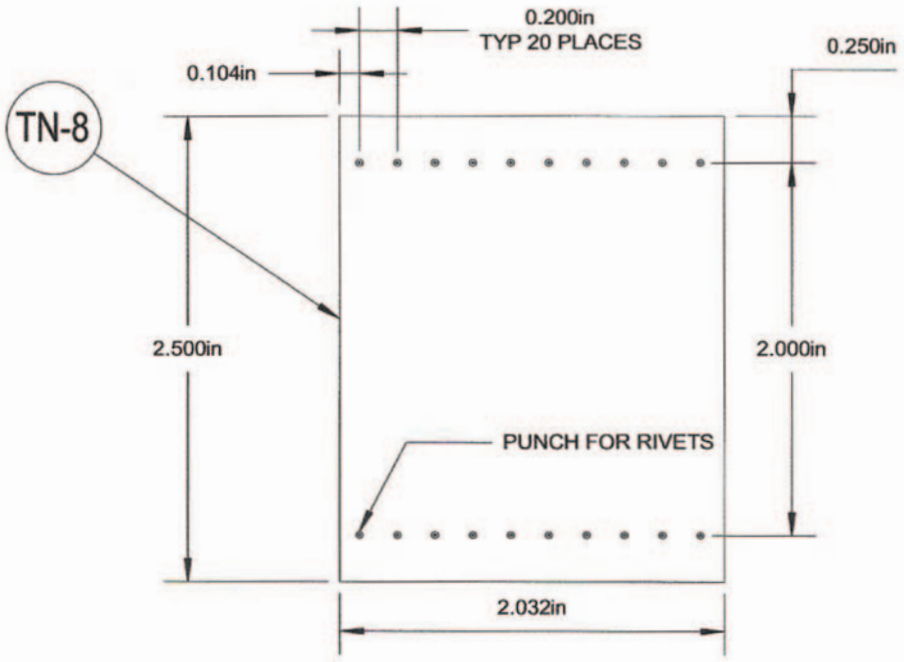


Figure 6-3

trol. Like the choice of trucks and couplers, radio control is a personal choice. It depends on your 'hands-on' preference, your operating preferences, the type (height) of track you operate on, and the condition of your back and knees.

TENDER DETAILS PAGE 4

PART NUMBER	REQ'D	DESCRIPTION	VENDOR	VENDOR PART #
TN-9	1	SHEET, BRASS .016 x 4.00 x 10.00	K&S	253*

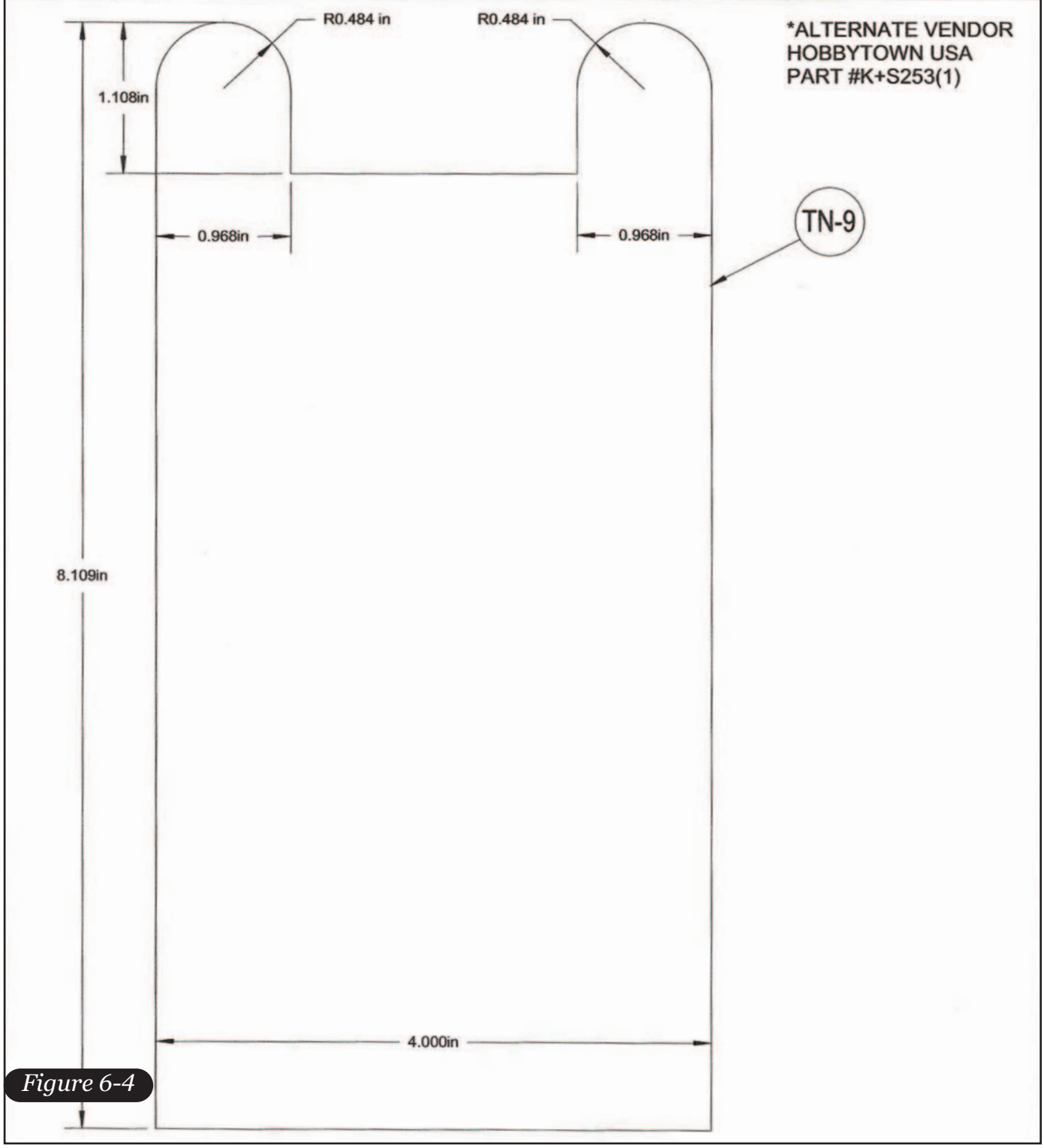


Figure 6-4

This Roundhouse-based locomotive takes to radio control like a duck to water, and whether you know it or not, you have been building a locomotive totally prepared for R/C from the very first installment of this construction. All the holes and mounts for adding R/C components are already in place, now all you must do is add the components. Since all preparations have been made, this is also a decision you can make at any time. There is nothing wrong with running the locomotive manually for a while, then adding R/C at a later date.

TENDER DETAILS PAGE 5				
PART NUMBER	REQ'D	DESCRIPTION	VENDOR	VENDOR PART #
TN-10	1	STRIP, BRASS .016 x .750 x 13.125		

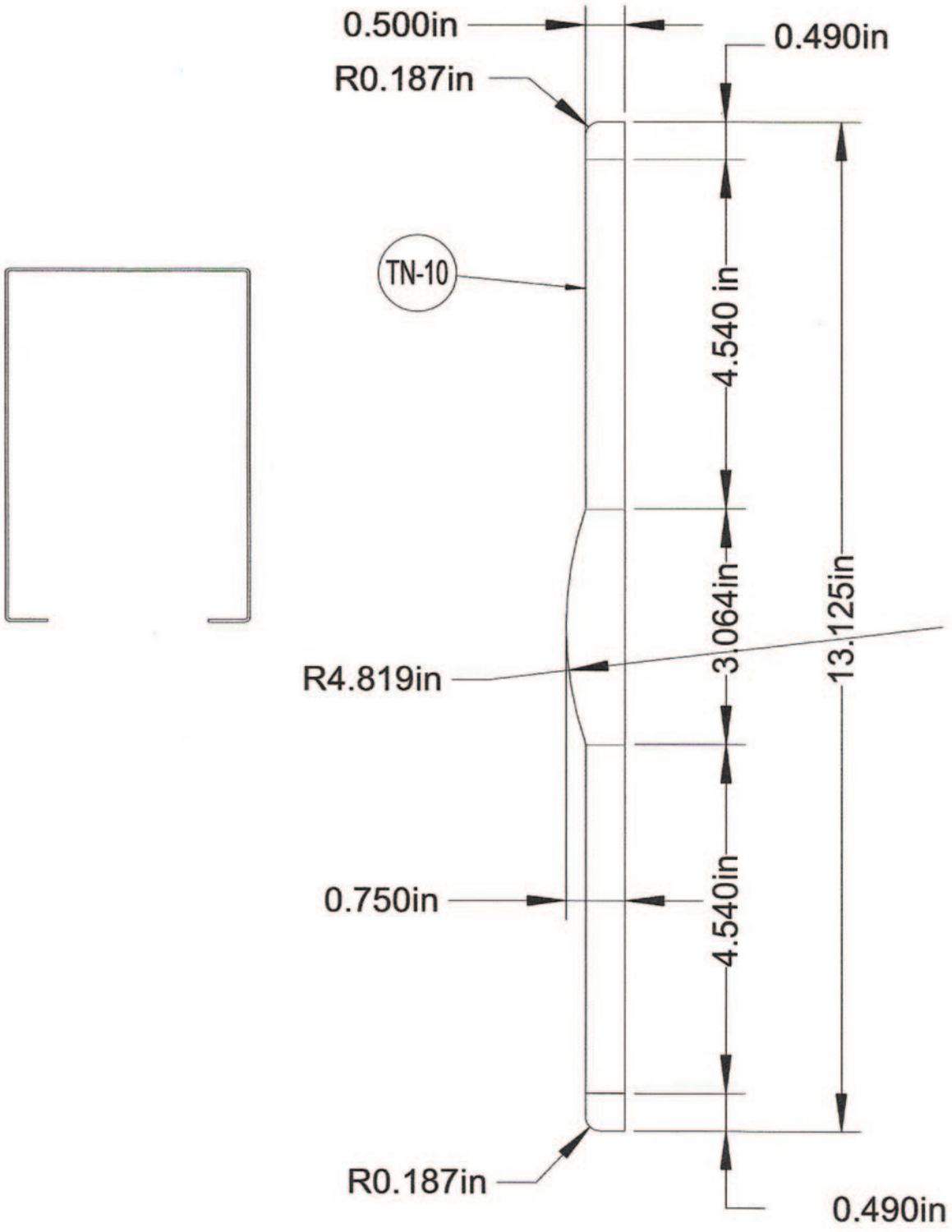


Figure 6-5

TENDER DETAILS PAGE 6				
PART NUMBER	REQ'D	DESCRIPTION	VENDOR	VENDOR PART #
TN-11	1	STRIP, BRASS .016 x .750 x 13.125		
TN-12	1	STRIP, BRASS .060 x .250 x .875		
TN-13	2	STRIP, BRASS .030 x .250 x 7.00		
TN-14	1 PAIR	COUPLER, KADEE SILL MOUNTED	KADEE	779
TN-15	1 PAIR	G SCALE FREIGHT CAR TRUCKS	ACCUCRAFT OR TO SUIT	AP13-015 OR TO SUIT

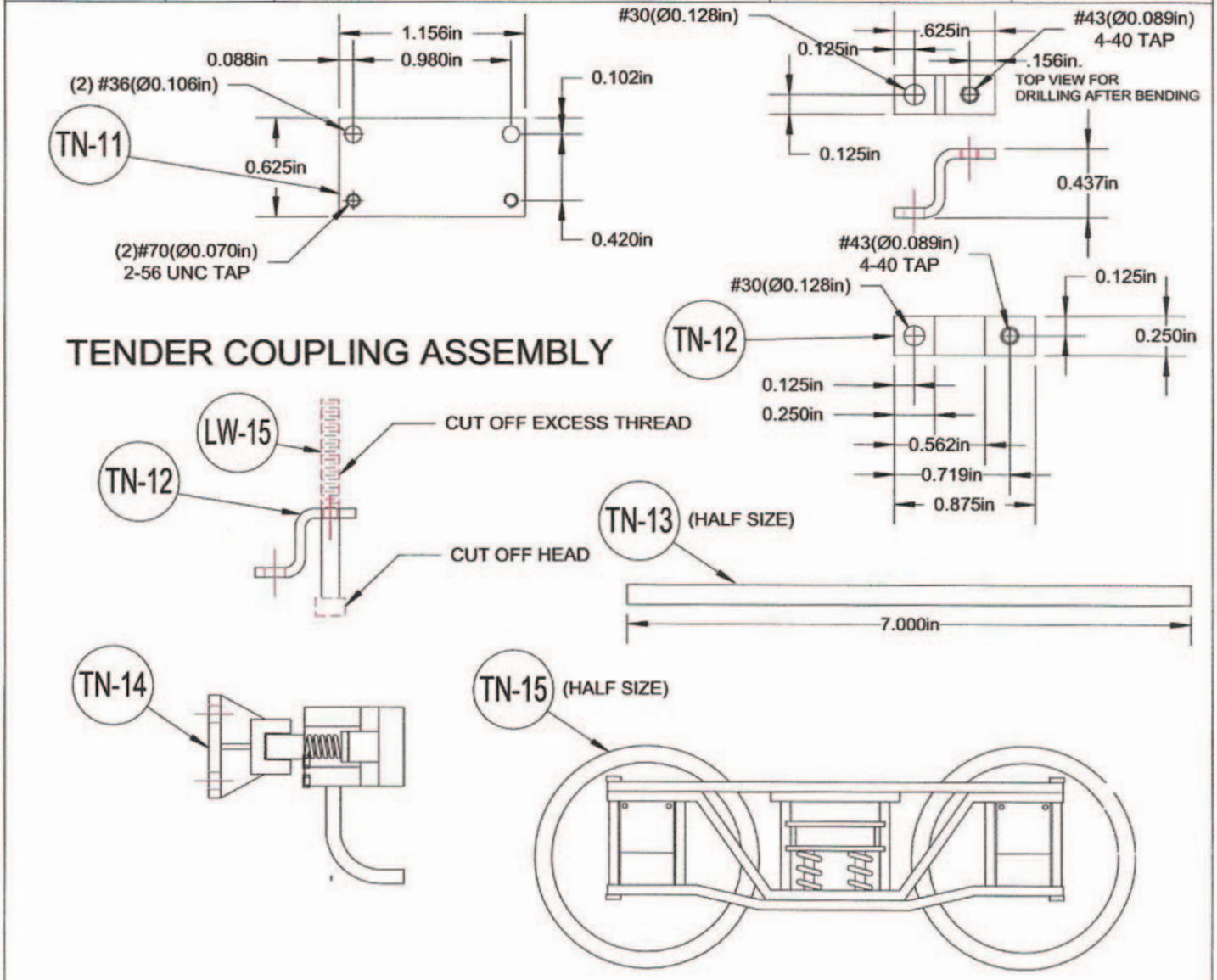


Figure 6-6

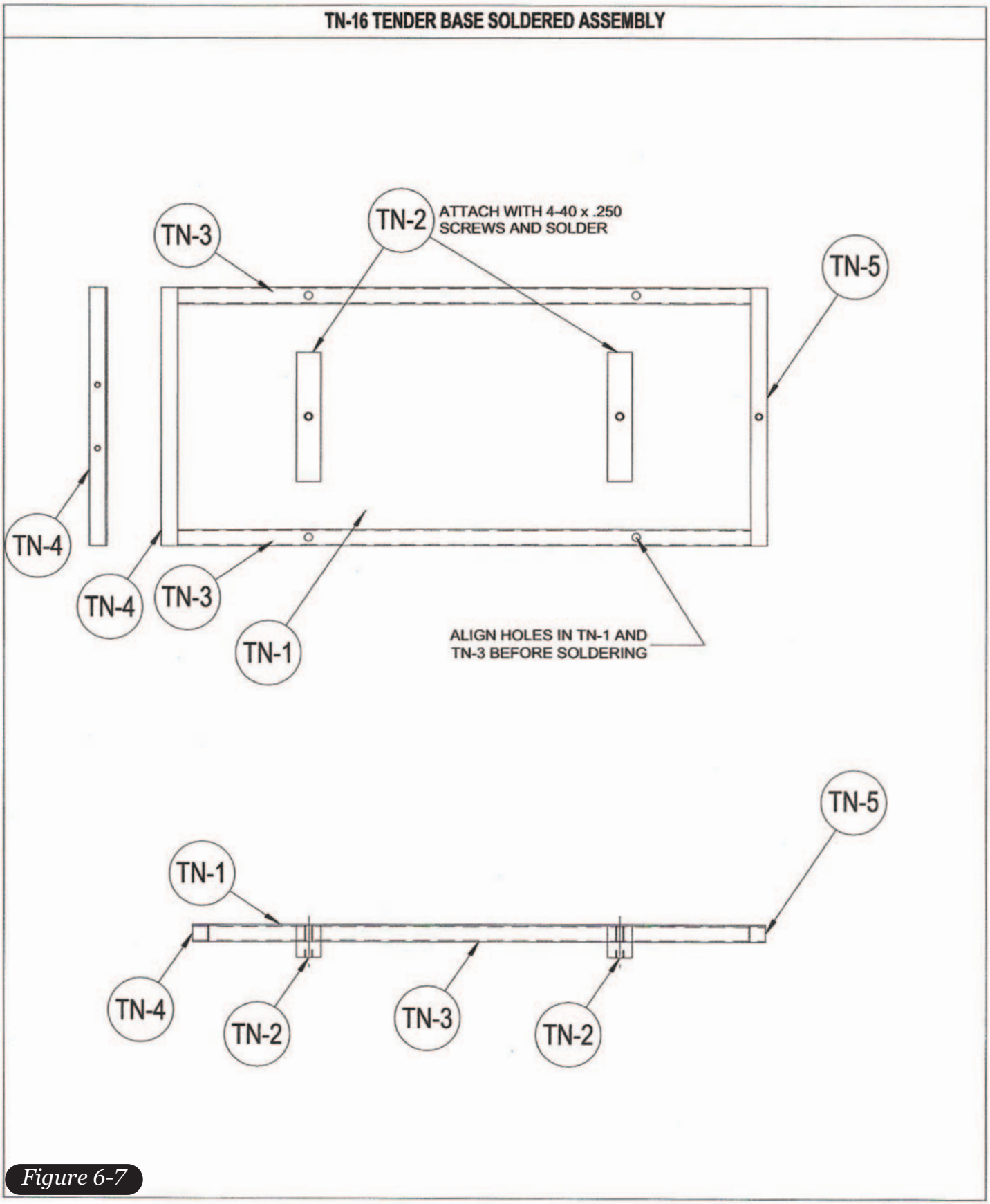

TN-16 TENDER BASE SOLDERED ASSEMBLY
TN-3
TN-2
ATTACH WITH 4-40 x .250
SCREWS AND SOLDER
TN-5
TN-4
TN-4
TN-3
TN-1
ALIGN HOLES IN TN-1 AND
TN-3 BEFORE SOLDERING
TN-5
TN-1
TN-4
TN-2
TN-3
TN-2

Figure 6-7

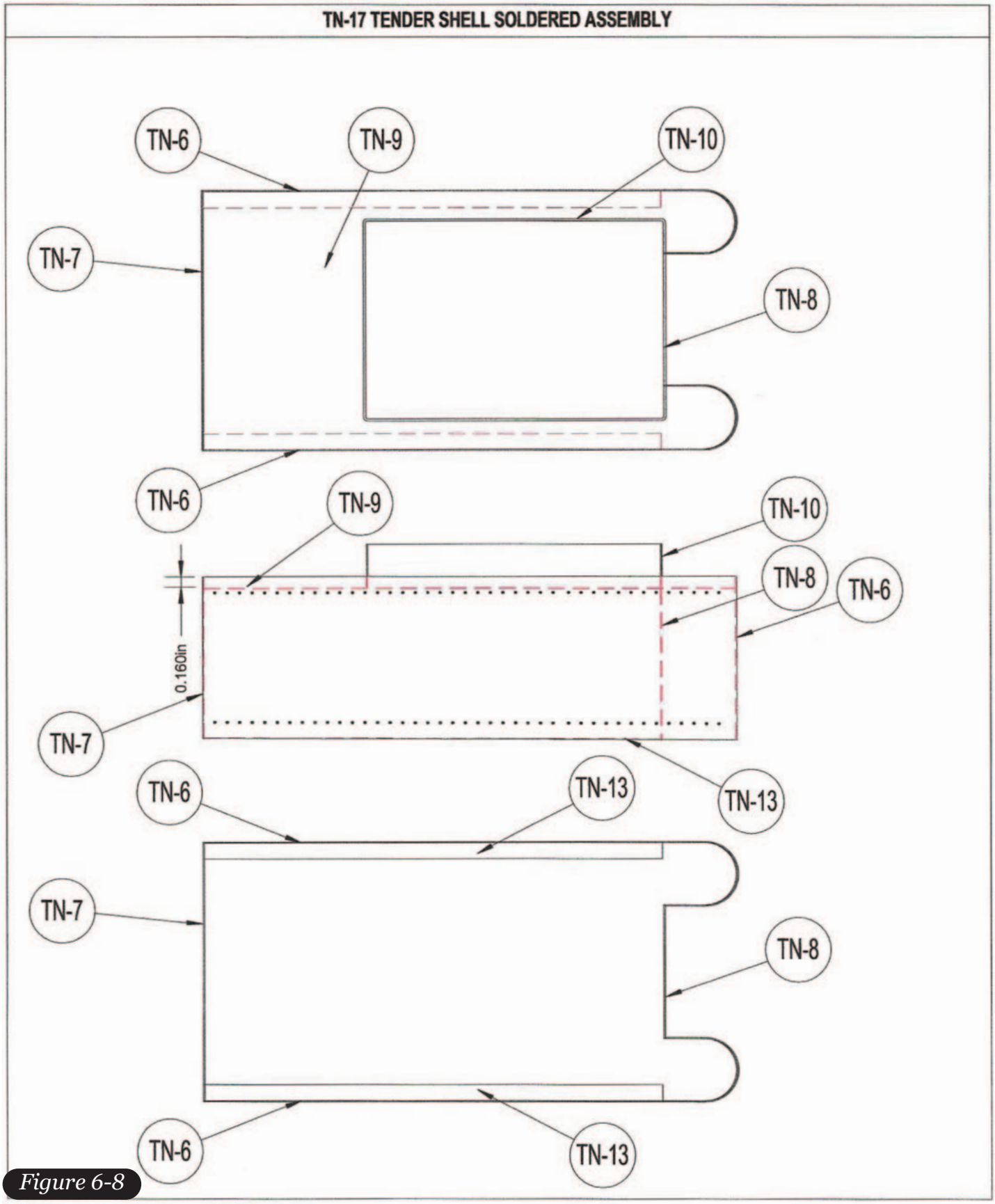

TN-17 TENDER SHELL SOLDERED ASSEMBLY
TN-6
TN-9
TN-10
TN-7
TN-8
TN-6
TN-9
TN-10
TN-8
TN-6
0.160in
TN-7
TN-13
TN-13
TN-6
TN-7
TN-8
TN-6
TN-13

Figure 6-8

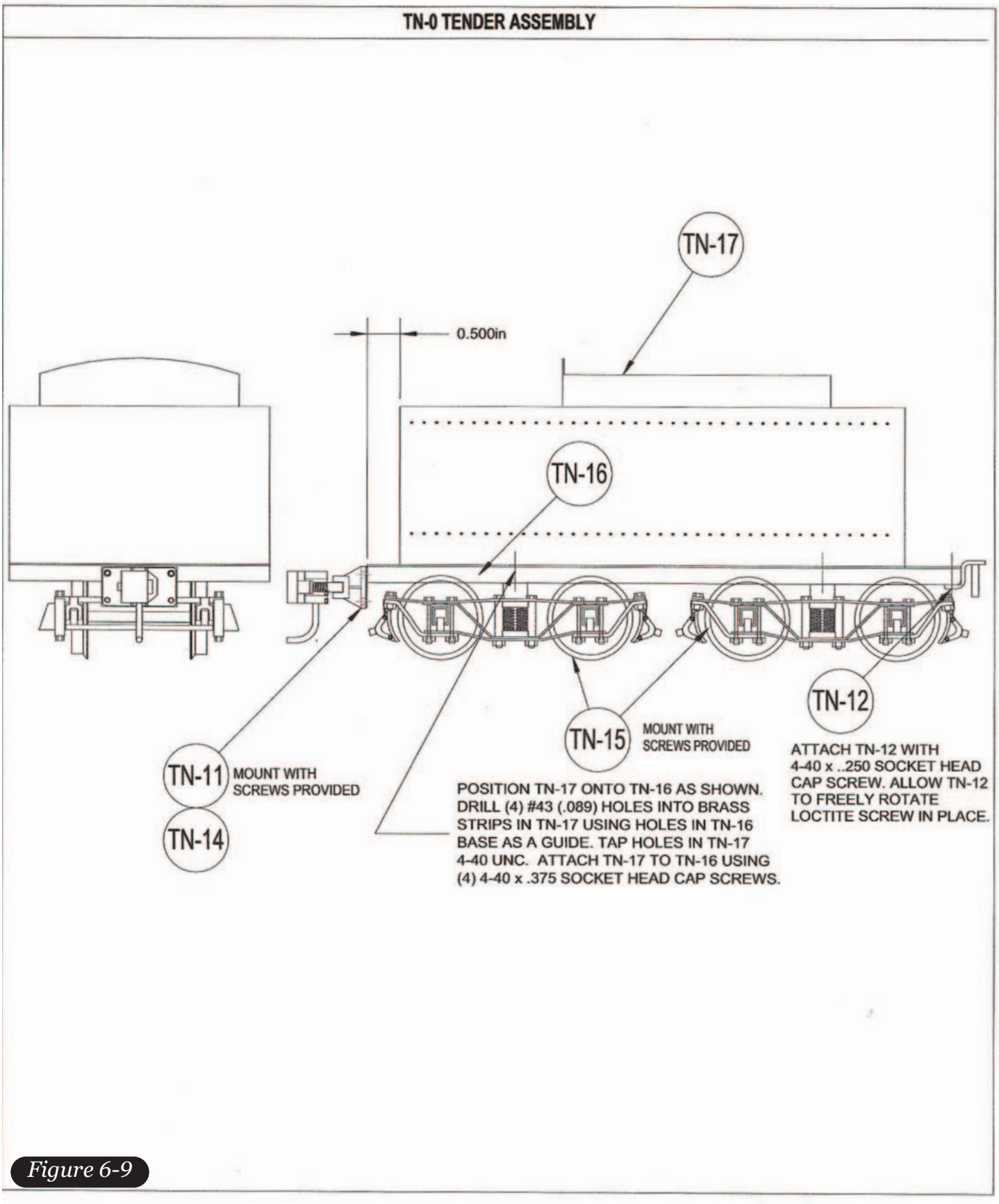

TN-0 TENDER ASSEMBLY
TN-17
0.500in
TN-16
TN-11
MOUNT WITH SCREWS PROVIDED
TN-14
TN-15
MOUNT WITH SCREWS PROVIDED
TN-12
ATTACH TN-12 WITH 4-40 x ..250 SOCKET HEAD CAP SCREW. ALLOW TN-12 TO FREELY ROTATE LOCTITE SCREW IN PLACE.
POSITION TN-17 ONTO TN-16 AS SHOWN. DRILL (4) #43 (.089) HOLES INTO BRASS STRIPS IN TN-17 USING HOLES IN TN-16 BASE AS A GUIDE. TAP HOLES IN TN-17 4-40 UNC. ATTACH TN-17 TO TN-16 USING (4) 4-40 x .375 SOCKET HEAD CAP SCREWS.

Figure 6-9

Figure 6-10 shows the entire assembly. All components are mounted in the cab, so there is no need for wired connections to the tender. The battery box is even stored in the roof of the cab. This was prepared for when you soldered the mounts to the inside of the cab roof in the last installment. The on-off switch is on the battery box itself so there is no need to find a mounting for that.

Like other components on this locomotive, the R/C receiver, transmitter and servos can be changed to taste, but doing so may mean changes in mounting.

A word on R/C transmitters. No transmitter was specified for this project since any Spektrum transmitter compatible with the AR410 receiver will work. Most people who operate live steam with R/C prefer the two-stick transmitters commonly used with model aircraft and the AR 410 receiver works with these.

My personal preference is the Spektrum DX-6, Version 2, which some may find a bit pricey, but it has some features you will find useful as you progress in the field of R/C live steam. The DX-6 V.2 has a lighted display screen, the ability to run multiple models, and you can tailor the response of the throttle to the position of the throttle stick using the 'throttle curve' function. Most handy for locomotives such as this one that have no sight glass on the boiler are the two on-board timers, which you can set to any duration and can be programmed to start with the first opening of the throttle, or several other transmitter functions. A reset button for the timers is on the front panel near the screen. You can adjust the timers to time your run and therefore water usage. Audible alarms triggered by the timers can tell you when to top off your water. Whichever two-stick transmitter you choose, you will want to remove the spring loaded return-to-neutral features on the sticks. These are useful on aircraft models but a nuisance for locomotive operation. Instructions with the transmitters tell you how to do this.

Before installing your R/C system into the locomotive, you might want to put all the parts together for a 'dry run' to see how things work and make some initial settings. Put four AAA cells in the battery case and plug it into the receiver in the slot labeled 'Batt.' Note which way the plug is inserted. The black or ground wires on all plugs go towards the bottom of the receiver, the side opposite the bind button. Connect the throttle servo into the *'Chan 1'* slot and the reversing servo into the *'Chan 2'* slot. You will want to set the left stick to throttle operation and the right stick to reverser function.

The transmitter and receiver must be 'bound.' This creates a monogamous relationship between receiver and transmitter. The receiver will only work with one transmitter and the transmitter will only transmit to the receiver for the selected model. With the multiple model feature the transmitter can operate many receivers, just one at a time.

With everything connected on the bench, operate the transmitter sticks and make sure the correct servo is activated for each control stick. Consult your transmitter Operators Manual if you have questions. Don't worry about length or direction of travel yet, just get the right servos operating with the correct sticks.

You will want to remove the cab to install the reversing servo (one of two RC-2's). The servo arm, called the "horn," and connectors to attach the 1/16-inch rod for the reverse linkage to the horn, are supplied with the servos. The quick connector with its 1/16-inch extension rod that was supplied with the valve gear is attached to the RC-2 servo connector and the valve gear as shown. The servo horn should be attached to the servo so that it is at 90 degrees to the body of the servo when the reversing control on the transmitter is in center or neutral position. This is easily set by turning on your R/C system and setting the reversing stick to center, and installing the control horn at 90 degrees to the servo body.

With the servo horn at 90 degrees to the servo body, the quick connector rod should be slid into the connector on the control horn until the valve gear is in neutral. Note the position of the horn and connector on the horn as shown on the cab-rear view on **Figure 6-10**. This mounting makes it easy to tighten the set screw on the connector on the servo horn once the proper position of the rod to the valve gear is obtained. Trim off excess rod, but leave a little excess for additional adjustment if needed.

To install the throttle linkage, first re-mount the cab. The throttle extension RC-7 is attached to both the throttle shaft and a support bearing assembly CB-10 in the cab. The construction and mounting of CB-10 were covered in the cab construction.

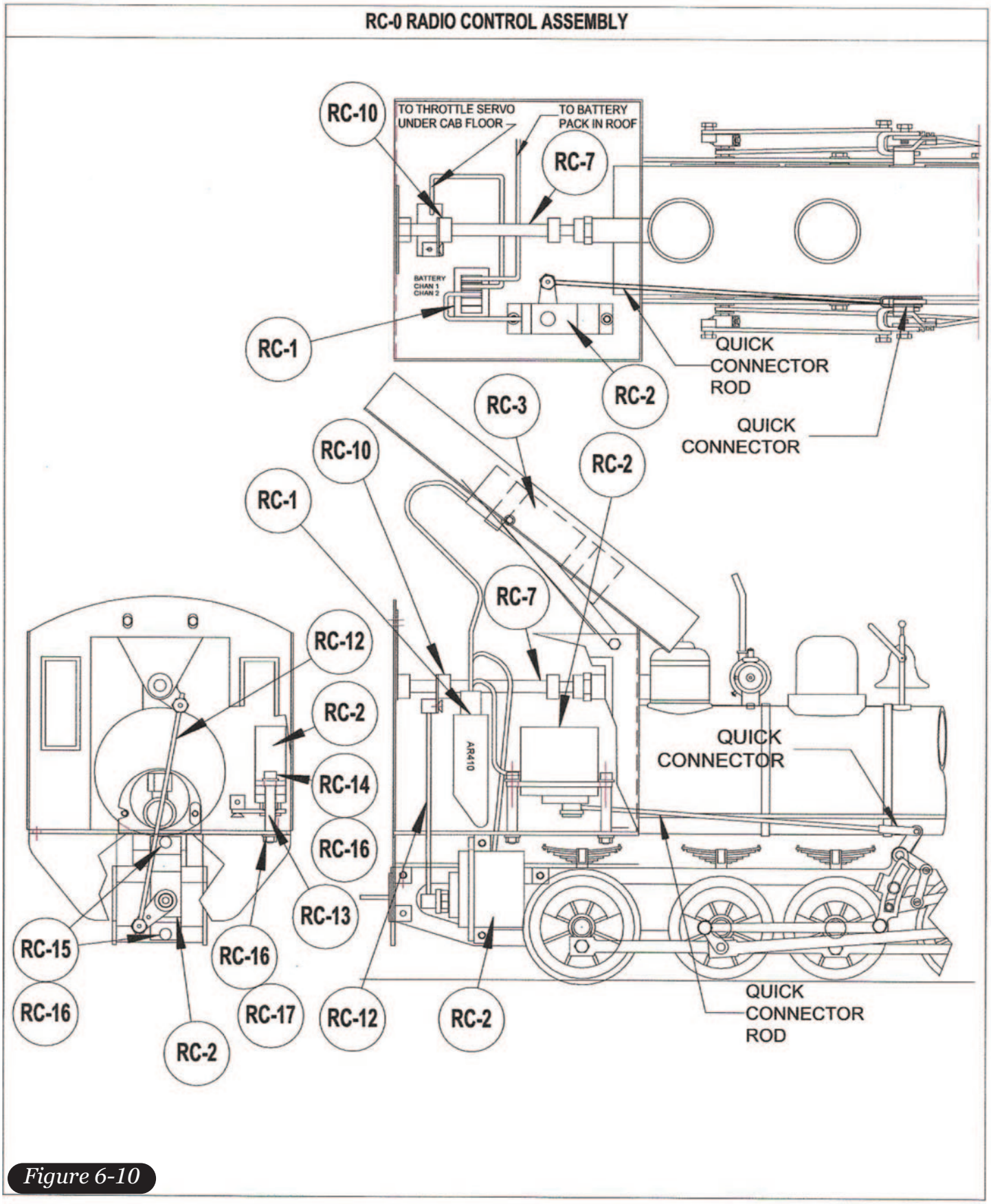

RC-0 RADIO CONTROL ASSEMBLY
RC-10
TO THROTTLE SERVO
UNDER CAB FLOOR
TO BATTERY
PACK IN ROOF
RC-7
BATTERY
CHAN 1
CHAN 2
RC-1
RC-2
QUICK
CONNECTOR
ROD
QUICK
CONNECTOR
RC-3
RC-10
RC-2
RC-1
RC-7
RC-12
RC-2
RC-14
RC-16
RC-13
AR410
QUICK
CONNECTOR
RC-15
RC-16
RC-16
RC-17
RC-12
RC-2
RC-2
QUICK
CONNECTOR
ROD

Figure 6-10

RADIO CONTROL DETAILS PAGE 1					
PART NUMBER	REQ'D		DESCRIPTION	VENDOR	VENDOR PART NUMBER
RC-1	1		RECEIVER 4 CHANNEL	SPEKTRUM	AR410
RC-2	2		SERVO,MICRO, METAL GEAR	HI TEC	HS-82MG
RC-3	MADE FROM		BATTERY CASE		
	1	RC-4	BATTERY CASE 4-AAA CELLS WITH SWITCH	PARTS EXPRESS	142-254
	1	RC-5	SERVO EXTENSION CABLE 12"	ADAFRUIT	972
	2	RC-6	SHRINK TUBING 1/16" x 1"		
RC-7	MADE FROM		THROTTLE EXTENSION		
	1	RC-8	TUBING, BRASS .188 OD x 2.50	K & S OR MCMASTER CARR	K & S 8129
	1	RC-9	COLLAR .188	DU BRO	141
RC-10	MADE FROM		THROTTLE CONTROL ARM		
	1	RC-9	COLLAR, .188	DU BRO	141
	1	RC-11	STRIP, BRASS, .032 x .500 x .75	K & S OR MCMASTER CARR	K & S 8241
RC-12	1		ROD, BRASS .060 x 4.00	K & S OR MCMASTER CARR	K & S 8162
RC-13	2		TUBE, BRASS 5/32 OD x .688	K & S OR MCMASTER CARR	K & S 8162
RC-14	2		SOCKET HEAD CAP SCREW 4-40 x .375	MCMASTER CARR	90128A108
RC-15	2		SOCKET HEAD CAP SCREW 4-40 x 1.00	MCMASTER CARR	90128115
RC-16	6		WASHER #4	MCMASTER CARR	92141A005
RC-17	2		NUT, 4-40	MCMASTER CARR	90480A005

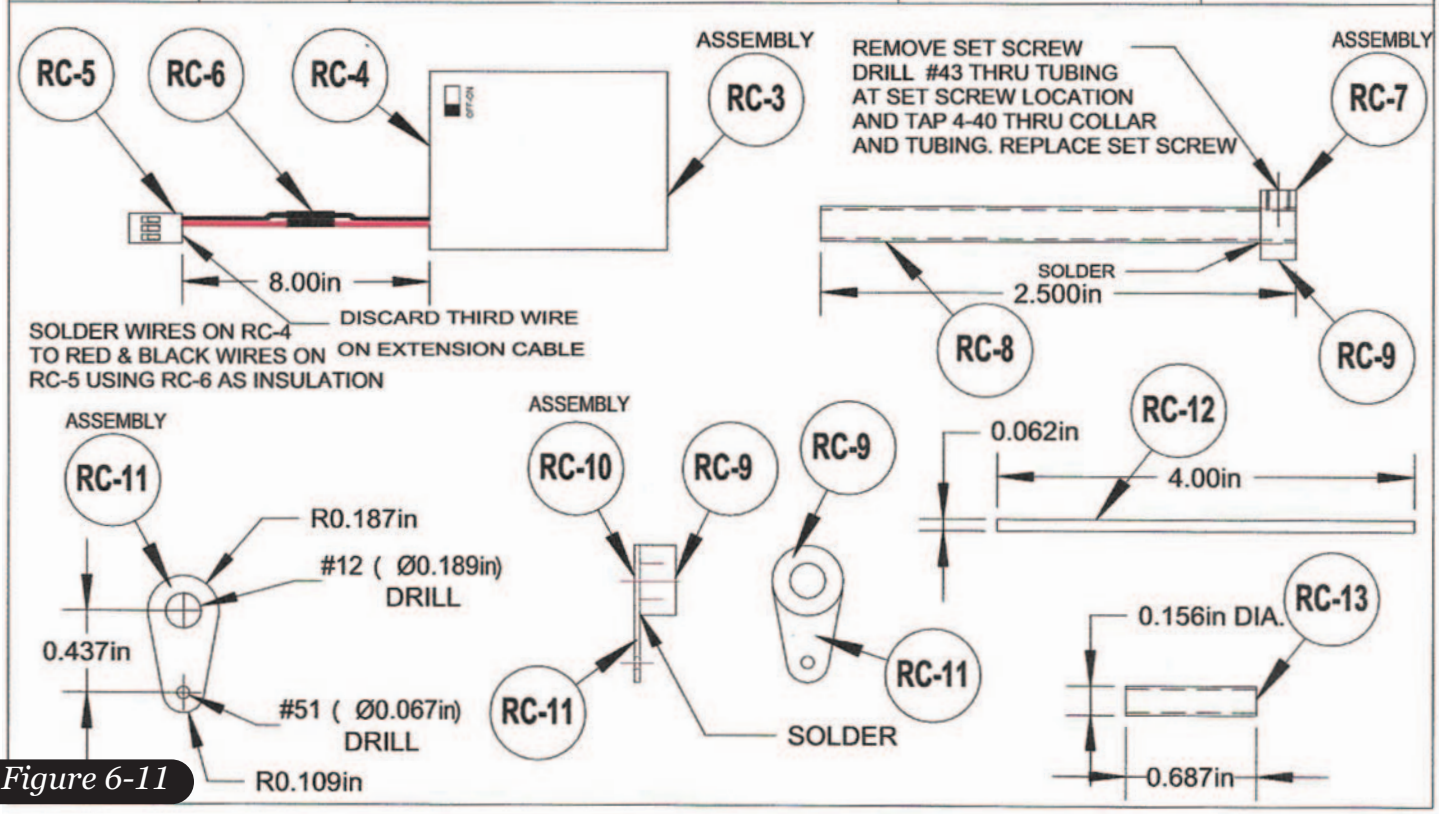


Figure 6-11

You will probably have to take off the bearing mount CB-10 before mounting the throttle extension RC-7. Slide Throttle Control Arm RC-10 onto RC-7, then slide RC-7 onto the throttle shaft as shown in the drawings. Tighten the setscrew on RC-7 so the throttle shaft turns with it. Re-mount CB-10 with RC-7 inserted into the bearing collar. Don't worry about the position of RC-10 yet and don't tighten it onto RC-7. That will be adjusted after the throttle servo is mounted. Assemble one of the servo arm connectors onto RC-10 similar to the way they are assembled on the servo horns.

Remove mainframe rear plate MF-16 to access the mounts for the throttle servo RC-2. (There are two RC-2's, one for reversing, one for throttle) Mount throttle servo RC-2 as shown with 4-40 screws and washers, and orient the control horn so it is at about the 7:00 position when the throttle stick is at the 'throttle closed' position. Install the control rod RC-12 onto the connector on the control horn of the throttle servo but do not tighten the connector down. Align arm RC-10 with the control rod and pass the control rod through the connector on RC-10. With the throttle servo RC-2 set at the 7:00 position (throttle closed or throttle stick all the way back), make sure the throttle is closed tight, then set RC-10 to the 5:00 position. Tighten the screws on the connectors on both the servo horn and RC-10.

If you have access to air to run the locomotive, it would be a good idea to operate the locomotive under air and on blocks, testing the throttle and reverser functions. You will need no more than 15-20 PSI, if that much. Make sure the throttle opens when you push the throttle stick forward and closes when you push it back. If the opposite happens, consult your transmitter manual for the 'servo reverser' function and reverse the servo direction. The same holds true for the reverser. The valve gear should go into the forward position (valve gear lever forward, valve linkage towards the bottom of the expansion link) with the stick in the forward position.

You do not want the servos to force the linkages of either throttle or reverser beyond their normal mechanical limits of travel. Transmitters such as the Spektrum DX-6 have servo travel limiting functions. Consult your transmitter's manual for how to do this and make sure neither throttle nor reverser is forced beyond their mechanical limits in either direction.

Further adjustment may be necessary, but the initial adjustment and calibration under air will give you a good start. The final test is under steam. Steam up the locomotive and attach the tender and maybe a few cars to give it a load and avoid the 'springboard' effect of a steamer with no load. Operate the R/C controls and make sure that the throttle is closed when the throttle lever is pulled back so the locomotive doesn't creep. Also make sure the throttle servo is not laboring when the throttle is closed or fully open. If it is, adjust servo travel until the throttle just closes tightly and the full travel of the throttle control arm RC-10 is around 90 degrees. Make sure the reverser give you a smoothly running forward and reverse, and adjust servo travel on this, too if necessary. A forced reversing gear can result in poor running or no running at all.

This concludes the Freelance Consolidation project. It's not really the end, more like a beginning. Using all the detail parts available from Trackside Details, Ozark Miniatures, Precision Scale and others, a finely detailed locomotive can be built. Customization of the sheet metal work is also possible. I know of a builder who is developing an outside frame version with Denver and Rio Grande style cab, tender, headlight mount and other details to simulate the appearance of an outside framed C-25 (**Figure 6-12**). Many other configurations are possible. Send us photos of yours!

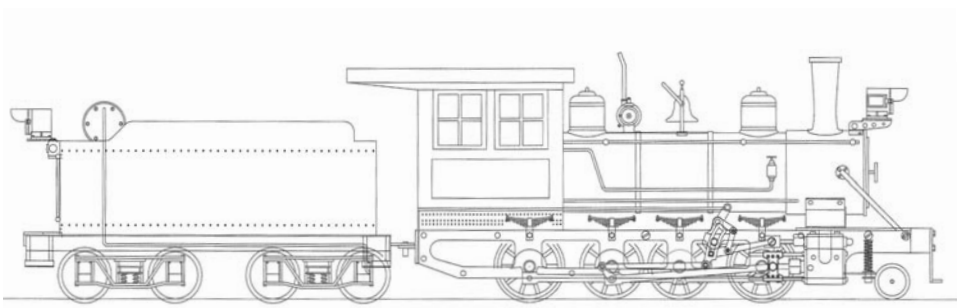


Figure 6-12

THE CUPOLA VIEW

Going Digital

Last year, Steam in the Garden LLC quietly crossed its ten year anniversary since we purchased and continued to carry on the legacy publication started by Ron and Marie Brown. Our business plan in 2010 was basically very simple, continue publication and grow the magazine. Part of that plan was to move from print to digital in five years. That is what our then editor, the late Dave Cole, had proposed. That never happened due in part to you, the reader, wanting a hard copy paper magazine, which was shown by digital subscriptions growing at a very slow rate.

Over the past five years the growth in our online presence has increased and our digital subscriptions are up, mostly for overseas because delivery of print outside the North American hemisphere is costly and slow. Digital puts our international patrons on the same playing field with access available on the first of the delivery month at 8:00am Eastern U.S. time. Everyone has the ability to get the magazine at the same time.

As publishers, we're not alone in the digital arena. Many other magazines now have digital only subscription plans. Print is not dead yet, but as our digital subscriptions grow, the desire for print copies recedes, and with printing costs increasing, we were coming to a crossroads where a decision had to be made. Will digital supplant print altogether for Steam in the Garden as was originally planned to happen in 2016?

Many of you will undoubtedly cry a boisterous NO! But the need to maintain a solid bottom line financially so we can continue to at least publish 'something' means we can't continue to support printing fewer copies of the magazine as print subscriptions start to fade and digital grows. We lose in the long run by trying to satisfy fewer printings.

So the decision has been made that 2022 will be the last year for print. We will stop taking full year print subscriptions on December 1st, 2021 in order to ensure that no one is paying for something that will not be delivered. A new subscription started in December 2021 will be begin with the November/December 2021 issue as the start of that subscription. We will publish a pro-rated schedule for subscriptions and renewals that would normally happen after that date, or you can simply order a single new current issue as they are released. The September/October 2022 issue #181 will be the last print issue and all issues after that date will be a digital download.

Notice that we state "all issues after Sep/Oct 2022 will be digital." We're not going away. We'll still be here, but in digital form only from the November/December 2022 issue and beyond. Your digital subscription will always give you access to every issue of SitG ever produced. And you can print out the pages you need for reference, same as before for projects.

We are also looking at a "Print-on-Demand" service for those who still want to hold the magazine in their hands. More on that to come later as we finalize a service provider.

We've held both our print and digital subscriptions at the same cost for over 10 years. Our internet storage and operating costs have doubled in those past 10 years and we have to increase our digital subscription rate in order to continue. Effective November 1st 2021 digital subscriptions will increase to $28.95, so make sure you renew or get the digital subscription at our 2021 rates prior to November 1st.

We look forward to continuing the Steam in the Garden tradition into the digital future.

Happy Steaming!

Scott

Cupola view' is written by Editor Scott E. McDonald: you can contact him at sitgeditor@gmail.com or P.O. Box 1539, Lorton, VA 22199.

Rob Kuhlman assists our Circulation Manager, Marie Brown, with the construction of her Birdwater & Raspberry Diesel kit during her annual steamup (see page 23). Marie will let the little diesel trundle around the railway while she's gardening in between her annual steamups.

Statement of ownership, management, and circulation

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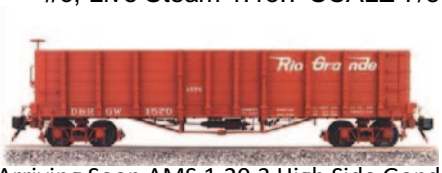

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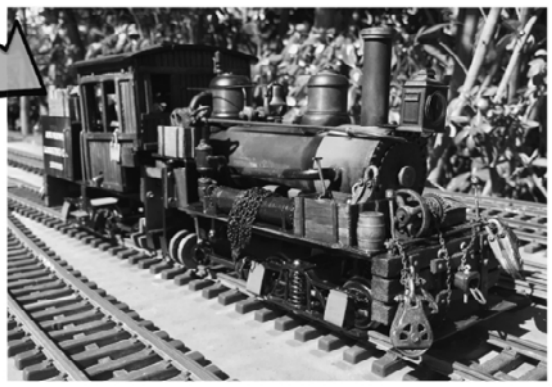

Special or Annual Meets

Cabin Fever Model Engineering Show January 14-15 2022 - Lebanon Valley Expo Center & Fairgrounds, Lebanon, PA. Gauge One Tracks available for steaming. Visit *www.cabinfeverexpo.com* for more information about 2022.

International Small Scale Steam Steamup. January 16-22, 2022 - 103 Live Oak Drive, Diamondhead, Mississippi. Visit *www.diamondhead.org* for more information.

Staver Locomotive Fall Steamup, September 23-26 September 2021 — Staver Locomotive, Portland, Oregon. Visit *www.staverlocomotive.com* for latest information.

National Summer Steamup, September 29–October 3, 2021 - Lodi Grape Festival and Events Center, Lodi, California. Visit *www.steam-events.org* for more information.

The Fifth Annual Gathering of North American members of the Association of 16mm Narrow Gauge Modellers will be hosted in Ohio. Date yet to be determined. Visit *www.northamerican16mmmodellers.org* for registration and venue information.

Regular steamups

Crescent City High Iron. Steamups as necessary on an elevated backyard layout on Northern California's upper coast. Info: Don Cure, diamondd1947@msn.com.

Greater Baton Rouge Model Railroad Club Open House and Gauge One Steamup. Info: Ted Powell, (225) 236-2718 (cell), (225) 654-3615 (home), *powell876@hotmail.com*.

Puget Sound Garden Railway Society. Two steamups per month, one at the Johnsons' on the second Saturday and a steamup at a member's track on the fourth Saturday.
Info: *http://psgrs.org/* or call Pete Comley at (253) 862-6748.

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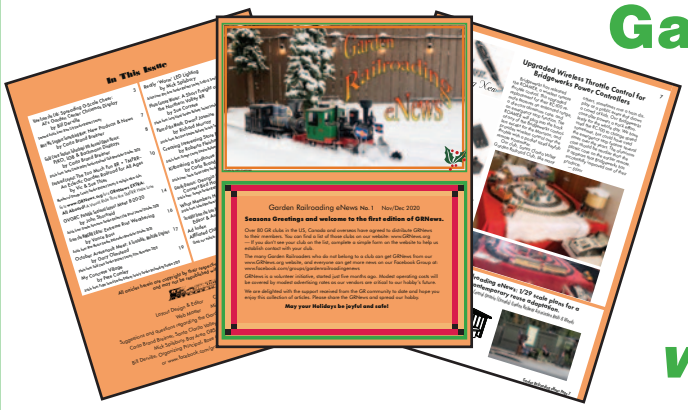

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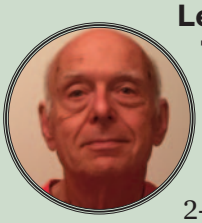
The magazine couldn't exist if it were not for the dedicated individuals who take time from the hobby to chronicle their endeavors, interests, and joy of live steam. If you get a chance to meet any of our contributors at a steamup, please thank them for their contribution.

Bill Allen - Bill lives in Woodside, California and first became interested in live steam in 2008 when he saw Richard Murray's layout at a BAGRS open house. He proceeded to buy a Ruby, C16 and Forney before deciding to start building his own. He bought a mill and lathe and with the help of some BAGRS members learned to use them and was soon making chips. Since then he has completed 20 projects, some of which have been featured in Steam in the Garden, and currently has a multi-part article running in Live Steam. All of his builds are one-of-a-kind as he only builds those which have never been done before and probably will never be done again in G Gauge live steam. Bill's prior hobby was building fine furniture and he uses some of those skills and tools in hie engine building.

Kendrick Bisset - Kendrick is a retired railroad signal engineer. His love of railroads started by age four with his first American Flyer train set (even though he was in England at the time). HO trains came at age 10. School, girls (and one in particular), and entering the railroad industry followed in seemingly quick succession – and then children, too. Kendrick feels very fortunate that his life work and his hobby have been so closely related. He got into live steam around 2006, and has been enjoying the companionship of the small scale live steam community since then.



Les Knoll - Les started his railroading experience with a Lionel F7 freight set at Christmas at age six. This grew to a tabletop layout in the family basement, later to be supplanted by a theater pipe organ and a rock band practice space in his teens. Later in life the HO/HOn3 bug bit, and the first incarnations of his Rivendell & Midland Railroad, one of the first JRR Tolkien-based railroads in the US, took shape. The R&M moved outdoors with his discovery of live steam in the early 90's, and after two purchased locomotives, five scratchbuilt live steamers followed, ranging from a 14-ton Shay to a 2-4-4-2 logging Mallet. The current Rivendell & Midland is in the back yard of Les's and wife Ruth's lake home in North Carolina. Les is a retired Forensic Engineer and a Registered Professional Mechanical Engineer.

Derek Pollard - Derek Pollard is a retired communications engineer with a lifelong passion for model railways, with many articles published in a range of journals. In his spare time he regularly drives full size trains on a heritage railway. He has been working with Chris Tolhurst for many years, both in prototype research and production support.

Chris Tolhurst - Chris Tolhurst is a retired engineer living in Suffolk, England. For many years he ran TME, a manufacturing company specializing in small batches of detailed live steam miniatures. He has produced models in all scales from 1/32 Gauge One up to 1/4 scale traction engines. Most commercial production runs by TME have been in 16mm/ft but Chris's hobby is 1/32 Gauge One and in retirement this will be the principle focus of future builds.

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