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Building 'Leo,' a live-steam

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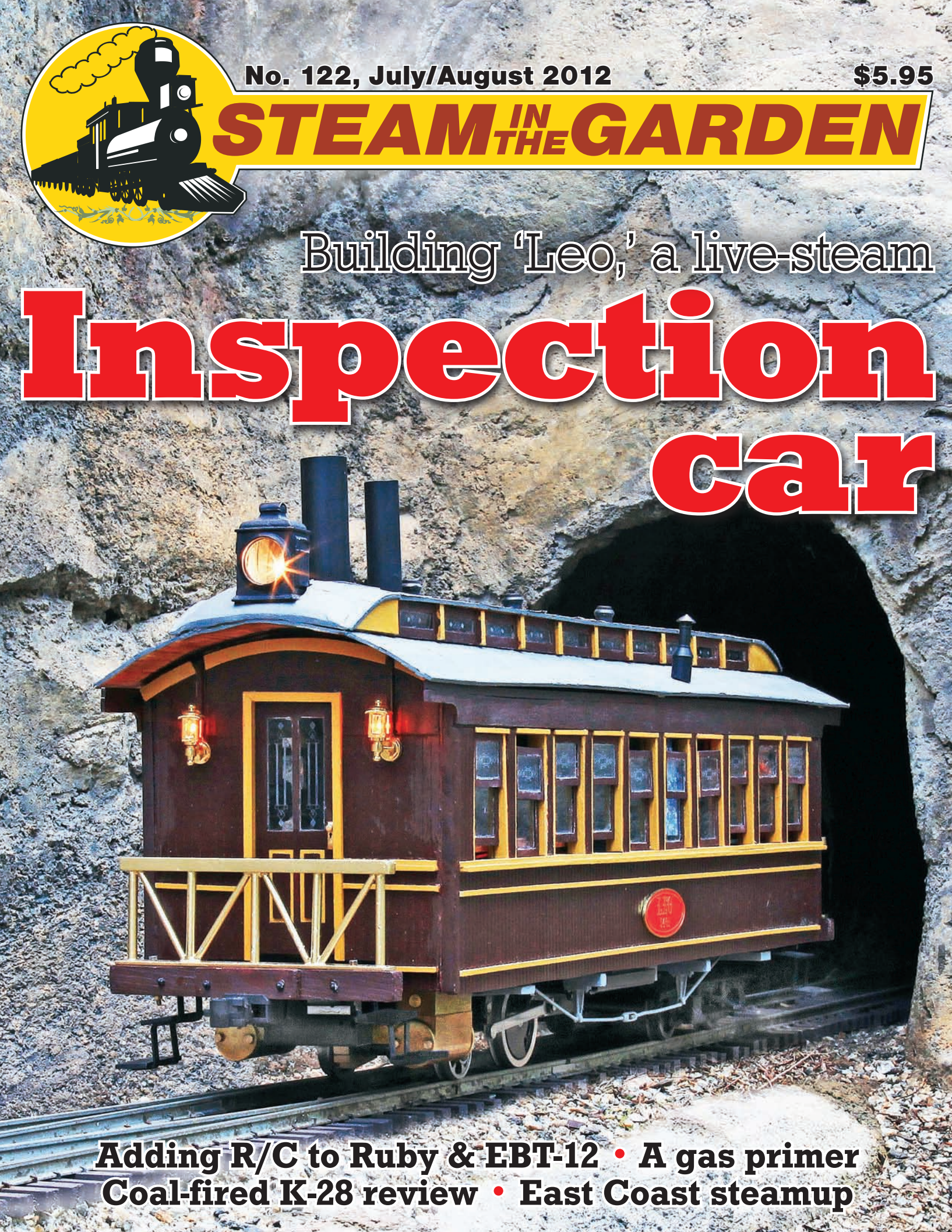

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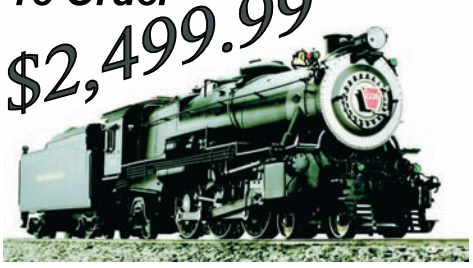

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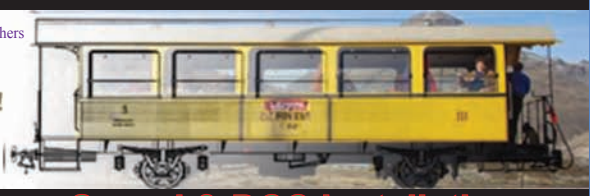

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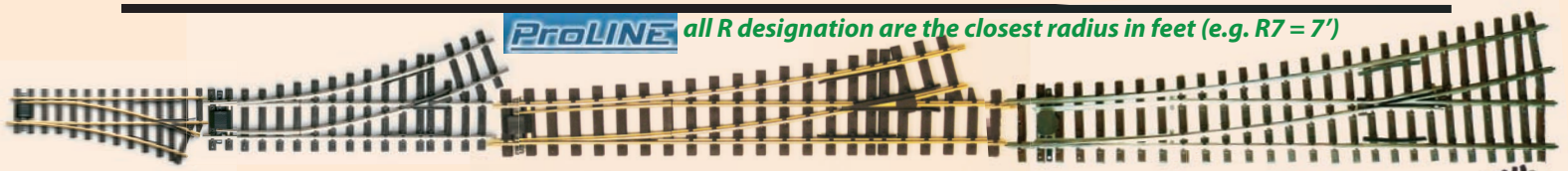

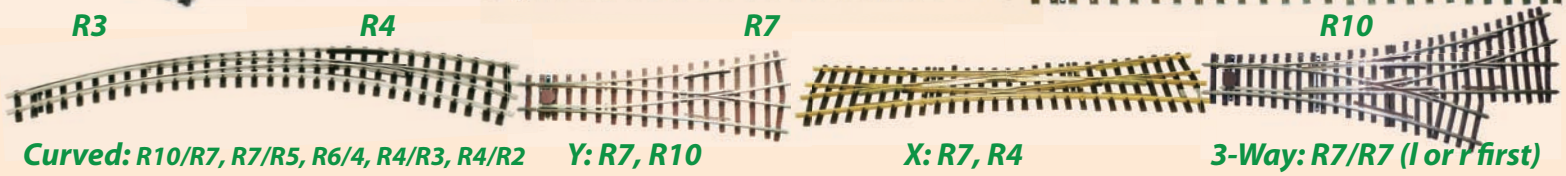

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Vol. 22, No. 4; Issue No. 122; July/August 2012

STEAM IN THE GARDEN

Gather friends, while we inquire,
into trains, propelled by fire ...

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Cover: Sonny Wizelman's 'Leo' steam inspection car on Gary Siegle's Santa Barbara, Calif., railroad. Photo by Rick Parker.

Even more 'stack talk'

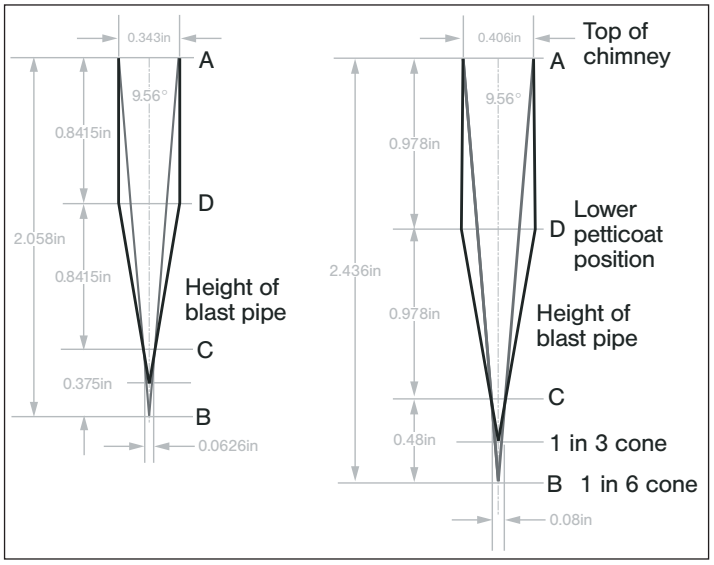
In reference to the letters sent to you by Keith Bucklitch and Larry Bangham concerning the blast pipe and chimney dimensions (see *SitG*, Nos. 120-121), I have attached a diagram and formula that I have used for the last few years. This formula gives you precise dimensions without the need for trial and error. It worked great for me when building my G1MRA "Project Loco" as the blast pipe could not be lowered so a chimney liner had to be designed and installed. As Keith has said creating a vacuum in the smoke box for any loco with a Stephenson front end is critical to its performance.

Jim McDavid
Pioneer, Calif.

Designing by computer

I have been reading the articles by Eric Schade on the construction of his Maine Forney, using his CAD skills and CNC machining and would like to make a few comments arising from the articles (see *SitG*, Nos. 120-121).

Firstly, may I pick up on the comment that Schade used brass to make the bushings for the boiler fittings — there is a problem with the use of brass in a boiler. Unfortunately, the water used in our boilers may lead to leaching out of the zinc from the brass.



Two examples of the blast pipe and petticoat pipe position formula: *Multiple the inside diameter of the chimney liner by six. Measure this distance down from the chimney top (A) and make a line (B) on paper. Multiply the blast-pipe diameter by six and make a line (C) above line (B). This is the height of the blast pipe. Now, for the lower position of the parallel chimney liner: Take the distance BC and subtract from AB, divide by two, result is the length of parallel straight portion of chimney liner (petticoat pipe). Add about 0.5-inches for a flared skirt. The short version of the pipe is half the distance between the top of the chimney and the blast-pipe height. Note: If you add extra turns of threading on the blast pipe body, you'll be able to fine-tune the exhaust. Source: Gauge One Model Railway Association.*

This results in the brass becoming porous and eventually crumbling.

While this may take some time, it will eventually occur and the boiler will become scrap. Many of us will have locomotives manufactured by well-known names such as Merlin, Mamod and others who used brass both for the fittings and the boilers themselves. We are now seeing increasing numbers of these boilers fail because of the de-zincification process. While we may be reassured that the failure is rarely catastrophic, it is still preferable (and easy) to avoid this result by using the proper materials when we construct our boiler.

For bushings and the like, the material to use is either gun-metal or bronze. The boiler itself, as Schade has indicated, should be made from copper, and combined with appropriate metal for the bushings, the boiler will outlast the builder's lifetime in normal service.

Also: The leaching of zinc from brass may of course occur in the various fittings that are screwed into the boiler. The difference is that it is simple to unscrew and replace a defective fitting without requiring a full rebuild of the boiler.

Of course, following any repair to a boiler requiring brazing or silver-soldering as Schade has indicated, it must be subjected to a hydraulic test equal to at least twice the designed working pressure of the boiler, and I commend Schade for stressing this in his description.

In the United Kingdom, it is a requirement of the steam societies that a home-built boiler is subjected to a hydraulic test of twice the working pressure, inspected and witnessed before a "test certificate" is issued and the model is permitted to run on society tracks.

I note that Eric Schade is proficient in computer numeric control machining (CNC), but when it came to machine his domes, I feel he missed a trick. He describes how he used a band saw to shape the curve where the dome sits on the boiler. He then went on to fine-tune the shape by using some abrasive paper wrapped round a piece of boiler barrel tube.

Now there are normally two ways to produce the saddle curve at the base of a dome or chimney. Users with a lathe can "fly-cut" the base by setting a cutter mounted on the lathe mandrel, to the diameter of the required base, then feeding the work-piece into the rotating cutter very gradually and advancing the saddle along the lathe bed.

Of course, with access to CNC equipment, one can simply mill the saddle to the exact curve required. One can then machine the dome or similar on the lathe, but if one also has a fourth axis CNC machine, then turning the work-piece to the finished shape is also an easy process.

I would like to support Schade in his use of computer-assisted design (CAD) when designing his model. Over the years, I have designed a number of 16mm scale locomotives using TurboCAD. Apart from the basic drawing techniques, I have found the software of use in ensuring that components fit together as I intend and that they will also remain within the basic "envelope" of the model, before actually cutting metal. As Schade has indicated, it is then a short step to using the CAD drawing to pro-

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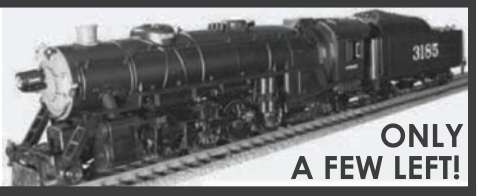

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duce the G-code for CNC machining.

I would encourage any prospective loco "scratch builder" to acquire some CAD software (there are several free packages available) and to spend some time getting to grips with its use, regardless of whether one wishes to go the whole hog of moving into CNC machining.

Keith Bucklitch
Worcestershire, England

Eric Schade responds: Bucklitch is technically correct in all aspects of his comments and I wish I had the materials, tooling and skills at my disposal to build as he suggests. I feel I have built a useful engine and am not disappointed by the choices I made or the results. It has been a fine learning experience and a lot of fun.

I used brass because that is what I had on hand and could work with my shop facilities. Bronze is better for boiler bushings but the brass I had in the shop will give fine service for the working lifetime of this locomotive. I expect other things to wear out first.

Fly cutting a dome is a machinist's technique to produce a perfect saddle for the domes, it is however, not the only way do get the job done.

Computer-aided design is a good way to draw things and allows more precise work and easier correction than pencil and paper. Transferring the CAD drawings to computer-aided machining is the way to go when practical. There is still a place for old-fashioned hand work though.

My goal with this project was to make an operating locomotive and learn from doing so. I have enjoyed the support and voice of experience from all over. Future projects will incorporate lessons learned from this one. This was my first scratch-built locomotive, and will not be my last. Purists may never be happy with my work, but the real goal is for me *to have fun. I thank our editor for publishing my article and helping to encourage newcomers to just "go for it" with the skills and equipment available to them.*

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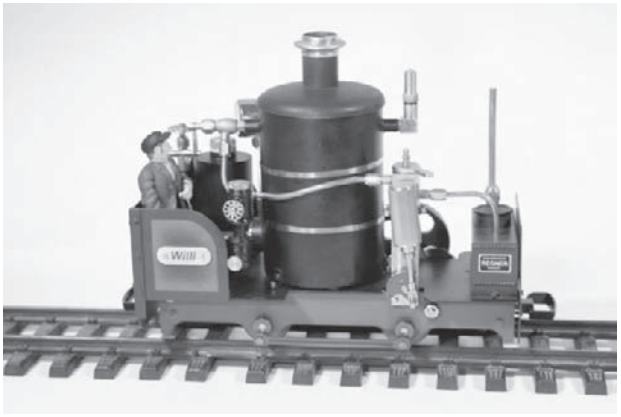

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LATEST WAYBILL

M6 in 1:32: *Accucraft is planning a new butane-fired Mogul based on a Baldwin-built Southern Pacific locomotive used throughout the system.*

1:32 Mogul planned

With another foray into 1:32-scale, Accucraft Trains Co. said in May that it would begin taking orders for a live-steam model of two Southern Pacific 2-6-0 M6-class locomotives that were originally built by Baldwin Locomotive Works in 1901.

The Union City, Calif.-based Accucraft said it was "taking reservations" for this "limited production" 45mm-gauge locomotive, which will be butane fired, and include a single-flue copper boiler, with a safety valve, pressure gauge and water sight glass. The locomotive will have D-valves, a lubricator and both a tender water pump and an axle pump.

The locomotive will come in three letterings: as No. 1727, as No. 1744 and unlettered with a manufacturer's suggested retail price of $2750.

The Southern Pacific Mogul Class M6 locomotives ran all over the railroad's system until the middle of the 20th century. According to a number of histories of the locomotives, they were originally designed for compound operation but after a few years of service, the S.P. determined the cost-benefit ratio was prohibitive and converted them to simple cylinders; at the same time, they were converted to superheating and their boiler pressure was increased to 200psi.

The San Luis & Rio Grande Railroad of Colorado purchased No. 1744 in the early 2000s, but the locomotive needs boiler work that the excursion railroad can't afford. It is stored in Alamosa, Colo.

No. 1727 was donated by the S.P. to the city of Dunsmuir, Calif. in Siskiyou County, in 1957, where it remains as a static display. It has been cosmetically restored at least three times in the last 55 years and a local group has attempted to keep it restorable to operation.

Accucraft is at www.accucraft.com or (510) 324-3399.

NGT-Ulin pact continues

Detail parts designed and built under special arrangement with Ulin Locomotives are continuing to be offered on special order by NGT Models of Lansing, Mich., the two companies said in May.

NGT — which sells a variety of small-scale live steam parts, including the Summerland Chuffer — said it is entertaining suggestions from hobbyists about future products to carry. The company is at www.ngtmodels.com, NGTModels@aim.com or (517) 897-4987.

Fitting Accucraft's Ruby with 2.4 GHz radio control

R/C

Text and photos by Graeme Price

Having recently bought my first live steamer, the new model Accucraft Ruby with the larger cylinders fitted as standard, I quickly learned that leaping through the garden to control it was just not an enjoyable experience.

This led to the decision to add Radio Control (R/C) so that I could sit in the garden and relax while watching my train run around.

2.4GHz: *The HobbyKing.com transmitter.*

I bought the Ruby R/C kit made by RC-Steamers.com using a HobbyKing.com brand 2.4GHz transmitter/receiver (HK-T4A V2/HK-T6A V2) system to control the servos. I use the HobbyKing brand because they are relatively inexpensive and easy to install and operate.

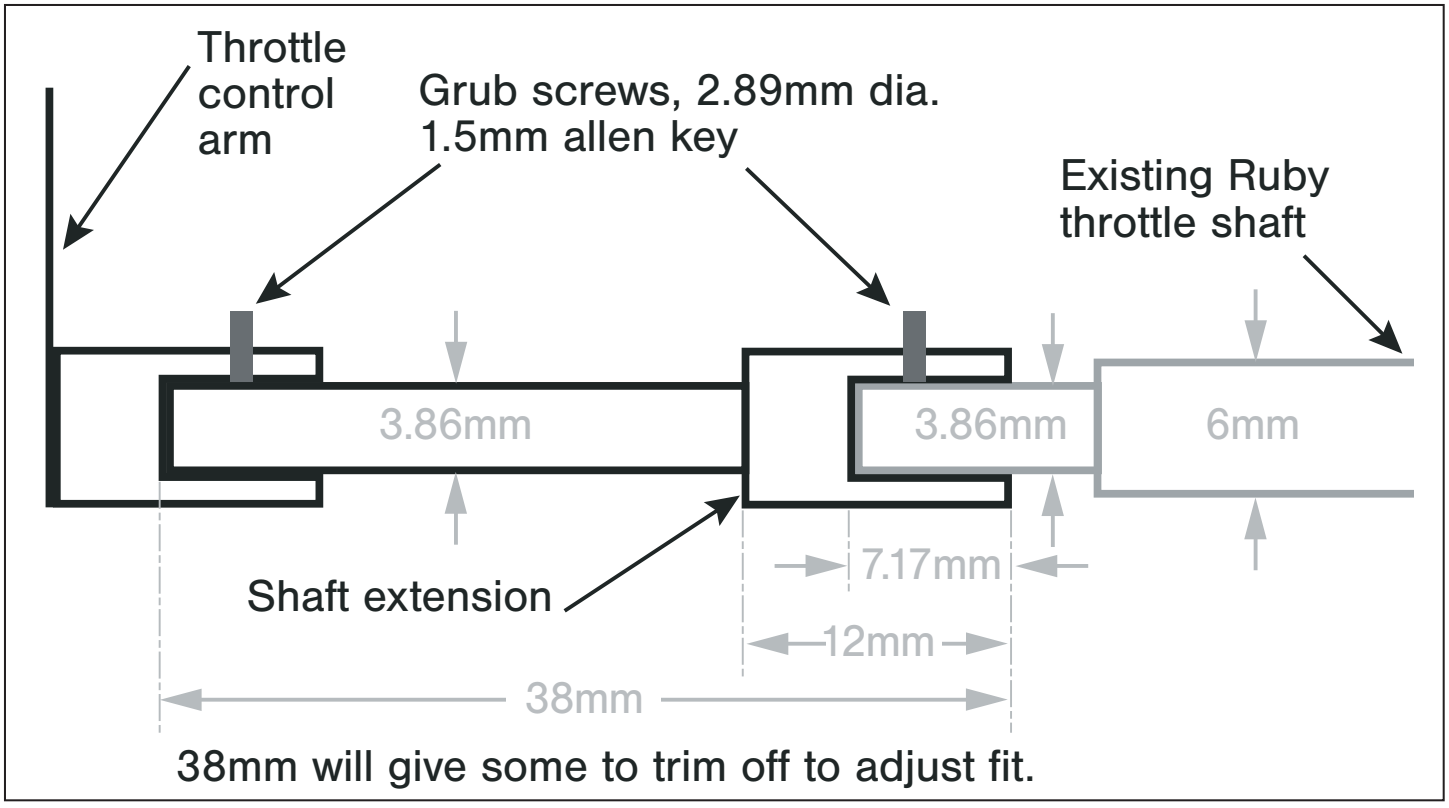
The kit comes with very well written, clear and concise installation instructions that are easily followed. There was one small issue I did come across when I tried to install the kit; I found that the throttle shaft on the Ruby was about 1½-inch shorter than that shown on the instruction sheet of the kit. Evidently Accucraft had changed the throttle shaft length on the new model Ruby; this was confirmed, by a couple of people, when I put the question to Internet forums.

A friend of mine graciously manufactured a shaft extension for me (see the drawing and picture) which positioned the control horn so that it aligned with the servo push rod the same as shown on the servo kit instruction sheet. This design change is something that the kit manufacturer may have to address in the future.

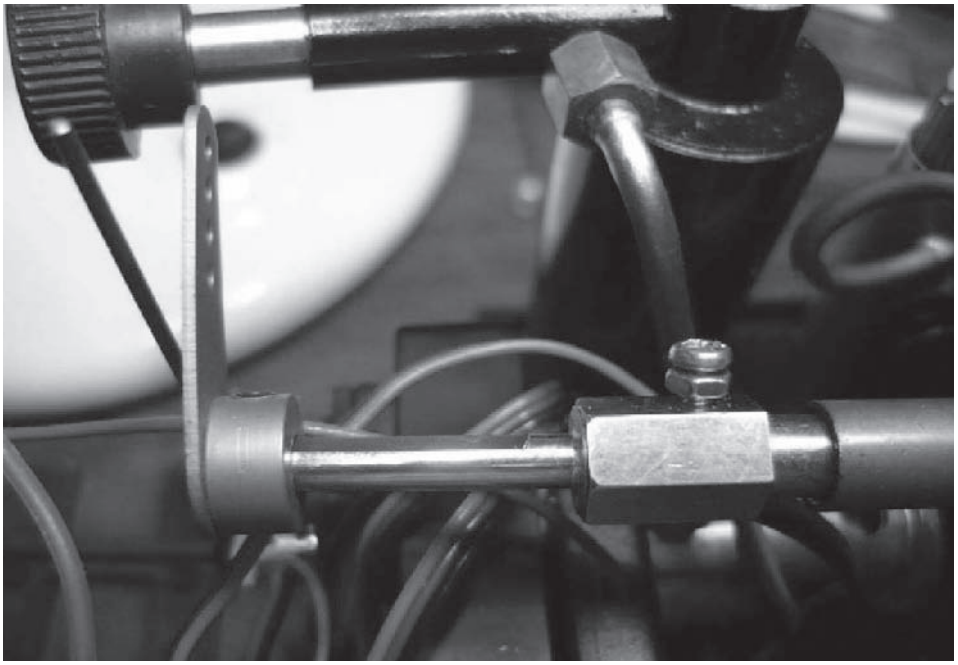
Another consideration is that Accucraft now fits a plastic throttle control knob to its Rubys instead of the control arm that was fitted to earlier models; consequently to fit R/C, an Accucraft control arm has to be purchased separately.

After overcoming this minor hurdle, I installed the kit and commenced wiring the loco.

I have fitted the batteries and the receiver into a tender and ran wires across the loco/tender gap via a plug/socket; I joined up the power leads at the plug and socket but left them connected to the original channel connections at the RX, this allowed for better current carrying, because the plug has larger pins than the RX pins current was not an issue.



Long arm of the throttle: *The fittings to attach a servo to the Ruby throttle cause the control arm to bind against the servo unless a shaft extension is manufactured. A fellow hobbyist constructed the author's shaft extension, which adds about 1½ inches (~40mm) to the length of the throttle shaft, putting the control arm directly above the servo motor.*



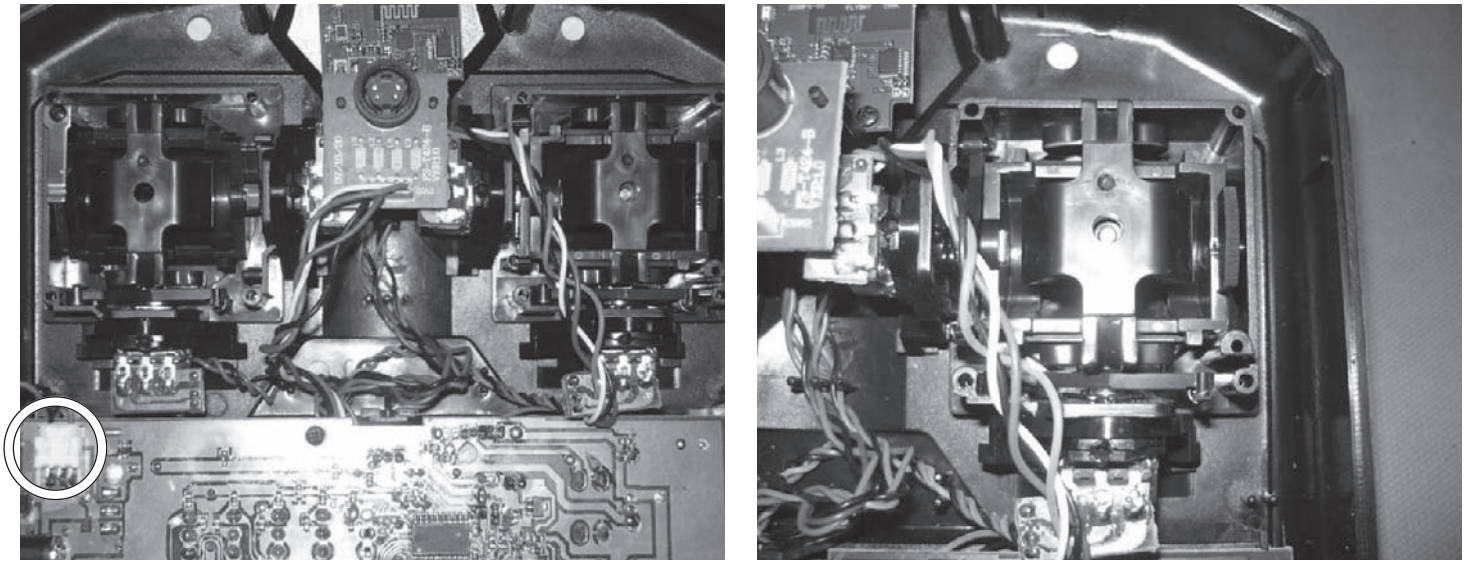
By doing this I reduced the number of wires crossing the gap, so instead of having six wires that would have been required if I had run directly between RX and servos, I now have only four and additionally I have the ability to separate the loco and tender easily.

To allow me to control the throttle and the direction control (Johnson bar) servos, I modified my transmitter to give me "throttle" on the left control stick up/down movement (RX Channel Two) and "direction" on the right control stick up/down movement (RX Channel Three).

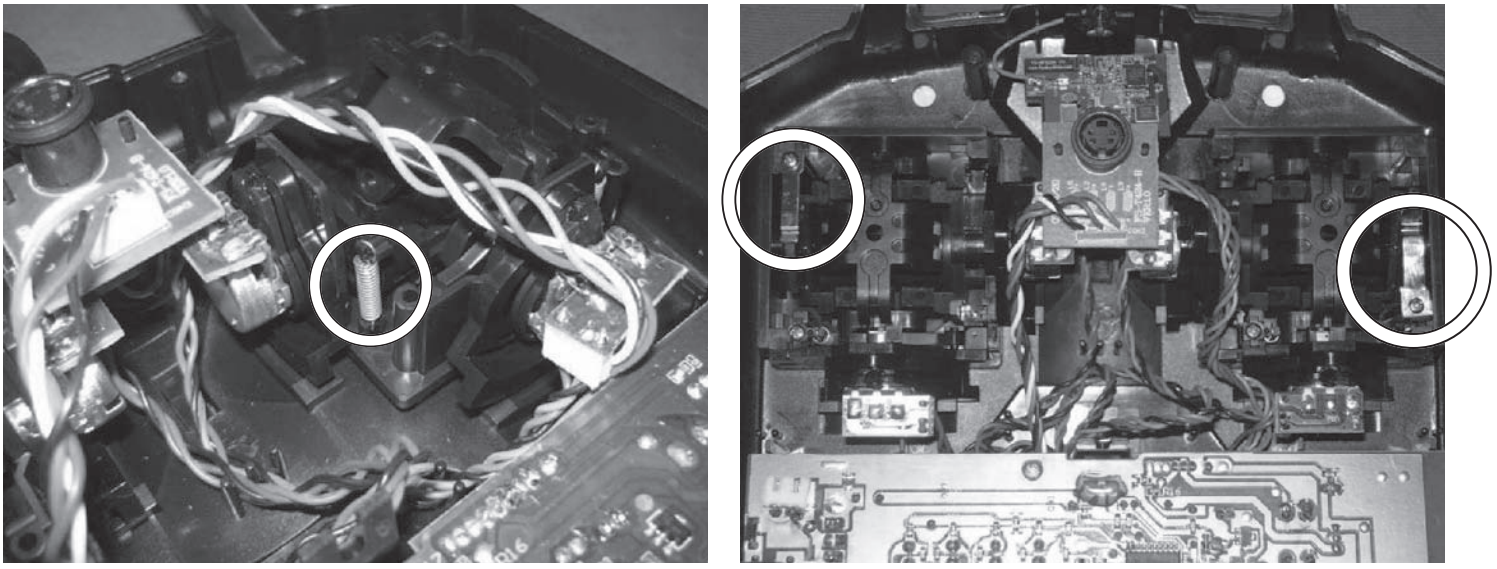
This was a relatively easy operation that anyone can do; all that is needed is a Phillips screwdriver and the ability to bend a small piece of metal. After that it was a matter of fine tuning the controls to obtain optimum performance.

Mode Three conversion

The transmitter I bought is known as a Mode One, this just means the right stick is the throttle (no spring return).



HobbyKing transmitter modifications: *Left, remove the back cover and unplug the batter compartment lead to separate the front and back covers (circle). Right, a close-up of the gimbaled assembly.*



Springs, wipers: *Left, remove centering spring (circle); depending on model, spring may be on the opposite side. Right, add dentent wipers made from any springy material such as brass (right circle); use original wiper (left circle) as a template for new component.*

Mode Two has the left stick as throttle and this is commonly used more in the United States. I have converted my TX to what could best be described as a hybrid of Modes One and Two (or Mode 1½ maybe?), where both left and right sticks are throttles.

This is achieved as follows:

- First, remove the four screws holding the back cover on the remote transmitter. Lift the cover part way off and unplug the power leads from the circuit board. Set the back cover aside.
- You will see on the left joystick a shiny metal wiper arm which rubs against detents in the throttle controller, holding it in place where you left it. On the right joystick, there is a spring that centers the joystick.
- Remove the screw and lift off the spring, using long-nose pliers, from the right joystick up-down movement control.
- Fabricate a wiper arm from a piece of 6mm wide thin piece of brass or any springy metal. Copy the wiper arm on the other joystick. I made the indent by using a dressmaker's pin and hammering it across the brass.
- Attach the wiper arm, using the screw removed with the spring. (I found the screw to be rather long so I just trimmed it by cutting a piece off the end and filing the end smooth to remove the burr left by cutting). All that is left to do then is to reassemble the control in the reverse order.

My thanks go to Bill Wray of Texas and Greg Hunter of "The Sandstone & Termite Railway" in Loftus, Australia, for the idea of converting the transmitter.

Radio control for the Accucraft EBT-12

Text and photos by Peter Thornton

A fine performer on the flat — but like most live steamers — the East Broad Top Mikado No. 12 from Accucraft Trains Co. requires remote control to enable it to handle switching and gradients. After running my EBT No. 12 on several tracks eminently suitable for manual control, it was invited to the RGSEast, usually the province of electric locos because of its hills. It was time for radio control using my Spektrum DX6i 2.4GHz system.

I added servos to the throttle and reversing lever connected to a radio receiver in the tender. A video of my EBT No. 12 running on that day can be found at http://www.youtube.com/watch?v=Y4wKet2wX9k. It includes a segment showing the loco starting a heavy train of 11 coal hoppers and a combine on the three-percent grade — under radio control.

Fine runner: *The author's EBT No. 12 at speed on Jim Stapleton's IE&W Railroad in Purcellville, Va.*

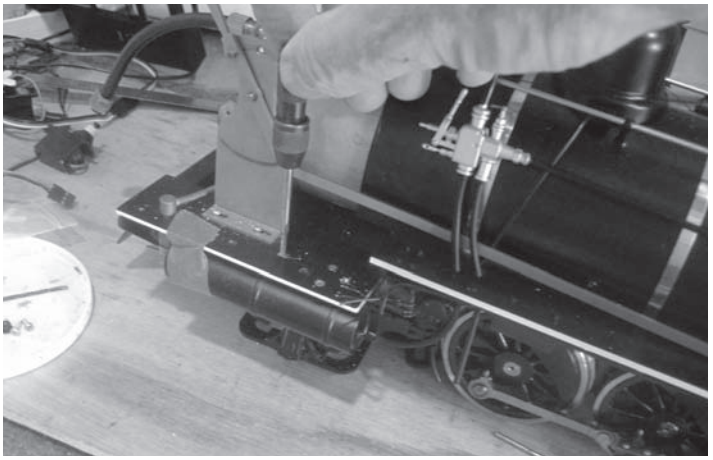
'R/C ready'

The EBT No. 12 is advertised by Accucraft as "R/C ready." There was some discussion on the Internet forums about exactly what that phrase meant. We did find the tender was prepared for switches, cables and included space for the receiver, but the locomotive didn't seem to have any special features making it "R/C ready"! Most folk thought they should at least include servo-friendly controls — and while the throttle and gas controls are large metal cranks suitable for hooking up to a servo, there is no special provision for mounting the servos themselves.

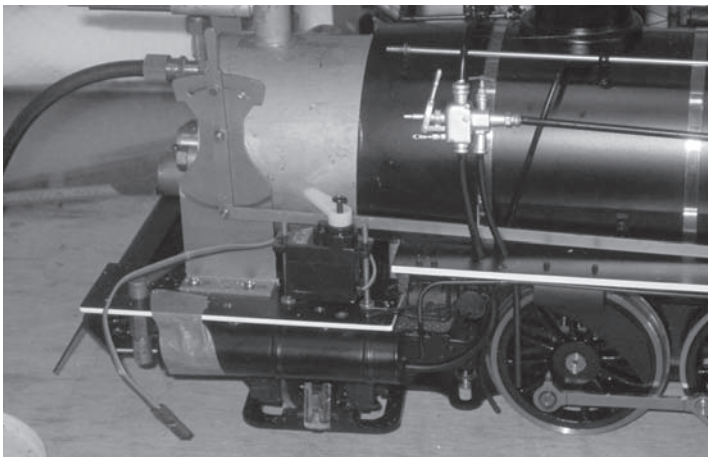
For manual control, the metal throttle crank gets very hot, and makes it difficult to run the loco. I had a plastic knob from an older loco in my parts box, so you will notice it replaces the crank in the photos. Now, of course, I can manage the throttle from my lounger so no more burnt fingers for me — famous last words?

The tender

The "R/C ready" features of the EBT No. 12's tender made the addition of a radio control receiver extremely easy. The tender is separated into two parts, both watertight, with the gas tank and water pump in the front and a box for R/C gear behind. The forward tank is usually partly filled with water when running. You can feed water to the boiler (manually, or perhaps using a servo pump controlled by the R/C) while under steam, and it keeps the gas tank butane at a constant temperature. There is nothing to stop water slopping out of the forward tank into the R/C area, although the relatively tight



Starting: *Servo rod holes were started with a pin vice and then completed on a vertical drill press.*



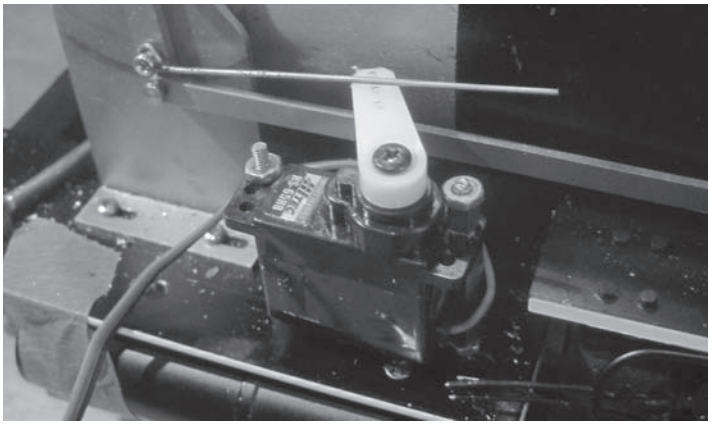
Fitting: *Test fitting the servo to determine the height; the tape holding the tank is clearly visible.*

fit of the cover may prevent some leaks. I put my R/C electronics in a plastic bag, as you can see in the photo, to obviate any problems (also, consider drilling a hole in the tender to let any water drain out from under the R/C gear).

There is a tube big enough for a couple of servo cables running from the front bulkhead, through the water box behind the gas tank, to the R/C box. I was initially worried about the apparent bend at the front, as the tube seems to end with a right angle bend at the side of the curved tank front, but in fact it seems the tube finishes at the bulkhead and the curved front is an open area. I found this out while trying to persuade the two servo cable connectors to make it round the corner.

The trick was to push them into the opening at the front so they are in the curved tank front, making them easily pulled through the tube. The actual pulling was done by a piece of fishing line (though any thread would probably do.) I tied a small brass nut on the line as a weight and dropped it through the tube while holding the tender (carefully) at an angle.

I used a pair of 12-inch "servo extension" cables,



Measuring: *With the servo bolted down and the arm cut to size, the actuator wire is measured. Note the forward nut holding the servo is raised above the case with a short tube spacer.*

from my local R/C hobby store, to reach the front of the tender from the receiver, and thus to give me a place to plug in the engine servo cables (see photos.) One cable's female end was taped to the fishing line, the other was taped a little behind it so they weren't both trying to get through the holes at the same time, and I pulled it through. As mentioned previously, the trick was to push the connectors into the curved tank front before trying to pull them into the tube. Once they were through I painted the male ends on the tender footplate with flat black acrylic.

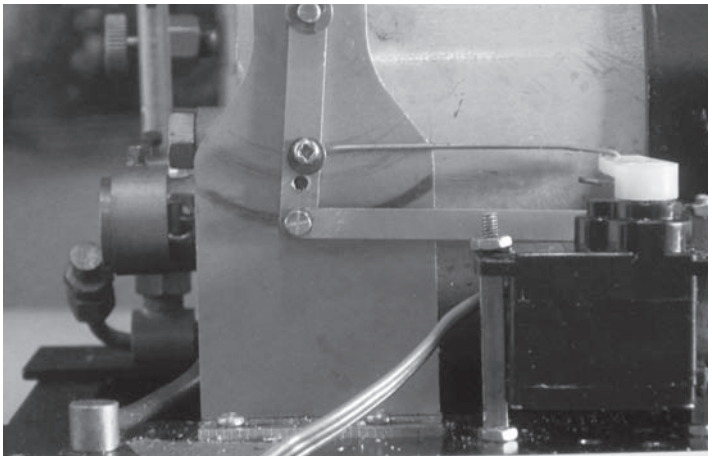
The R/C hobby store also sold me a four-pack of NiMH AA cells in the form of a wrapped 4.8V battery. I figured it would be more water resistant than using a battery holder from Radio Shack with separate batteries.

The water filler modeled on the rear of the tender tank is already hinged and the floor has a pair of holes ready to accept your on/off switch and a charging jack for the battery. All my steam locos have 5.5mm power sockets from Radio Shack, as they match the Spektrum receiver jacks and allow me to use just one charger for all my locomotives and transmitters.

I actually have three chargers — two smart chargers and the original Spektrum charger — as redundancy is everything when you are at a remote steam-up 1000 miles from home.

The on/off switch I used is overkill — a two-pole/three-way switch left over from my indoor O-scale layout of 20 years ago; any on/off that fits will do. I had to mount the switch a little low in the filler to avoid hitting the cover, and I put a dab of red paint on it so I would remember which way is "on." My 5.5mm socket needed a larger hole, so I had to find the right drill and carefully enlarge the hole.

As the top of the tender lifts off for access to the water bath and pump, I wanted to be able to remove



Side view of reversing lever, actuator: *Note, an earlier hole for the actuator wire is below the one that works better. As the old saying goes, 'measure twice, cut once.'*

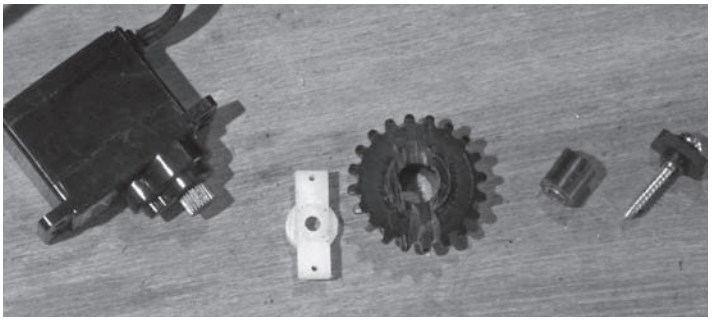
it completely if necessary, so I connected the switch and socket under the water filler to the receiver and battery with the 12-inch "servo extender" cable's plug and socket, allowing me to disconnect the top and place it aside if necessary.

I cut the cable about three inches from one end and attached that to the electronics in the tender box. The longer piece was attached to the removable top, and the 12-inch length is just about enough to let me place the top on the ground next to the tender while I pumped water or performed other maintenance tasks.

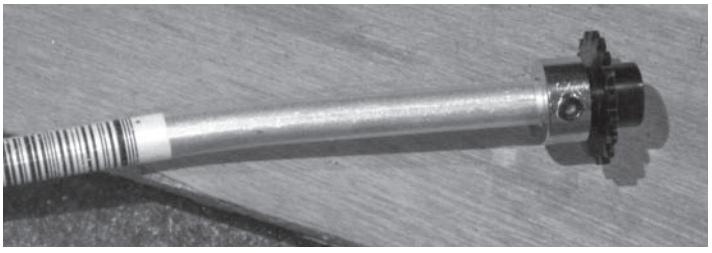
The servo cables have three wires: a (+) and (-) power supply and a signal. I connected the black (-) to the battery-to-rcvr (-) wire by cutting it, soldering all three together and shrink-wrapping the joint. The red wire from the battery was cut and soldered to the red wire leading to my socket and on/off switch. The yellow signal wire from my on/off switch connected back to the receiver, feeding it (+) power from the battery if the switch was on. .

The receiver I used is a Spektrum AR6200 with dual antennas. Again, total overkill, but I had one that arrived with the DX6i package, so why not use it? There's the possibility that the metal tender box will reduce the signal and cause problems, but no one is reporting any issues with these receivers tucked into brass tenders so far.

It certainly works in my loco. (My EBT No. 7 has a "Spektrum compatible" receiver from HobbyKing.com in Hong Kong which cost me about $12. No problems with that either.) The battery pack and receiver are inside a zip-top bag and the additional antenna is Velcro taped to the side of the box. With the cable from the tender top attached, and all plugged in to the receiver, it was time to test it with a spare servo on the cable(s) at the front of the tender.



Throttle servo arm cut down: *The sprocket has a slot across its face to fit against the arm, the quarter-inch sleeve for the sprocket has a brass sleeve inside it, and a longer screw, with a spacer.*



Throttle sprocket and collar test: *Sprockets have a narrow boss on one side, which was filed to snug around the servo arm, but on the shaft it was filed off so the sprocket fit tightly against the collar.*

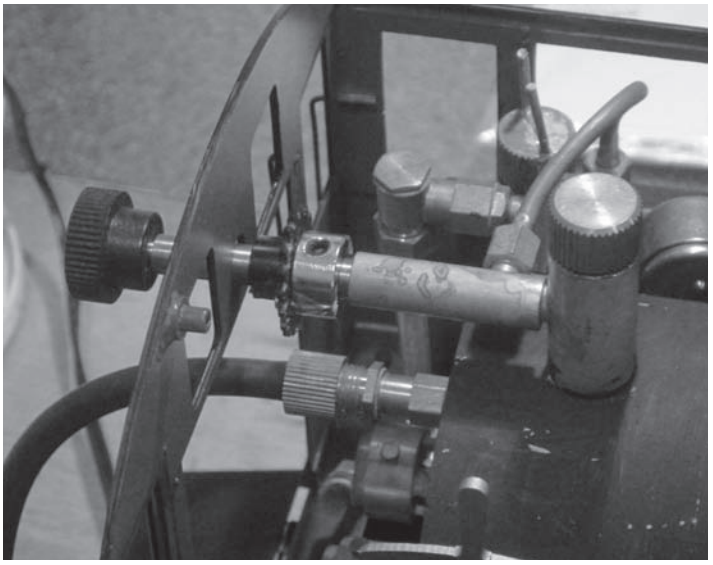
All was well, and the whole job only took me about an hour once I had the pieces in hand.

Removing the cab

I removed the cab to simplify fitting my servos (and to fix some shipping damage). There are four screws, two at each side, holding it (and the air cylinders — see below) in place, plus all the bits that come through the front and back must be carefully handled, and there are a couple of screws in the back corners. The throttle rod, which in this loco goes through a hole in the back wall, can be unscrewed and then pulled out gently when it seems not to be unscrewing any further. (Try not to damage the O-ring or you'll get leaks.) The handrails are bolted through holes in the front wall on this loco, and the other pipes are also slotted through their holes. If you are not sure where everything goes, take some photos before you start pulling them out.

Remove the four screws in the floor of the cab first. The air tanks under the cab are also held in place by the cab screws and they are solid brass so they weigh a proverbial ton! You'll see from the photos that I taped one to the footplate while I was working on the reversing lever side.

On the other, I put the screws back loosely to keep it from flopping about and damaging itself, the air pipes, or something else. Once you have the tanks under control, you can remove the throttle shaft, move the



Throttle test: *You can just see the bolts through the sprocket, fitted in slots in the edge of the collar.*

cab rearwards, and deal with the various pipes in the front wall as you ease the cab off the footplate.

[P.S. While you have the air tanks loose, you can adjust the piping around the lubricator drain and the blowdown valve so they both open easily. As delivered, there can be clearance issues.]

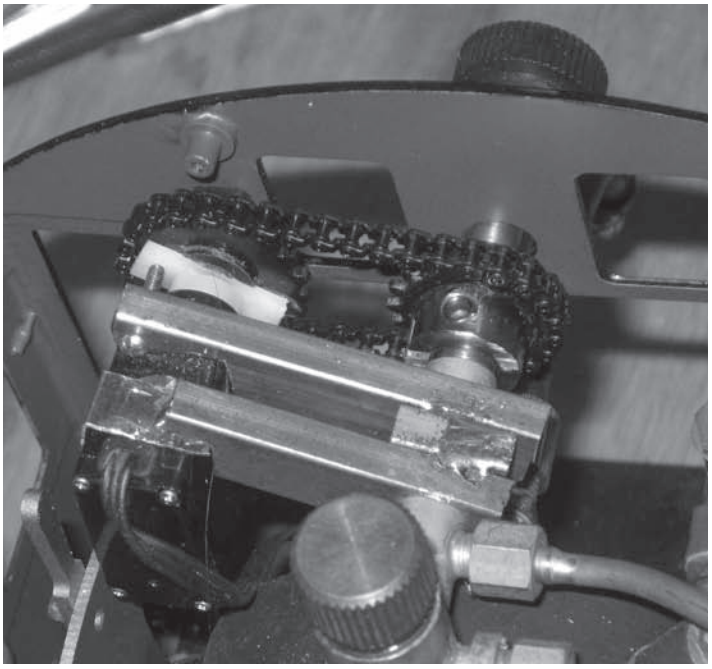
I also found it helpful to loosen the reversing lever as the rod needs wiggle room through the cab front — the screws are quite short and will easily come out, so make sure you have the lever centered first, making it easier to put it back in the right place.

The reversing lever servo

The reversing lever (Johnson bar) is controlled by a servo mounted in the front corner of the cab. I had purchased 12-inches of threaded rod from the same R/C hobby store (GPA Hobbies of Crofton, Md.,) that sold me the servos, thinking it might help hold the servo on the footplate. After marking out holes I drilled them and tapped them 2-56 for the threaded rod. [P.S. I could have drilled holes larger and bolted the rod to the footplate with a nut above and below. I tapped the hole because I could, not because I had to.]

The rods were cut to about one-quarter-inch longer than the (estimated) height of the servo and screwed in place with lock nuts above the footplate. I then opened up the holes in the servo mounting tabs very slightly and slid the servo onto the rods to set the height. This required me to decide where to attach the servo to the reversing lever, which requires knowing the throw of the servo (and clearing the reversing rod leading from the lever out of the front of the cab.) The servo arm moves 45-degrees from the center and thus the distance moved should be the amount you want the lever to move.

I ended up about a quarter-inch above the foot-



Throttle servo installation: *The author cleaned up the solder holding the two frames together after taking it all apart – again. Note that the collar's set screw is accessible for adjustment.*

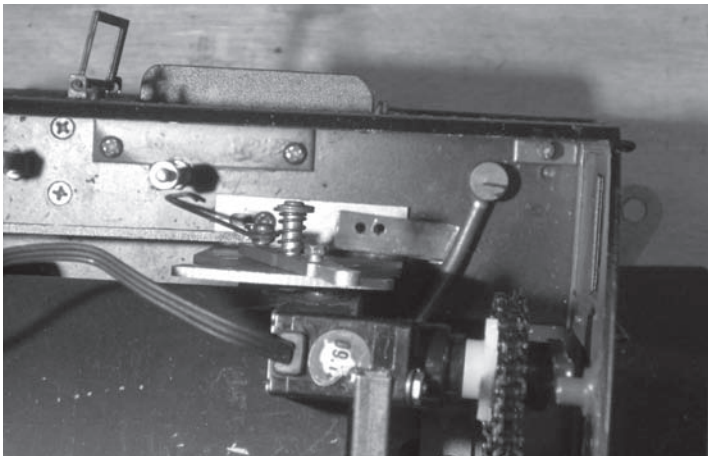
plate and I cut one-eighth-inch tubes from square brass to fit the rods and hold the servo in place. It was a tight squeeze getting the wires to clear the tube, and I also had to add a short tube on top of the front servo mounting tab as I couldn't get the nut into the gap between the tab and the boss for the servo arm. (See photos.)

Now I had the servo solidly mounted, I added a nylon arm, plugged the servo cable in to the socket on the front of the tender, and turned the R/C on. Testing the movement of the servo made me realize the long nylon arm was impacting the boiler wrapper, so I cut off the end hole of the three on the arm. The arm was sanded and filed to a smooth shape and refitted on the servo. I then set it at center and turned everything off.

Accucraft supplies a positive stop for the end of the reversing levers on all their locos (all the ones I have seen, anyway). In this case, the lever has a bolt screwed in the top that fits in the holes (one of the three) in the frame holding the lever.

I unscrewed the bolt to free up the movement but didn't remove it, in case it was needed at some future time when I had to operate in manual mode. I "damaged" the threads on the bolt with a quick grip from my wire cutters to make sure it stayed in place — glue has the same effect.

(Yes, the need for manual control does happen — the batteries fail sometimes, etc. A by-product of my servo connection to the lever is that you can insert a screwdriver in the cab and remove the servo arm, thus



Brass plate fitting: *The brass plate prevents the lower end of the throttle servo from rotating. Note there is only one piece of brass bolted to the top of the servo – this was an early test.*

Tender: *Rear compartment of tender, with two servo extenders pulled through with fishing line.*

releasing the R/C control. The throttle can be released quite easily also, by releasing the collar on the shaft.)

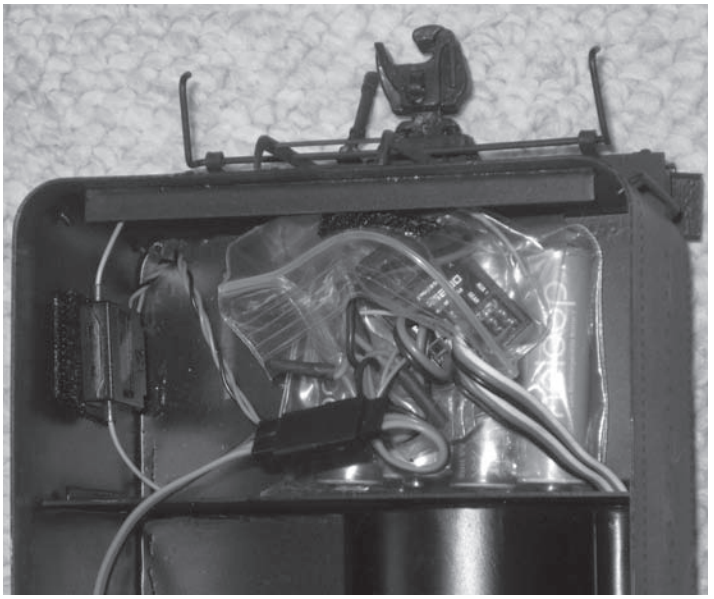
The EBT Mikado is unusual (for Accucraft) in that the reversing lever works the modeled reversing rod to the working outside valve gear. The pivot is quite high, so the servo is working on the bottom of the lever.

I thought the servo needed to connect as close to the bottom of the lever as possible, so I drilled the lever and tapped it for a bolt just above the pivot. (Again, I tapped threads because I could and it was easy. A hole with a pin soldered in it and the rod securely attached would work instead.) A short length of piano or music wire (which is very rigid) was bent to fit the bolt in the reversing lever and to the servo arm. (Sometimes you have to heat the wire in a torch or lighter until red hot in order to persuade it to bend.)

When it was in place, the R/C was turned on again and tested — alas, the servo didn't move the lever quite far enough, so I had to drill another hole a little higher on the reversing lever. (I confess to this, as it is obvious in the photos! I probably measured before cutting the nylon arm.) This time it worked just right, so I was done with the reversing servo, except for threading the cable back to the footplate and painting the wires black.

Reassembly

I then unbolted the reversing servo in order to reinstall the cab, as I anticipated needing the cab to support the throttle servo (which in the end I didn't, so I could have left it off until the final stage.) I suspected the reversing servo supports were going to interfere with the tabs on the cab, which they did, so a little judicious filing was needed to get the cab to sit down on the floor.

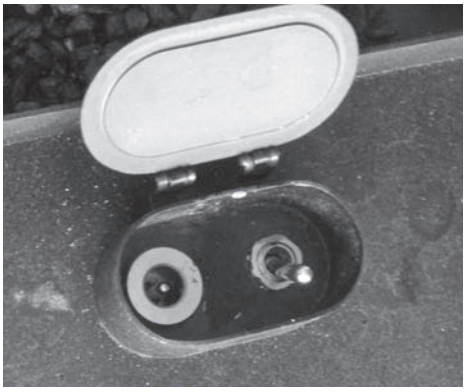


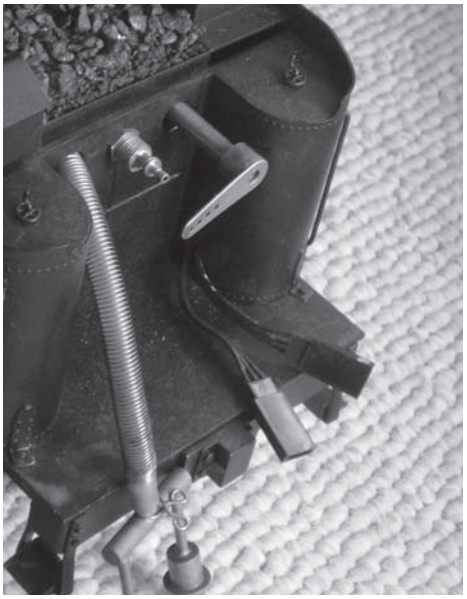
Bagged: *The R/C gear in its plastic bag. The second antenna of the AR6200 is attached with Velcro to the side of the box.*

Putting it back was the reverse of removal — lots of fiddly bits to feed through the front cab wall and screws to be dropped into the holes in the floor while supporting the air tanks. My favorite tool for this is a "grabber" — a device like a pencil with multiple small wires that come out when you depress the knob on top and are sprung back into the grabber as you release the knob. You can grab a screw/bolt and start it in the hole that your fingers can't reach.

Throttle servo

My first installation many years ago used a servo and a rod to drive the throttle ("Simple R/C for Accucraft's C-16," *SitG*, May/June 2002 and July/August 2002). We now have a one-eighth-inch chain available, which makes it easier to manage and tune





Wiring: *Left, the charging plug and switch under the water-filler hatch. Middle, the underside of the plug and switch. Right, the wires (painted black) coming out of the tender.*

the drive from the servo to the throttle. In theory, one could adjust the drive ratio, using different size sprockets, so that the throttle moves more than the servo, or vice versa. In fact we've discovered that the Accucraft throttle only needs about a quarter turn to open, so more-or-less direct drive is fine. I used a 20:18 ratio, so the throttle shaft is turned 10 percent more than the servo.

I found out that a big drive ratio and a small servo are not compatible on my previous conversion; see "A Tale of Two Servos," *SitG*, July/August 2009.

This time, I noted the sprockets were available (inexpensively) with one-quarter-inch shaft holes. I took a double-sided servo drive arm and slotted across the hub of the 20-tooth sprocket to fit the arm, bolting the sprocket to the two arms with a couple of small bolts. A quarter-inch tube fit inside the sprocket to keep it from wandering about, and a brass tube inside that made it snug with a longer screw. A plastic spacer on the screw made everything tight.

The throttle shaft turns out to be 6mm, which is very close to one-quarter-inch. After cutting off part of the hub of the 18-tooth sprocket to narrow it, I cut slots in the brass collar and soldered bolts in the slots, attaching the sprocket to the collar. That allowed me to slip it on the throttle shaft and tighten the set screw in the collar.

With the two sprockets mounted, I had to put the throttle servo somewhere close. My preferred spot is flat under the roof, but this loco has a big cab, windows close to the roof and lots of working bits on top of the boiler, not to mention the reversing lever sticking up at one side. The best spot seemed to be a high vertical mount on one side of the firebox.

I have had success attaching servos to throttle shafts using a bracket from the throttle shaft cover — the tube the throttle shaft screws in to. In this case it is 5/16-inch diameter (I have no idea why the shaft is mm and the boiler fitting is in inches), I took my rectangular tube and drilled it at one end, then measured where I wanted the servo to hang and cut a square notch out of the other end of the tube. The protruding end was then drilled for a small bolt and the servo tested.

All was well until I added the chain and tightened the collar on the throttle shaft so the servo was doing real work — it twisted significantly with only one bolt holding it in place. I had already realized that it would need something holding it still or it would rotate around the shaft, instead of rotating the throttle!

I made up another bracket of the rectangular tube and soldered it to the first piece with a spacer, adding a small brass U-shape on the end to hold the servo longitudinally. I then added a brass tube from the footplate to the bottom of the servo to stop it from rotating. A brass rod bent at 90 degrees was soldered in the top, and the bottom of the tube was split and soldered to an upright edge on a small brass plate that was bolted under one of the screws holding the reversing lever in place.

Once that was done, I reassembled everything and tested the R/C operation. It worked fine — except the start position needed adjusting, and, as Murphy's Law will advise you, I had got the collar and sprocket on the throttle shaft at the precise angle so the set screw was blocked by the servo! I had to take out the throttle shaft again, reset the servo at the "closed" end of its travel, put the chain back on with the throttle shaft sprocket now at a convenient angle, and re-install the shaft with the collar in the right place for fine adjustment.

And that, essentially, was that.

Designing and building 'Leo,' a live-steam

Inspection car

Leo: *The author's steam inspection car runs the rails at Gary Siegle's railroad in Santa Barbara, Calif.*

I often wonder where the inspiration will come from for the next project. Should I wait until it strikes like a bolt of lightening or should I seek it out? I decided to be proactive and while sitting at the computer I Googled "railroad oddities."

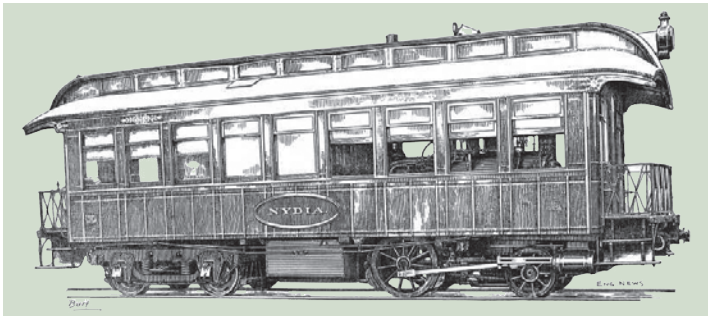
Among other things that came up was an article reproduced from the August 1889 edition of *Engineering News* about a steam inspection car. The article was about a car built by Baldwin Locomotive Works for the Susquehanna Coal Co. It combined both the engine and the car in one body and was named "Nydia." The article went on to give some dimensions, a side and end view along with a top view with the roof removed so you could see the layout of the boiler area, the executive seating area and the bathroom/galley. The article described in some detail the lighting, wall covering and the engraved glass in the windows and doors.

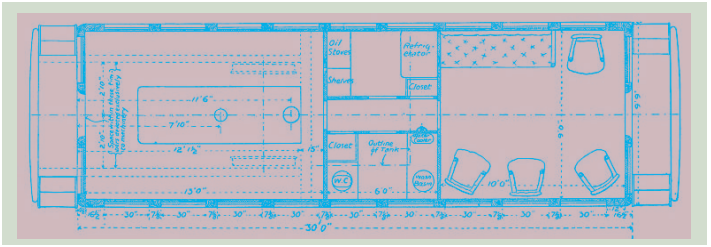
This was the spark I needed. I began to do the planning for my version of the inspection car. I have always been the "idea guy" — I do not have the skills necessary to do this by myself. It would not be possible without the help and generosity of many people. I will do my best to give them all the proper recognition.

For the coach body I chose a Northeast Narrow Gauge 1:20-scale narrow gauge 26-foot coach. For the engine I was planning on using a Ruby boiler and drive components. Cliff Luscher at Accucraft Trains Co. sold me a scrapped boiler and a gas tank and with those in hand, I began to draw some plans. I now had the actual dimension of the boiler and I could make some size decisions for the executive area and the bathroom/galley. From the drawing of the inspection car I knew that the Northeast Narrow Gauge model as provided would be too short, but I thought I could figure out a way to increase the length from nine windows to 10, thereby adding enough space for what I envisioned.

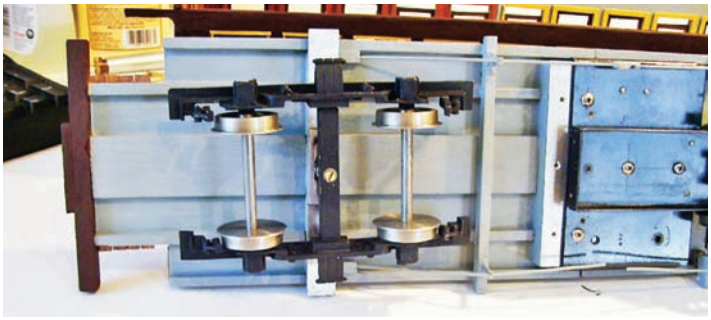
In my conversations with Ted Stinson of Northeast Narrow Gauge (a division of Northeast Model Products of Wiscasset, Maine), he said he could remake

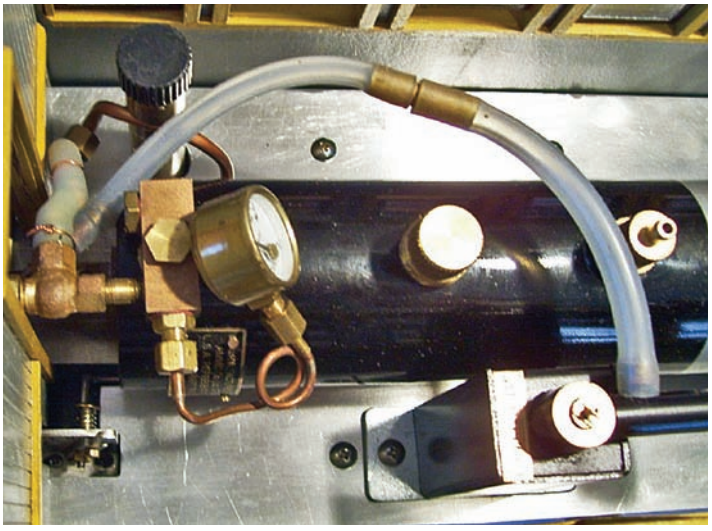
Text by Sonny Wizelman/Photos by Rick Parker, Sonny Wizelman





Prototype: *Left and above, the steam inspection car as depicted in* Engineering News *of 1889.*





Undercarriage, boiler: *Above, the car's rear trucks are shown. Right, the Ruby boiler in the front compartment (boiler room); note that the silicon tubing has been replaced with copper.*

the sides to the larger size I needed, provide the two additional ends that were required to divide the boiler from the bathroom/galley area and another to divide the bathroom/galley from the executive area. He also provided the additional windows and doors I would need. He did all this for a very modest charge and I am very appreciative of his willingness to help.

The head consultant on the project is a close friend, Bill Turkel of Upland, Calif. Bill and I have had many discussions on what to do, what material to use and his contributions are all incorporated into the final product. First, Bill took the boiler and took off the front number plate. He replaced the Ruby throttle with a valve from Coles Power Models of Warren, Texas, that reduced the length from front to rear on the boiler creating more room for the other sections of the car.

When Bill was finished, I made a wooden mockup of the base, which is designed to be in two pieces, so if needed it can be removed for servicing the boiler. The base attaches to the boiler from the four brackets that were part of the original side-tank assembly on the Ruby. The mockup included the under structure as the original model showed, with modifications that allowed the base to slip on and off.

We did not alter the Johnson bar assembly as per Bill's advice. Any changes we made might affect the positioning of the bar and affect the forward, reverse and neutral positioning. The new base had a place for the gas tank and the lubricator to be attached. There is also a place for the rear bolster assembly.

The Ruby has four driving wheels whereas "Nydia" had only two; the front two wheels were not drivers. So I made a wooden mockup of a two-piece part to hold the truck in the original Ruby frame. I now enlisted the help of another friend, Eric Strauss of Sherman Oaks, Calif., who is a master machinist and has helped me with his skills on other projects.

The boiler needed a bracket to hold it to the frame, which Eric made. Next I bought a 7/8N2, 12-inch, 1:13.7-scale set of trucks with spoked wheels made by Sierra Valley Enterprises of Merced, Calif., and sold through Sunset Valley Railroad of Lake Tapps, Wash. They were not the correct scale but were the only ones I could find that had spokes and resembled the ones in the photos of "Nydia" in the article.

Eric milled the width so they looked more prototypical. He tossed out my design for the fixed wheel bearings for this truck and proceeded to design and make a far superior set. We bought oil-filled bearing grade bronze, one-quarter-inch thick, five-by-six-inches from McMaster-Carr Supply Co. of Elmhurst, Ill., and Eric proceeded to make the bearings. Instead of attaching them in a fixed position, as I had designed, he came up with a solution that used spring steel strip to allow the trucks to move up and down over the track.

We bought a 12-inch piece of 3/32-by-six-inch brass from Small Parts, which was going to be the base. Eric determined that the base would be front heavy if it were all brass so he decided to make the front section in aluminum for balance. Eric made

Floor: *The parquet floor used on the drawing room and galley half of the car.*

a complete computer-assisted drawing of the front axle assembly, the front axle bearings and the base before going into the shop to cut metal. Everything he did worked perfectly including building some left to right lateral movement into the rear truck bolster.

Eric really came through and did a first-class job. His planning and engineering and workmanship are really appreciated. This would not have been possible without him and I want to express my gratitude.

While Eric was doing the machining, I got started on building the walls and the ends and the interior dividers. The *Engineering News* article discussed windows with etched patterns, but since it was going to be a steam engine I did not think that using plastic for the windows was going to work. I thought that slide glass might be the answer — the glass used by scientists or doctors when they examine something under a microscope.

My wife works for a dermatologist and I asked her to bring home a box of slide glass to experiment with. I went to the hardware store and bought a brand new glass cutter and proceeded to start cutting. Each attempt was a failure as the glass shattered.

Soon after this happened, I was with Dan Pantages of South Surrey, British Columbia. He was showing me some glass he had cut as a replacement for a plastic part on a locomotive he was selling. I asked Dan if he would help me out with my project and he agreed. After he said yes, I told him how many pieces would be needed. It required 20 for the clerestory, 20 each for the lower window and the upper window and eight for the windows in the doors plus a few extras for me to break while I was working on them. His face dropped but he did it and I think we are still friends. Thanks Dan for your help and your friendship

The *Engineering News* article said the glass was etched, so I wanted my glass to have that look. I planned on using decals in white, as I had seen transfers done this way to represent etched glass.

Walls and windows: *An interior wall of the car; the 'boiler room' is painted a utilitarian gray.*

Power and guidance: *The car has a single drive wheel with a single leading truck.*

I asked my son, who is a graphic artist, to come up with a design and sent it off to have the decals made. I applied all of the decals to the glass, but they didn't have the look I was after. The decal material made the glass appear foggy and it was not what I envisioned.

About that time, Dan asked me how the windows were going. When I told him about what I had done, he mentioned John Clark of Cedar Crest, N.M. Some years earlier I had seen a prototype of a model that John had been working on called "Emelia." John had done etching on the windows and wood with a laser. We modified the design John had used on "Emelia" and after several e-mails, John made a very generous offer to do the etching. When it arrived it was the exact thing I pictured. It was the correct way to do this. I want to thank John for his help on the project.

Now I had to mount the glass into the frames. There were to many inconsistencies in the frames that were provided with the kit, so I asked a vendor and a friend, Hernan Pineda of C & H Letterpress of Santa Ana, Calif., to cut them out on his laser cutter. I made a drawing with the inside and outside dimensions for the upper and lower side windows and furnished Hernan with the wood and he had the window frames cut. I want to thank Hernan for his generous help.

I experimented with several glues without much success. Bill Turkel suggested Watch Crystal Cement

— Continued on Page 30

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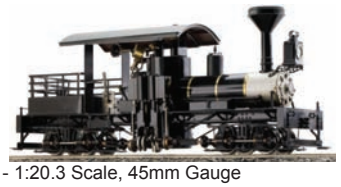

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- Butane / Alcohol Fired, D-Valve
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- Brass & Stainless Steel
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Accurate interior: *Dollhouse furniture is used to make the interior of 'Leo' comfortable for the rail inspectors.*

Laser windows: *After other techniques didn't work, the windows were etched by laser.*

— Continued from Page 27

(also called Hypo Cement), which is a glue used on watch crystals and is available from Micro-Mark of Berkeley Heights, N.J. It did the trick. After you have let the glue set up you can clean up any excess with nail polish remover.

I now began to build the body of the car. It was my plan to make each section a self-contained separate piece so the entire car could be taken apart for servicing.

The *Engineering News* article mentioned something about the interior of the executive area, saying it was all finished in beautiful wood. I began a search for a company that could provide this. I found S.H. Goode & Sons Workshop in Atascadero, Calif. Stephen Goode makes an amazing assortment of precision-cut hardwoods (37 different to choose from), moldings, trim and flooring. I worked with Stephen on the choices. We used 1/32-inch walnut sheet stock for the interior walls, walnut molding for the interior window and doors, floor molding and chair rail molding. He also provided six-board parquet flooring that I used for the floor in the executive area and the bathroom/galley.

I used the plans from the coach to draw some ideas for additional molding on the sides and ends and chose the paint scheme. I have learned over the years to prepare the parts and then paint them before you assemble them. You will need to do some touch up at the end but this is much easier then trying to paint small parts and keep the different colors separated. I made mitered molding for all the windows and the doors on the inside and added additional molding for decorative purposes. I used a satin super-clear lacquer spray over all the parts and then assembled the body.

When the assembly was complete, the lighting was added. These are one-quarter-inch scale lights from Cir-Kit Concepts Inc. of Rochester, Minn. I chose brass colonial coach lamps for the outside front and rear ends of the coach, one for each side of the doors. In the executive area there are four tulip-shade wall sconces and a two-arm, bell-shade chandelier hanging from a brass rectangular tube at the top of the room.

Bill Turkel cut grooves in the top of the ends and room dividers to hide the wires and cut and attached brass square tubing to hide the wires as they came down to the fixtures. I now wired it all together and built a box to hide the batteries. There are 10 lights and after discussing this with Bill, we ran five lights each to two batteries. They are inside the box — I made it to look like a crate — with just the on-off

Lights, action: *Lighting inside 'Leo' works with a battery hidden in the boiler room (right).*

switches visible in the crate top. I had just enough room next to the boiler for the box.

There were a few last details to add. The door knobs are one-half-inch scale brass door knobs and key plates from Hobby Builder Supply of Atlanta. "Nydia" had what looked like name plates on each side. I wanted the same look. I asked my son to design an oval name plate and then went about finding someone to make them. I found John Lythgoe of Formil Model Engineering in England, sent him the design and the paint samples and he produced the brass name plates.

I named this project for one of our grandchildren: Leo lives in Brooklyn, N.Y., and was born on May 4, 2001 (5401). The two oval borders, with the word "Leo" and the number "5401," are raised and polished brass, the background is recessed and painted and then baked to give them an enameled look. They are truly works of art.

When Eric completed the base I began to do the finishing. I added the underbody parts — there is a front bolster which along with the rear bolster hold the body in place, the truss rod supports a center support. I wanted to add truss rods. I needed to find turnbuckles that were threaded so that the two halves of the base could be taken apart. I found exactly what I needed at Hartford Products of Hillsborough, N.C. Bob Hartford helped me and I used his HP-22BTR turnbuckles and HP-19 10-inch queen posts.

Next I laid the parquet flooring, which included half-inch-by-half-inch pieces that came from Goode & Son. I drew a center line on the base and started to glue the flooring to the base. I added strips of walnut to the platform. I added the end beams, nut-and-bolt castings from Ozark Miniatures of Cedar City, Utah, and the Kadee couplers.

More windows: *Etched glass festoons the rear door of the inspection car, which is framed with lights.*

We wanted some very ornate end railings. Bill engineered and made the two end rails. We had some issues because they were soft soldered and did not withstand the stresses of handling. Bill reengineered and remade them so they were much stronger and this solved the problem. They are brass and painted with a gold paint. Bill also made the step brackets. He bent them to my specifications. I drilled the holes for the screws to attach them to the underbody and made the steps and assembled and painted them.

Next, I built the roof. As with all the other components, it had to be designed to be removable. The servicing of the boiler has to be done with the roof off. The clerestory sides had to be increased in length to correspond with what was done to the coach sides. After painting the sides the windows were installed.

The original model called for one piece of 1/16-inch sheet for the clerestory top and the roof.

I decided to build the underside with 1/16-by-one-eighth-inch basswood strips, also from Micro-Mark, and then stained with a cheery stain. I made three one-eighth-inch curved parts to slip down inside the body. These would hold the roof shape and provide a way to keep the roof positioned properly in the body.

I was afraid that the stack and the safety on the boiler might vent oily water on the inside of the body so I made brass tube extensions that would take the stack and the safety waste out through the roof. I cut openings in the roof for these and added mitered borders. Many small pieces came from Trackside Details of Pinedale, Calif.: For the headlight, I used Trackside's TD-85, the vents were TD-44x and the smoke stack vent was TD-65. To simulate the roofing paper, I used one-half-inch square hand towel paper which I painted gray, using the wet paint as the glue to attach it to the roof. I lined the inside of the headlight with silver Mylar, added a MAG light and wired it to a battery and an on/off switch in the clerestory roof.

I imagined that the original was furnished with very elegant furniture. A friend told me about Larrianne's Small Wonders, a dollhouse store in Ventura, Calif. Larrianne had a wonderful selection of one-half-inch scale period furniture. The things are beautifully done. They are upholstered and detailed magnificently and made a perfect finishing touch. For the galley she had a period toilet. When my wife noticed the toilet visible thought the window I decided to add shades as a privacy issue.

Because I had never run the locomotive with all the components together, I took it to Bill's home track and we tested it. It was not running well. Bill kept it at his shop and went to work solving the problems. There was no blast pipe, there were a few steam leaks and the jet was not being held securely. He replaced my Teflon tubing going from the gas tank to the jet with copper tubing and soldered the assembly together. He tested it without the body and roof and was pleased. He brought it to my house and we ran it with the body and roof on and it ran beautifully. There were lots of smiles and lots of high fives. It was a real thrill to see it running and performing so well.

Soon I will be taking it to a steamup via an airplane. I would never trust a shipping company to get it there in one piece, so it will be carry-on. I tried to out think the TSA and made the gas tank removable and I will send that ahead separately.

Again, I would like to thank all the people who contributed their time and skill to this project. It is a testament to our hobby that there are so many willing and talented people in it.

Accucraft's K-28, a first venture into a traditional fuel

COAL

By James Overland

Remember seeing a congregation of steamers at Diamondhead or Sacramento, all standing around a locomotive that is hissing and spitting from multiple places much more than is usual for a gas-fired loco — seemingly a bit less controllable and slightly more dangerous — it must be a coal burner! Talking to Cliff Luscher at Accucraft Trains Co. by phone before the arrival of the new Denver and Rio Grande Western (DRGW) K-28 coal-fired model, he said that it was heavy, but true to form for coal firing, it is an enjoyable beast!

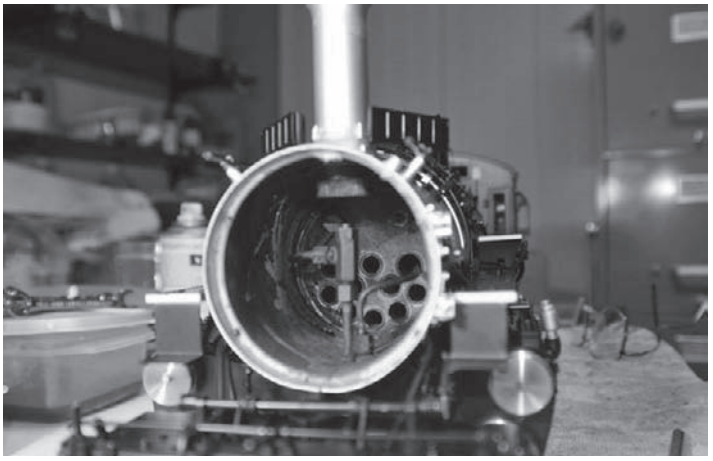
The new K-28 came to me via two pathways: a reluctance to embrace Colorado narrow gauge and the fraternity of coal firing. From Seattle, I started live steam-garden railroading in 1991 with a 1:20-scale Northwest logging theme, branching to some mainline — thank you, Aster, for the Great Northern S-2 model. After reading *Narrow Gauge & Shortline Gazette* magazine and especially talking to dealers at conventions, it was clear to me that they considered that life began and ended with DRGW and Westside Lumber Co. in S-scale, and everyone else was second class. I would always stay with, and believe in, a local railroad connection.

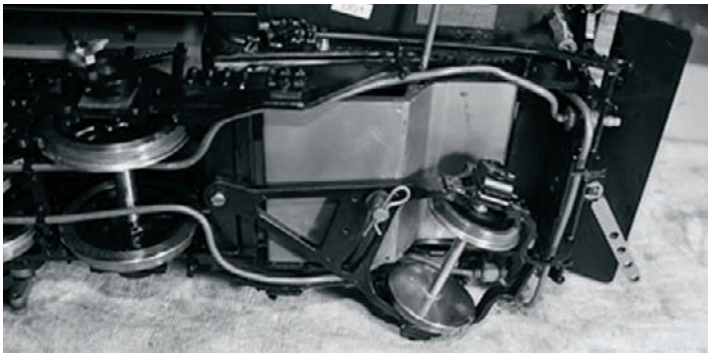
Except ... Accucraft Trains Co. came out with its DRGW K-27 gas-fired model and it was big. Plus Hartford Products of Hillsborough, N.C., and Phil's Narrow Gauge of Peyton, Colo., had some fine rolling stock kits to build. So I put my head down and ordered a K-27 and acquired a library of DRGW books to get the story right. I traveled to Boulder, Colo., for work each year and you can get there from Denver via Golden, Colo., and the Colorado Railroad Museum. Why do 1:20-scale models of the DRGW always look so huge and the real cars at the museum look so small?

The second pathway is coal firing, which of course starts with John Shawe of Shawe Steam Service Ltd. of Hertsfordshire, England. I had obtained a coal Fowler conversion from him and modified it to a Northwest proto-

Accucraft coal-fired K-28

- **Loco type:** American Locomotive Works (Alco) narrow gauge 2-8-2 (Mikado), 1923. Cylinders: 18-inch diameter, 22-inch stroke. Drive wheels: 44-inches. Boiler pressure: 200 psi. Tractive effort: 27,540 pounds. Weight: 156,000 pounds.
- **Scale:** 1.20.3, 45mm gauge.
- **Length:** 40 inches.
- **Height:** Eight inches.
- **Width:** 6¼ inches.
- **Boiler:** Single; full stayed; superheater.
- **Fuel:** Coal.
- **Grate area:** 62 sq. cm. (60 x 140mm).
- **Min. radius:** Four feet.
- **Water pumps:** Axle pump with bypass valve; tender water pump.
- **Cylinders:** Two, with D-valves.
- **Valve gear:** Simulated Walschaerts.
- **Fittings:** Throttle, water-level gauge, pressure gauge, boiler petcock, cylinder drain cocks.
- **MSRP:** $6500.





K-28: *Top, the locomotive. Left, a look into the smokebox. Right, the trailing truck. Top photo, courtesy Accucraft. Other photos: Torry Krutzke.*

type to haul sawn lumber. Note: Many Northwest locomotives ran on coal as coal was in as much local supply as trees. When you ask John for instructions on how to fire a coal burner, he just says "practice."

I enjoyed the Fowler, which because of the small firebox needs attention not to let the fire fall too low. John says never rake the coals with the pick, but at Diamondhead one year I caught him raking the coals from the bottom — below the grate — to get the fire going again after each addition of new coal to the firebox. This is one of the secrets to coal firing to keep the locomotives running for more than an hour.

The next temptation was the Aster Mikado. I had a kit and was looking forward to building it. But should I have it converted to coal? Yes. After the usual wait for our locomotives, I have a coal Mikado that gets run more than my other locomotives. The slightly larger firebox of the Mikado is forgiving.

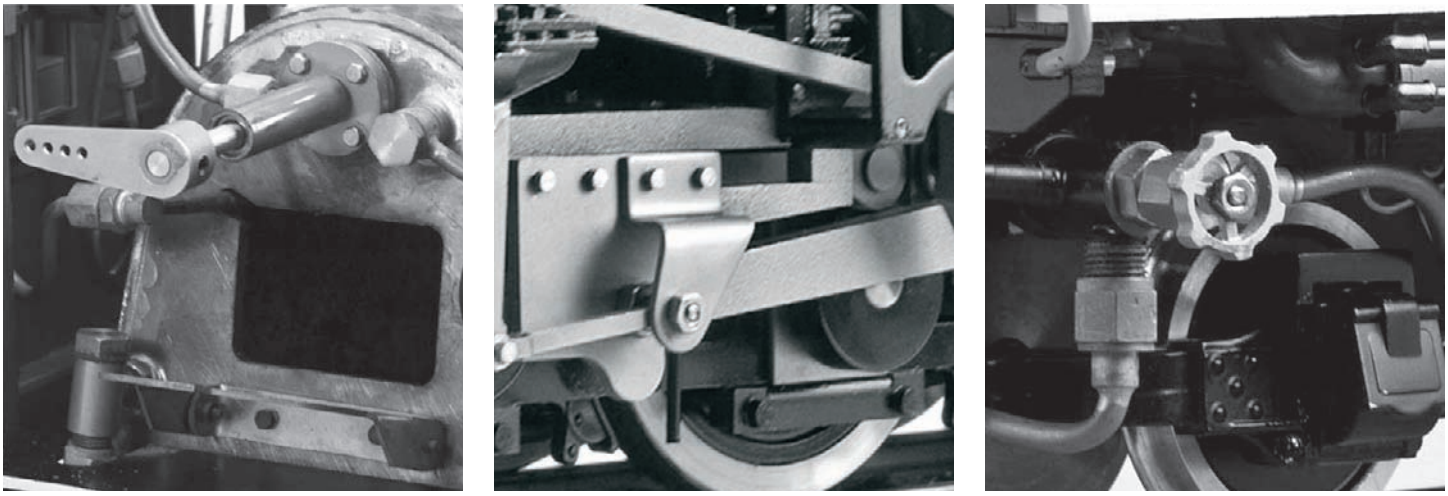
So when is Overland going to get around to discussing the new K-28? The story begins several years ago with Torry Krutzke at Pikes Peak Locomotive Works of Pueblo, Colo. As many of you know, Torry developed quality conversions of Accucraft K-27s to coal firing. After debating with myself too long, I put in an order with Torry.

I had other gas and alcohol steamers, so why not have the DRGW theme be coal fired with a large loco and firebox? The bigger the better, especially seeing Torry's and other coal K-27s at Diamondhead. Well, my hesitation put me at the end of a rather long line of orders for the conversion, and events took over until Accucraft had its coal-fired K-28 project.

Thus the new K-28 is a good combination of Accucraft's proven experience with its K-28 running gear and the consulting of Torry on the project to add the coal firing boiler with the necessary multiple flues, grate design, and exhaust nozzle, not to mention his troubleshooting of the pre-production model.

So I put in an order with Pete Comley at Sunset Valley Railway of Lake Tapps, Wash., and in not too long a wait (railroad time), the big heavy box arrives on the front porch. My wife, Linnea, is generally OK with this as she gets big boxes of yarn from time to time and she receives the same number of weaving magazines as I get railroad modeling magazines.

The model comes well packed — for which Accucraft is well known — with no damage. I use the metal frame around the locomotive as a carrying case and the Styrofoam over the boiler on the K-28 is good extra padding. The screws on the handles of the metal frame seem to come loose, so this is something that I routinely check. The model comes with an excellent manual prepared by Torry. I actually read this first. I put the engine on the workbench, turned it over and started oiling all around. The motion was quite stiff, which is a good thing as you



K-28 details: *Left, the firebox; center, linkages at a wheel; right, a valve. Photos courtesy Accucraft.*

want the locomotive to break itself in. I put plenty of oil on the axle pump cam while turning the motion and put thicker oil on the pump motion.

Torry in the manual recommends lima-bean sized Welsh coal with an upper limit of one-half by three-quarters inches with an ideal size of three-eights inches, referred to as "bean" size, which I saw him using at Diamondhead. (More on coal sources later.) I have a supply of "grain" size Welsh coal for the Mikado, which is the next size smaller than bean; I got it more than a decade ago directly from Wales and it is nearly a lifetime supply. So I thought I needed to order a new supply of bean-size coal for the K-28. In the meantime I have several small bags of coal that I can make into bean size to use. So, next I am off to Lowe's Home Center with a list of stuff that Torry recommends in the instructions. Are we having fun yet? Coal fires are started first with charcoal (not briquettes) and Torry suggests a bag of large pieces, which are then chopped into lima-bean size chunks. Getting the bag home, this looked like a lot of work to me, so I started with what I use in the Mikado, charcoal pieces which are for house plants from Home Depot.

Just like Christmas, I am looking for more stuff in the big Accucraft box. To fire the locomotive, you need a coal shovel, a pick and a flue brush to clean the flues after running. The shovel needed for the K-28 is larger than the one I have from Shawe for the Mikado. Nothing left in the box. Surely someone thought of this.

With a call to Accucraft early the next morning they said, oh yeah, we will get these to you. The short of it was that I had to buy a shovel, pick and flue brush from them that they have for their larger locomotive, and I still do not have the pick. This seemed out of character for Accucraft, especially when I had recently written a rather large check for the K-28. But the shovel soon arrived and all pre-preparations were set to go. One nice thing in the instructions is that Torry gives you a four-page checklist. I copied these pages and put them in a clear plastic holder to take with me when steaming.

So I took the locomotive down to Kurt Sykes' railroad in Federal Way, Wash., for a first check out. As the water capacity of the boiler is large, it took about 10 minutes on charcoal to get the pressure up to 30psi to start adding coal. But after that steam pressure rapidly increased. We went for a loop, but then I noticed that the water level was low, even though I thought the water by-pass knob was completely closed to allow water to flow into the boiler. On further inspection water from the by-pass was coming back into the tender. Not wanting to force the by-pass knob further, we dropped the fire. Back on the workbench I took the by-pass fitting apart and lubed it up well. While still tight, the by-pass can now be turned enough to direct the water into the boiler. The next week I ran the locomotive on rollers at my home for a 40-minute run with no apparent difficulties.

A week later I went to the Puget Sound Garden Railroad Society steaming track down by Boeing Field in Seattle by myself with my five Phil's Narrow Gauge cars and Hartford DRGW caboose. I also had my new coal supply. The fire started as I was becoming accustomed to and I had a 1¾-hour run. I left the roof off of the cab and removed the back deck of the tender to allow easy access to see what was going on and control the locomotive.

While not much can be done about it, the water sight glass is forward in a somewhat awkward location for easy reading. The water in the glass is in motion and it is not always possible to get a clear reading. So there was a lot of checking which will be a problem with the roof in place. Perhaps this will change as I get more used to the locomotive. The cylinder drain cocks worked as advertised. Similar to the gas-fired K-27 that I had, the speed on the K-28 seems to top out for

a throttle setting above half a turn. This might have something to do with the load it was pulling.

One difference with the K-28 from the Mikado is tending the fire. On the Mikado, once you have a glow coming below the grate as seen from the outside, you just fill the firebox full of coal. On the K-28 — with the large front to back length of the grate — I found that I had to check and tend the fire more. When adding new coal, it was important to make sure that there was enough coal shoved to the front end of the firebox.

One suggestion from a comment on an online forum was to use the poker to even out the coal after every two-three shovels full. At the end of the run there was some ash build up in the firebox. I used a bit less than a quart container of coal for this run, more that the Mikado uses. Along with those where fortunate to get one of Torry's original conversions or now have the opportunity from Accucraft, I look forward to a learning curve on getting the best out of this model, yet I do not see any difficulties or problems in running this model.

A feature of the model is that the front end is removable to get at and clean the flues. The various pipes and handrails have pins and slots to aid in the removal. I thought that I would not need to open the front much because one can access the flues through the firebox door. But after the long run there was ash in the smoke box that needed to be cleaned out. The fitting for activating the whistle leaks a bit and some people have removed this fitting, but it is not an easy fix. The running gear and frames are robust, but there are some fragile parts to be aware of. Care must be taken on removing the front which is obvious, but the single retaining screw is too small for the job it needs to do. The back ladder on the tender is fragile. Some people are moving the hand pump in the tender so the pump handle has access through the top of the tender. I added a brass rod to the back of the ladder for additional support. I have added an engineer, who unfortunately had to lose his left arm and leg to fit inside the reverser. I also have added a spark arrester that is seen in some prototype photos.

The instructions make a big deal about getting Welsh steam coal from Coles' Power Models of Warren, Texas. In December I called and they said I could only have 10 pounds, and as of March, I still had not received it. I went directly to Signal Fuels in Wales and obtained a 20-kilo (44-pound) bag of bean size. Others have gone through Maidstone Engineering of Kent, England, to obtain Signal Fuels' products.

Signal Fuels supplies fuel for homes but now has a regular business of 20-kilo bags for hobbyists. Triple R Services of Mount Holly, N.J., and The Train Dept. of Virginia Beach, Va., have discussed supplying coal in the United States. Grain size is one-quarter-by-one-half-inch and bean size is one-half-by-seven-eighths-inch. I went through my new bean supply with a pair of yard clippers, cutting the largest lumps in half; an easy, short task. Others have reported success with grain size, although this is a bit smaller than Torry recommends.

The DRGW K-28s were built in 1923 following the K-27s from 1903. The K-28 generally hauled passenger trains and were named by their crews as "Sport Models." In conclusion I can add my positive response to a recent post by Torry, "My hat is off to Accucraft, more especially Bing [Cheng] and Cliff. What I have seen so far is extremely well done."

A primer on locomotive fuels, dispensers and makers

GAS

Text and photo by Carl Weaver

New live steamers often find it intimidating to find suitable fuel for their gas-powered locomotives, and then to get the fuel from the container into their loco's fuel tank. In an attempt to alleviate some of the confusion by providing the basics needed to make decisions, we have expanded and updated a guide that ran in this journal in 2008.

Sorting fuel containers

Both pure butane and butane/propane mixes are sold in differently shaped and sized containers resulting in different amounts of fuel. In all cases, the shape of a container can be misleading, so divide the cost of a container by the grams of fuel inside to see which is the most economical to buy. Normally, either form of fuel is cheaper and more economical if purchased in large-size containers by the case. But that may not be the only cost. If you buy online, a Hazmat shipping fee is added to the cost.

Straight butane

Straight butane works well indoors and in warm climates, but does not do well when it is cold and the liquid butane in the container will not change into a gas under low pressure. But, this may not be an issue if the fuel tank is in the cab near the boiler or a warm water bath is applied to the fuel tank. Also, a few companies offer a mix of butane and isobutane (higher pressure), which works at lower temperatures. Butane is available in many containers and these are the most common:

- The most popular and most economical are the various brands of straight butane in 7.8-ounce to eight-ounce (220- to 227-gram) cartridges available from Asian grocery stores (used to power portable cooking woks and stoves); almost universally these are made in Korea. This is the least expensive alternative.
- Various brands of butane in tall, thin six-ounce (170-gram) cartridges.
- Cigarette lighter cartridges available from most grocery and drug stores, which usually come in 42- or 165-gram containers (1½- or 5.9-ounces).
- Butane soldering and cooking torch cartridges that are available from home improvement, hardware and kitchen stores in 5½-ounce canisters (about 156-grams). This is usually the most expensive choice.

Butane propane mix

Butane/propane mix can be confusing because the mixes come in different ratios. The common mix of 70 percent butane and 30 percent propane (actually 60 percent butane, 10 percent isobutane and 30 percent propane) is useful in cold climates and for locomotives without a water bath in the tender or a fuel tank in the cab. Other mixtures are available in ratios of 80/20 and 50/50. The lower the amount of propane, the safer it is, so read the label. Remember that straight butane is the safest and the fuel recommended by most locomotive manufacturers. High ratios of propane may damage fuel tanks or cause filler-valve gasket failure. ***Never use straight propane***. Butane-propane mix canisters usually

come in two types of two sizes each:

- Canisters with the standard Lindal Valve threading on its nozzle for an easy screw-on attachment are available from hiking and camping stores. These canisters made by several brands such as Primus in the gray container, are generally available in two sizes of about 220-grams (7¾-ounces) or 450-grams (almost 16 ounces).
- Canisters with a smooth, unthreaded nozzle can accommodate an easy press-on attachment. These are available at many camping and other stores including Wal-Mart and are available in both large and small sizes with varying volumes ranging from 175-grams (6.2-ounces) to 470-grams (16.6-ounces). The most common is Campingaz in blue-colored 230- or 450-gram containers (eight- or 15.9-ounces).

Sorting fuel-tank filler valves

Gas-powered locomotives from Accucraft Trains Co., as well as most other live-steam manufacturers, have Ronson-type filler valves installed in the fuel tank. However, locomotives from Roundhouse Engineering Co. Ltd., are different. Although the filler portion of the valves used on Roundhouse fuel tanks is the same, the thread to attach them to the fuel tank is different. So when changing one, having the correct mounting thread is important. Neither of these situations affects filling a fuel tank with a Ronson-type adapter; in the event you need to replace a filler valve, just make sure you have the right mounting thread.

A different situation exists with some German-made locomotives such as those from Regner Steam Technology, where both the filler portion and the mounting threads are different. In this case, a fuel-filler nozzle that will fit a Ronson valve will not work. Luckily, Jim Saunders of Wee Bee Loco Parts of Marion, Ind., makes a Regner-gas filler valve conversion to a Ronson-type filler valve.

Sorting filler nozzles to fit canisters

If you use King or Ronson canisters, then you are lucky and usually won't need to use an adapter to get fuel from the container into your tank. These cartridges have three-quarter-inch filler spouts that can easily reach and fit the Ronson valves of most fuel tanks. The protective plastic top on the King container has five different detachable adapters to fit the spout and make it compatible with most valves.

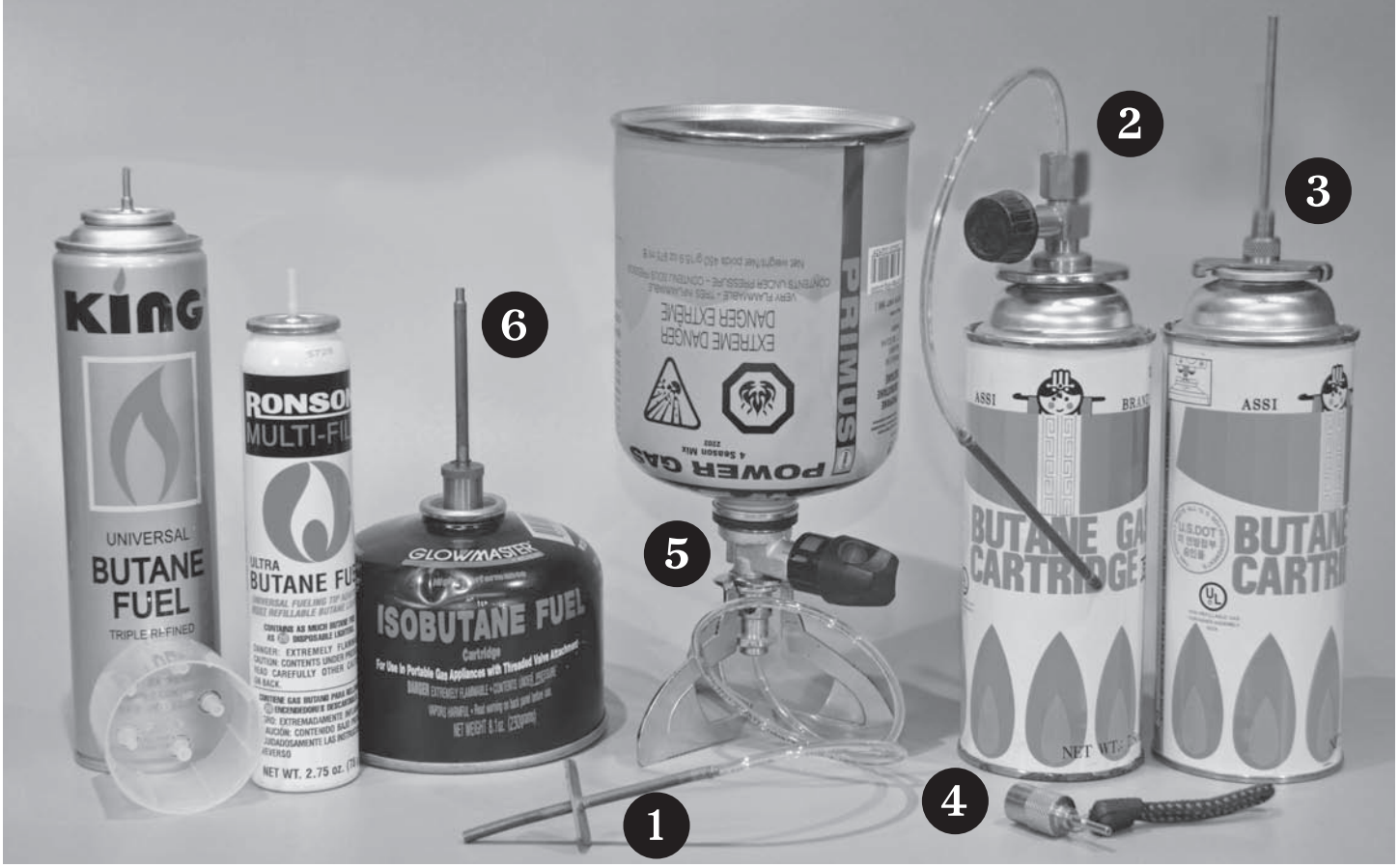
If you use any brand of the Korean straight butane 7.8- to eight-ounce (220- to 227-gram) cartridges available from Asian grocery stores then the spout is far too short to reach the filler device on a fuel tank and the end is not machined to mate with a Ronson valve. There are three adapter solutions available for use with this type of container, which can be seen in the photo on the next page:

1 Accucraft offers a 3½-inch gas adapter made up as a piece of copper tubing with brass fittings at each end. The part number is AP-29204 and can be found on the Accucraft Store web site. One end of the adapter is flat with a slight indentation to fit on a Ronson valve. The other end is pointed to fit into the hole in the end of a Korean butane cartridge. Make sure you get the ends in the right place. Perfectly straight alignment and constant sufficient pressure are the keys to using this adapter. Unfortunately, it usually takes two hands to use this device because the fuel tank has to be held steady so the adapter cartridge is properly aligned. In addition, these adapters are easily lost, so having more than one is a good idea. One solution to not losing an adapter is to drill a hole in a penny or a piece of brass and slip it over the adapter and solder it in place as a holding tab. A second hole can then be drilled in the tab to accommodate a slip ring attached to a retractable line pinned to your steamup apron. That way it's always handy and almost loss proof. This type adapter is the least expensive choice.

2 Quisenberry Station Live Steam LLC of Alexandria, Va., offers a second alternative for the Korean cartridge that has a built-in on-off valve. This device has a collar-type fitting that can be firmly attached to the cartridge. A hose is attached to the valve body that has an Accucraft fuel adapter in the end of it. This unit can be used with one hand, but pressing down on the Accucraft adapter with your hand can be quite difficult, especially if you have arthritis or greasy hands. So, soldering a piece of brass or a penny with a hole drilled in it to the Accucraft adapter is a helpful modification. (See the modified Accucraft adapter at the end of the hose in the photo.) Keep in mind that the hose does not mean that you can stand the cartridge on its bottom while fueling since the cartridge must be horizontal or upside down to empty.

3 Silver State Trains of Las Vegas, Nev., Norm Saley of Orlando, Fla., or Warrior Run Locomotive Works of Nanticoke, Pa., and others offer a third type adapter with a collar that firmly attaches to the cartridge. The main feature of these devices is that the cartridge and adapter can be manipulated with one hand. They are large and not easily lost, unless you throw one away with an empty container. This type adapter is the easiest to use with Korean butane cartridges.

If you use any brand of butane/propane mix canisters with threaded nozzles available from hiking and camping stores (the most common of which are the Primus canisters), there are three solutions:



Gas containers, fillers: *Left, King Butane Fuel, with built-in nozzle and extra fittings in cap. Next left, a can of Ronson fuel.* 6 *Isobutane can with common screw-on adapter.* 5 *Primus can with stand and valve hose.* 2 *Korean can with valve, hose, adapter.* 3 *Korean can with collar, adapter.* 4 *Primus screw-on adapter with lanyard.* 1 *Modified Accucraft adapter.*

4 Primus, Soto and Brunton each offer an adapter that is available from camping stores that sell screw-top type canisters. They are both small and easily lost, but the Primus comes with a split ring and a short lanyard and the Brunton has a wire handle attached. These adapters when not screwed on a canister can be hooked to your steamup bag or apron. One disadvantage of this type of adapter is that they both have a short nozzle similar to the King cartridge, which may not reach the Ronson valve on some fuel tanks. This type adapter is the least expensive choice.

5 Quisenberry Station offers a screw-on device that has a valve and a folding stand positioning the canister upside down. A hose is attached to the valve body that has an Accucraft fuel adapter in the end of it. This device takes two hands, one to turn the valve and the other to hold the adapter against the Ronson valve. The adapter is hard to hold, so modifying it with a penny or piece of brass soldered on, makes it easier to use.

6 Wee Bee Loco Parts, Silver State Trains and Sunset Valley Railroad of Lake Tapps, Wash., each offer a screw-on adapter that fits threaded canisters. It has a long nozzle that reaches the Ronson valves on most fuel tanks. Norm Saley no longer fabricates this type of adapter because of the variation in screw threads among canisters. So, make sure the one you purchase fits the brand of canister you use. This type adapter is the easiest to use with butane/propane mix canisters that have threaded nozzles.

If you use a Campingaz type butane/propane mix available from hiking and camping stores that does not have a threaded nozzle, then an adapter similar looking to the Primus type above, but with a press-on fitting and seal is available from Norm Saley, Bob McDonough of Sinking Spring, Pa., or Warrior Run. This type of push-on adapter is known as a Hadden Valve and some dealers offer both short and long neck versions of the device. It is not in the photo, but it looks similar to the screw-on type, but with no internal threads.

As a last resort, you can make your own adapter to fit the fuel container you have selected. Several clever steamers have come up with some very innovative solutions. For example, a few have merely jury-rigged parts from inexpensive camping stoves to create adapters.

I apologize to anyone I have accidentally omitted who provides fuel adapters or other products. Also, I have no connection to any of the brands or sources mentioned. Further, I hope this short article has cleared up the mystery of fuel canisters, filler valves and how to get gas from any type of container into a live steam fuel tank with an adapter, especially for you newcomers.

Steamers at East Coast Large Scale Train Show

Great Eastern

Text by Brittany Grimm
Photos by Brittany Grimm & Scott E. McDonald

An opportunity to see old friends and make new ones, the 2012 East Coast Large Scale Train Show, March 23-25, was once again a great time for live steamers.

Setup for the Aikenback Live Steamers began on Thursday morning at the York, Pa., fairgrounds and by mid-afternoon the track was set and trains were running.

The next day the show began — the doors opened at 9 a.m. and the crowd began to fill the hall and vendor area. Trains were running constantly on all layouts including the live steamers.

This year saw a new rule implemented to help to avoid track congestion and to guarantee that everyone who wanted to run got the chance. The new rule states that one time slot can be reserved in advance for any time during the day, then for a second run a steamer must wait until one hour before the time slot to reserve that run time. This gives those who want to run but were not there early the chance to sign up for a spot without all of the spots having been taken up by reserves earlier in the day.

U.K. modeler: *Jim Barker oils a truck on one of his English 'wagons.'*

During the day Friday, Harry Quirk ran his newly acquired Aster Great Northern S2 which was built by Triple R Services; it performed very well and ran consistently lap after lap. That night the steamers got together for a group dinner at the Olive Garden and a great time was had by all.

Saturday the show was not as filled with the public, but the live-steam track remained active with participants and there was always a train running. Break down of the track began at around 4 o'clock and the weekend was wrapped up well.

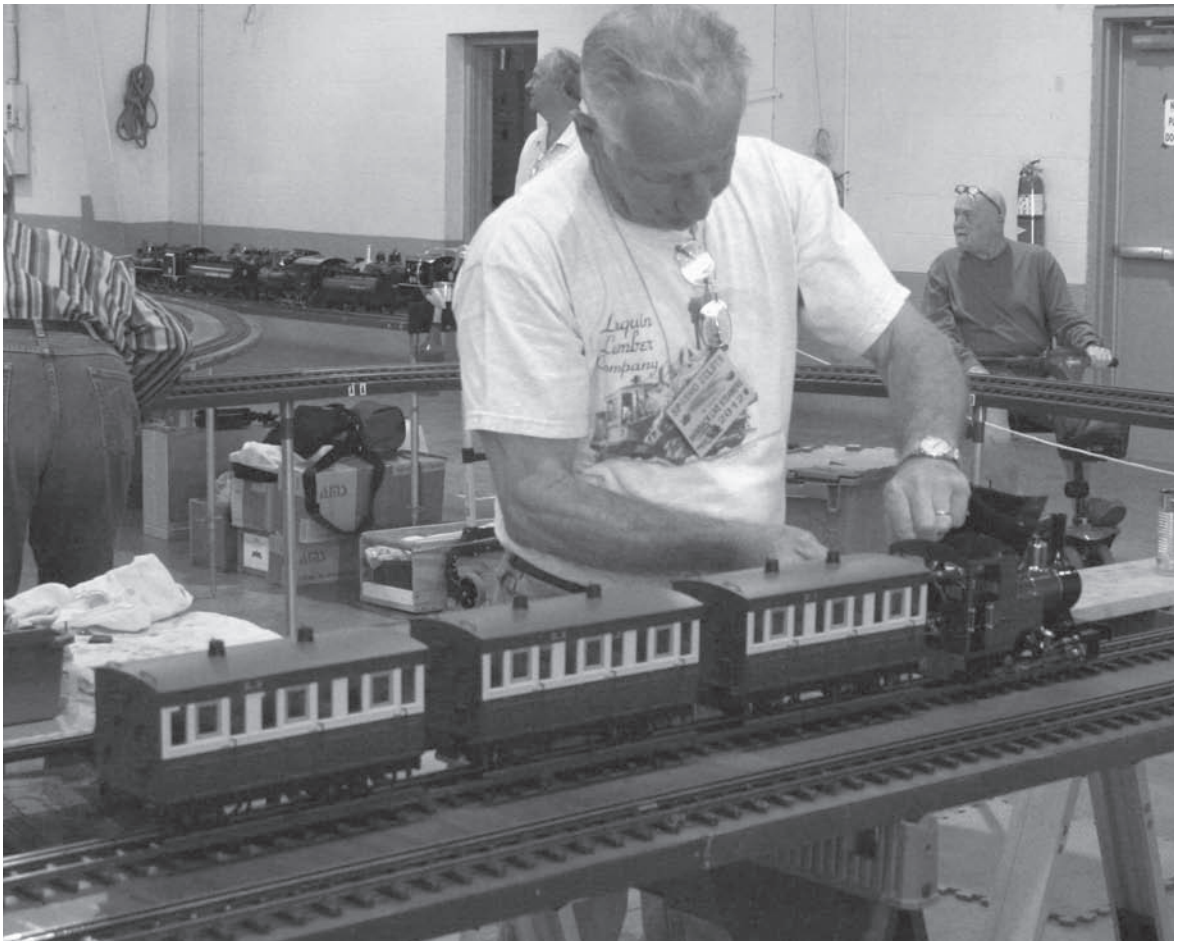
Thanks to Mike Moore who brought his track for us all to run on. I know that I had a great time and believe that everyone else did too. I look forward to a spring and summer full of steaming!

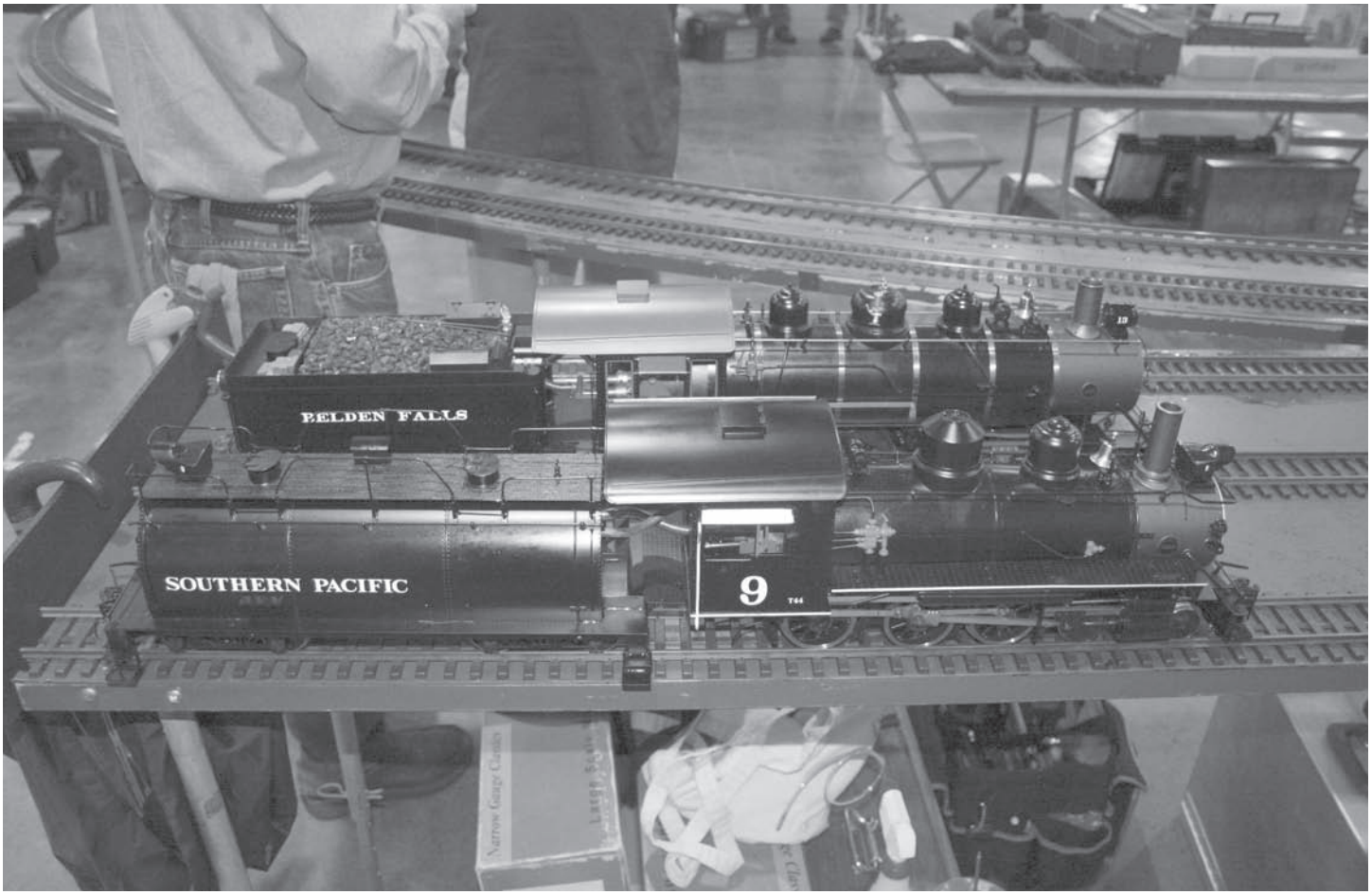
Going to Schools: *Ron Vertrees putting water into his classic Aster Schools locomotive.*

Great Northern: *Triple R's Ryan Bednarik, left, shows Harry Quirk the newly built engine.*

Different makers: *Paul Quirk, left, with an Aster K4 and Bob McDonough, right, with an Accucraft K4.*

Locomotion: *Top, Richard Poletto from Sayre, Pa., with his Roundhouse Billy locomotive, complete with a rake of appropriate English carriages. Bottom, Larry Green's Accucraft EBT Mikado and Scott McDonald's Accucraft SPng 4-6-0 poised for action.*





Brothers in steam: *Harry Quirk, left, and brother Paul Quirk, right, discuss Paul's new locomotive.*

Pacing: *Author Brittany Grimm paces her Accucraft K4 locomotive during the ECLSTS in March.*

THE CUPOLA VIEW

With a little help from our friends

Like a common aspect of rural American life in the 1800s — the communal barn raising — small-scale live steam thrives only because of its communities.

This reality hit home again to me the other day as I was first reading Sonny Wizelman's great story in this issue about his live-steam inspection car, "Leo." Sonny calls himself an "idea man" with few technical skills and when he wants to build a locomotive (usually something unique like the "Leo"), he cajoles, flatters and befriends his way into getting the machine built.

Sonny has developed a (somewhat now burgeoning) community of steamers in Southern California, both by drawing them in through his locomotive-building schemes and by organizing area backyard steamups. And Sonny and his partner-in-crime Bill Turkel are lynch pins in the National Summer Steamup, another growing community of small-scale live steamers.

Similar groups — builders and runners, or runners and builders — are in small pockets all around the United States and in Canada: The Aikenback Live Steamers in the mid-Atlantic, the upstate New York folks, Texans in the Houston area, the Seattle and Denver contingents (and many others).

Sometimes the groups are niches of garden railway clubs and sometimes they're not; it doesn't seem to really matter whether they are organized or disorganized.

Whether it's building a unique locomotive like Sonny's or building a backyard railroad, much of what is accomplished in this hobby seems to come from a community of people. Just like in the 1800s, when you needed a barn, everybody in the community would come out and help you raise a barn. Today, if you need a layout or you need a locomotive, everybody in the community will come out to help you.

My colleagues here at *Steam in the Garden* and I are now at the 18-month mark of our stewardship of the magazine. We have accomplished a lot — Sonny has brought in a large number of new advertisers to the magazine and sponsors to the web site (whom we thank every day for their support); Dan Pantages, Howard Freed and Paul Scheasley have set up business and accounting infrastructure, and Marie Brown and Scott McDonald have brought new rigor to subscription management — but we still need help, mostly in two areas:

- **Subscriptions.** While we have embarked on an ambitious program to get *Steam in the Garden* into many more hobby stores than every before — thereby exposing more and more people to a hobby they may never have considered, small-scale live steam — we still need people to subscribe.

Our 2011 project of trying to get existing subscribers to support the hobby through gifts of subscriptions to local libraries is still in place. Contact your local librarian, receive permission and then visit our web site at Steamup.com to order a gift subscription (use the "Subscribe now" button).

When you're at your next steamup, walk around to all the participants and ask if they're subscribing; you might be surprised to find how few do.

And if they're already a subscriber, remind them they need to renew. We have way, way too many people who have forgotten to renew their subscriptions. We can't send magazines to people who forget to renew.

Like Sonny and his unique locomotives, flat-

'Cupola View' is written by Editor Dave Cole; you can contact him at dmcole@steamup.com or P.O. Box 719, Pacifica, Calif. 94044-0719.

ter, cajole and befriend your steamup buddies into becoming subscribers to *Steam in the Garden*, either in print or digital. (Just visit Steamup.com and push the "Subscribe now" button.)

• **Contributions.** In an ideal world, every year the print magazine and web site of *Steam in the Garden* would have more than 80 individual articles, consisting both of writing and photography. We have fallen far, far short of that goal since taking over.

As editor, I try to make contributing to the magazine or the web site as painless as possible, and while many have learned how fun and easy it is to participate in *Steam in the Garden*, we still need contributors.

If you have ever bought or built a locomotive, a piece of rolling stock or a layout, you have expertise in some aspect of small-scale live steaming that can and should be shared with the entire hobby. Writing and photographing an article for the magazine or the site is a good way to share with the hobby.

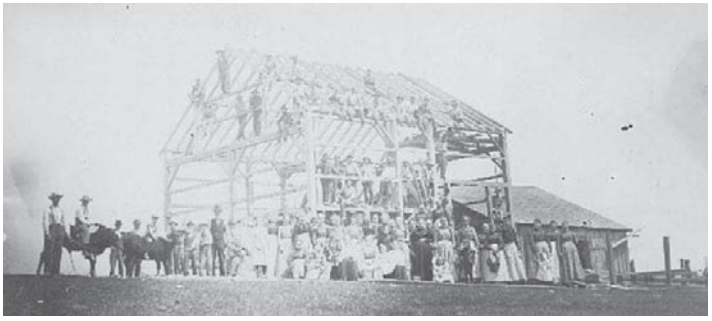
A great *Steam in the Garden* article is one in which the reader is drawn into the mind of the writer, bringing understanding as to how the writer achieved their goal and conveying the writer's enthusiasm for the project.

Many people are discouraged from writing for *Steam in the Garden* because they are concerned about their writing skills. Please don't worry about how poorly you might think you write. You're probably a better writer than you know, but regardless of your writing experience, your article will be in the hands of a skilled, professional editor who has worked with amateur and non-professional writers for almost 40 years. Even the best writers need an editor and it is the goal of *Steam in the Garden* to make you look as good as possible.

A "typical" *Steam in the Garden* article is about 2000 words (sometimes 1500; sometimes 2500), which runs over about four or five pages. The print deadlines are the 15th of even-numbered months.

We need not only words, but photographs as well. First word of advice: figure out how to set your camera to its highest resolution (number of pixels). While the web site only needs low-resolution pictures, you provide the editor with much more flexibility if you give him high-resolution pictures, because then he can run them large in the full-color magazine (printing presses require more resolution than computer screens).

I noted in a recent column in *Narrow Gauge & Shortline Gazette* that my fellow editor Bob Brown encounters contributors who make their submissions fancy by embedding the photographs and the words together. To paraphrase Bob, it's hard enough to write and photograph a story, don't try to do the layout too. While Bob has a staff art director to lay out his pages, here at *Steam in the Garden*, that's my job. So, you need only provide your story, your photographs and captions for those photos.



Community: *A circa-1900 barn raising in Dekalb County, Indiana. Photo courtesy of Wikipedia.*

You can learn more about contributing by visiting Steamup.com, scrolling to the bottom of the page and clicking on "Contributing."

(A word on my e-mail etiquette: I try to get back to correspondents within 48 hours, but I sometimes fall short of that goal. Please be patient with me.)

While we won't attempt to prevail upon all of you to help us with building a backyard railroad or a unique locomotive, in the areas of subscriptions and contributions, *Steam in the Garden* could really use your help in raising our barn.

TIMETABLE

July 6-8, 2012 — West Coast Regional Meet, San Diego Garden Railway Society. Tours of backyard layouts. Info: http://www.sdgrs.com/

July 18-22, 2012 — National Summer Steamup, Lions Gate Hotel, McClellan, Calif. Featuring nine live-steam loops of 45mm and 32mm tracks, a Saturday-night BBQ dinner, clinics and workshops, a dealer room and swap tables. Info: http://www.summersteamup.com/, steamup@steamevents.com or call (650) 898-7878. Lions Gate Hotel: (866) 258-5651.

July 29-Aug. 4, 2012 — Grand Rails 2012, 77th Annual National Model Railway Association convention, Amway Plaza Hotel, Grand Rapids, Mich. Tours, clinics and workshops for all scales. Info: http://www.gr2012.org/.

Aug. 14-19, 2012 — National Garden Railway Convention, Pheasant Run Resort, St. Charles, Ill. http://2012ngrc.com/

Sept. 6-9, 2012 — Adirondack Live Steamers Fall Meet, Wilton, N.Y. Info: http://www.adirondacklivesteamers.org/ or call Ben Maggi at (585) 506-2680.

Sept. 20-23, 2012 — Fall Steamup, Staver Locomotive, Portland, Ore. http://www.staverlocomotive.com/

Sept. 21-23, 2012 — Marty Cozad's Annual Steamup, Nebraska City, Neb. Dual raised track with 20-foot curves; 2000-foot dual ground-level track. Info: Jerry Barnes, juking@atcjet.net.

Oct. 27, 2012 — Annual General Meeting, Gauge One Model Railway Assn., Woking Park, Kingfield Road, Woking, Surrey, GU22 9BA, United Kingdom. http://www.gaugeone.org/

Jan. 15-22, 2013 — International Small Scale Steamup and Arts Festival, Diamondhead Inn and Suites, Diamondhead, Miss. Called "the most important small-scale event in the U.S.," Diamondhead includes 24-hour steaming, a "flea market," seminars, a dealer room, a festive meal and extracurricular activities. Info: reshew_j@bellsouth.net; http://www.diamondhead.org/ Diamondhead Inn & Suites: (228) 255-1300.

Regular steamups

Upstate Steamers. Several steamups per year in various locations around Western New York. Info: http://www.tinyurl.com/upstatesteamers.

Michigan Small Scale Live Steamers (MSSLS) hosts a large number of steamups. Info: http://www.mssls.info/.

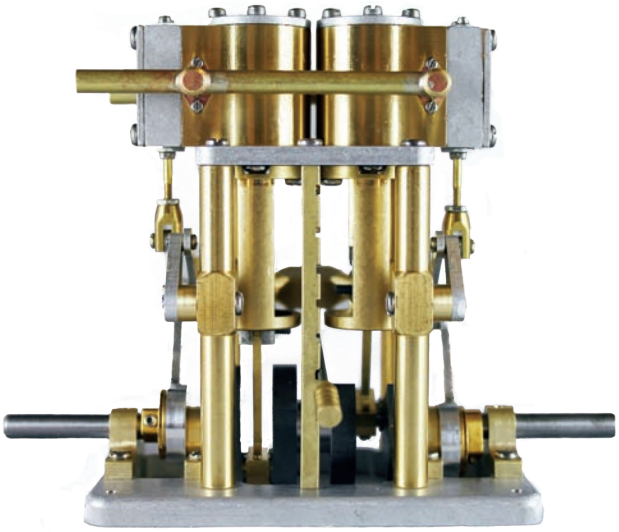
Puget Sound Garden Railway Society. Two steamups per month, one at the Georgetown Powerplant in Seattle on the second Saturday and a steamup at a member's track on the fourth Saturday. Info: http://psgrs.org/livesteamtimetable.html.

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.

Southern California Steamers: Contact Sonny Wizleman for dates, places and other pertinent information. (310) 558-4872. sonnyw04@ca.rr.com.

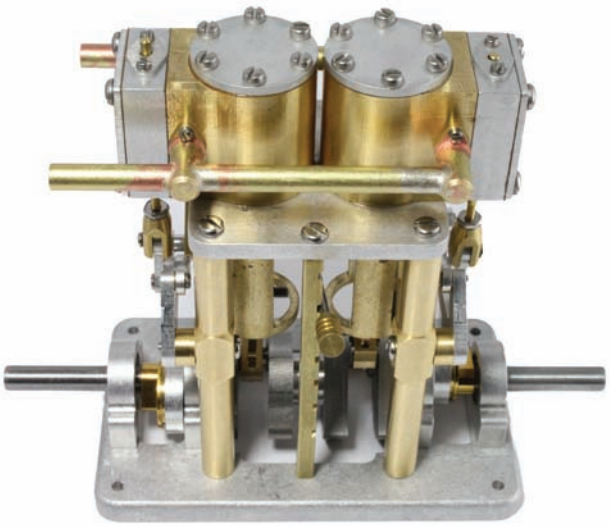
Ad index

Fully Machined Steam Engine Kits



TVR1A

Ready to assemble steam engine kit: $245
Fully Assembled and Tested: $350
Includes all hardware
Double acting, twin cylinder
Hackworth reversing gear
Includes full-color assembly manual
Dimensions:
Base: 3.000" x 1.844"
Crankshaft end-to-end: 4.344"
Height: 3.375"
Weight: 327 g



TVR1ABB

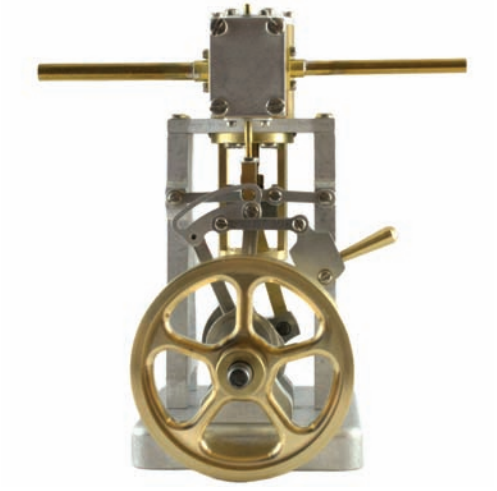
Ready to assemble steam engine kit: $295
Fully assembled and tested: $400
Includes all hardware
SAME AS TVR1A but with shielded ball bearings
Includes full-color assembly manual
Dimensions: Same as TVR1A
Weight: 323 g

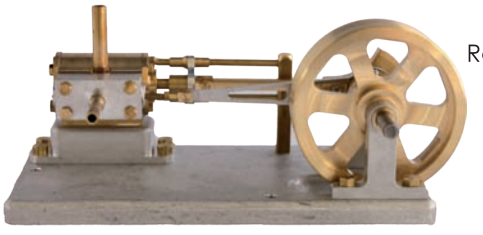
Flywheels for TVR1A / TVR1ABB

MFLY: $20
1 3/8" DIA
(Solid Marine)

BFLY1: $25
1 3/4" DIA (5 Spoke)

BFLY2: $30
1 3/4" DIA (6 Spoke)





HM1

Ready to assemble steam engine kit: $95
Fully Assembled and Tested: $145
Kit includes all hardware
.344" bore, .500" stroke
Double acting, single cylinder
Includes full-color assembly manual

VR1A

Ready to assemble steam engine kit: $119
Fully Assembled and Tested: $175
Includes all hardware
1/2" bore, 1/2" stroke
Double acting, single cylinder
Reversing lever
Includes full-color assembly manual

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BR 'Duchess of Atholl'

Now in production for late April 2012 release, the "Duchess of Atholl" (in Royal Blue livery as shown) is a re-run of the earlier production "Duchess of Sutherland." Reservations are necessary. Please contact your Aster dealer or Aster Hobby USA LLC for additional information.

Union Pacific Challenger Nos. 3985 & 3977: now under construction

UP Challenger No. 3985 is the largest operational steam locomotive in the world today and represents an important addition to any Gauge One steam collection. Additionally, a gray No. 3977 is under construction. The entire production run is already sold out. Thank you for your early commitment. Development information is on our web site.

Pictures below are of pilot models and are subject to minor changes.

Great Northern S2 #2584

This superb-performing 4-8-4 is still available in kit form; RTR has sold out. Contact your nearest Aster dealer today.

Narrow-gauge locomotives in 1/22 scale: Baldwin tank, Krauss tank, Lima Shay

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