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Garden RAILWAYS®

OCTOBER 2017

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HOW TO

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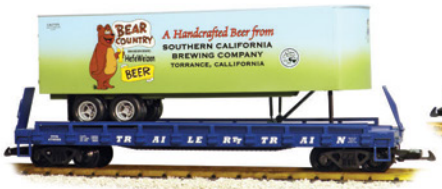

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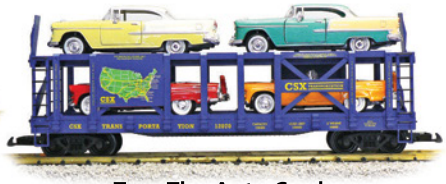

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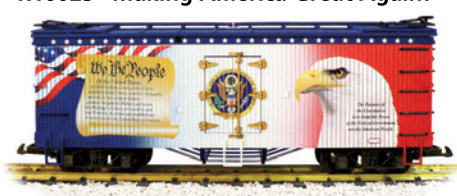

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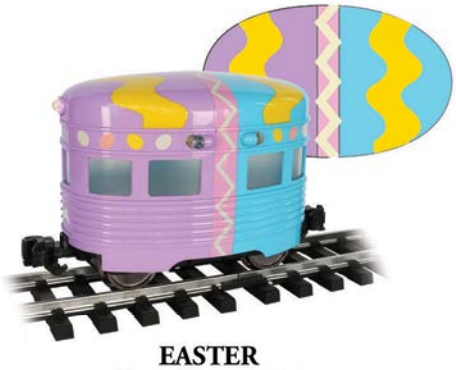

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Thoughts on raised railways

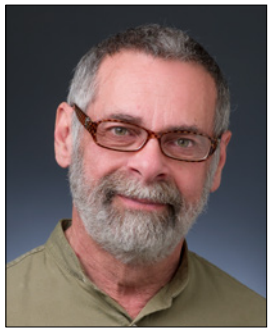

PHOTO BY WILLIAM ZUBACK

As the years have gone by, we're seeing more and more stories on raised railways. Given the demographics of the average garden railroader, I suppose this isn't too surprising. The mean age of *Garden Railways*' readers today is rising each year. As of now, 30% are 56-65, 45% are 66-75, and 15% are over 75. As we age, we tend to gain weight, body parts wear out (especially knees and hips), and ground-level railways become increasingly problematic.

When Barb and I were planning our own garden railway, in those palmy days 24 years ago, we had a more-or-less level site to work with. However, we also had a mountain of dirt to play with, which came out of the hole into which our house's foundation went, so we could essentially create our own landscape. Given that, we decided to raise both the railway and the garden, which was ultimately surrounded by a stone wall around 18" high, upon which we can comfortably sit.

"Track can be more easily maintained at waist level."

Others have taken a similar course, building dirt-based railways that are retained by stone walls or walls made of heavy timbers or interlocking concrete blocks. The defined areas are then backfilled with dirt, creating an environment that is hospitable to a garden and, hence, a traditional garden railway.

Some people have taken an approach derived more from indoor railways than those of the garden variety. These involve building tables or benchwork of some type, then mechanically attaching the track to it. Scenery often goes by the board and the railway becomes more of a running track. Track can be more easily maintained at waist level and trackplans can become more complex. This type of outdoor railroad has become attractive to those who are more interested in railroad operations than in scenery or maintaining a living garden.

On the other hand, there are benchwork railroads that *have* been fully scenicked. Mountains and rockwork are often artificial, usually made of concrete, or concrete in conjunction with natural stone. Special pockets with drainage holes are created to contain dirt and plant material, making for some striking vistas. Even water features have been incorporated on these lines.

Still another variation is one that I have seen in several places, where the ground in question is sloping and the railway owner wants a relatively level line. On these railroads, a portion of the track is laid at ground level. As the ground begins to slip away, a portion of the track is still supported by dirt, retained by one of the methods mentioned above. Finally, the track takes to the air on indoor-like benchwork and no attempt at scenery comes with it, although structures might.

One of the great things in working outdoors, to my mind, is that, by definition, no two railways can be alike because no two builders have the same working conditions. Working in an indoor environment is more or less the same wherever you are. The floor is flat and the climate never varies. All that's different is the size and shape of the available space. Outdoors, *everything* is different, and variety, as has been said, is the spice of life.

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NOTES & NEWS

PRODUCTS

Engines & rolling stock

LGB (Märklin) has two new items. The first (shown) is a White Pass & Yukon boxcar (#L48675). Paint and lettering are prototypical for Era VI. The car has metal wheelsets, many separately applied details, and the sliding doors can be opened. Price: $179.99. Also available is the company's Christmas coach for 2017 (#L36017), which is imprinted with a festive theme. The car has a sound function that can be activated by a built-in motion switch. Four different Christmas melodies are played, one after the other or randomly (batteries not included). The car has opening doors and metal wheelsets. Price: $209.99. Website: *www.lgb.com*

Piko America LLC, 4610 Alvarado Canyon Rd., Suite 5, San Diego CA 92120, has announced a variety of new products. These include a Christmas Camelback steam locomotive (#38246) with directional LED lights, working smoke, digital sound, and full features on either analog DC or DCC. Price: $624.99. A D&RGW pipe gondola with an excess-length pipe load (#38749) is designed to be used with idler flatcars on each end to handle the oversized pipe load. Price: $119.99. A UP container car includes a container with openable doors (shown). Price: $89.99. For complete information on all new products, visit *www.piko-america.com*

Bridges & structures

American Made Steel Bridges, Inc., 274 Hernando Road, Winter Haven FL 33884, now offers all of its 1:32 scale, stainless-steel bridges in painted or unpainted format. Website: *www.americanmadesteelbridges.com*

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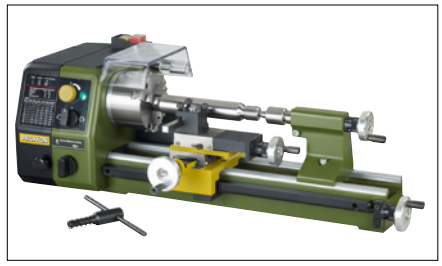

Proxxon Inc., PO Box 1909, Hickory NC 28603, has four new products. These include a Metal-turning Lathe PD 250/E (#34002, shown), $1,190; a Micro Press MP 200 (#27200), $155, a Gas Soldering Set MSG (#28144), $65; and a Scroll Saw DS 460 (#37094), $540. Visit the company's website for complete information: *www.proxxon.com/us*

IN MEMORIAM

Jerry Reshew passed away on June 23, 2017, at the age of 88. Jerry was the founder of the Diamondhead International Small Scale Steamup, starting in 1993, and held each year in Diamondhead, Mississippi, and he organized and ran the show for the first 20 steamups. This event grew to be one of the best-known and well-attended steamups in the world, with representatives from up to 13 counties in attendance.


PHOTO BY MIKE MARTIN

Jerry was the most genial of men and literally made friends wherever he went. He had wide and varied interests outside of live-steam locomotives, and was a pillar of his local community. He was an avid live steamer and also played baritone in the Diamondhead Steamup Brass Band. He was a wonderful raconteur and always had a kind word for everyone. The steam community and all of those who knew him have lost a great friend.

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LETTERS

1:1 LGB caboose?

I was driving back from South Dakota when I stopped in Luverne, Minnesota, to visit the Minnesota Southern Railroad. East of the depot was a wide-cupola caboose with the railroad's herald on the side. Upon closer examination, I noticed the reporting marks were "LGB," as shown in the close-up image.

I can't find evidence of the LGB reporting mark being used by any current railroad. The Minnesota Southern's reporting mark is MSWY. Perhaps there's a large-scale fan employed on the Minnesota Southern. *—Cody Grivno, Associate Editor,* Model Railroader *magazine, Waukesha, Wisconsin*

Workshop safety

I read your April editorial and really want to thank you for reminding us all to work safely. Just last week I lost focus for just a moment and ended up with a nasty bruise from table-saw kickback. *—Neal Smith, Jacksonville, Oregon*

The first time I read your editorial "Workshop safety" (April 2017) I thought, "Oh, yeah, but not in my shop." For the nearly 30 years I've been a model railroader, I have been particularly careful about my fingers around power saws. And, in my confidence, I've been particularly careless in failing to maintain safety guards. But just a few days later I found your quote "Power-tool injuries are exceedingly common" to be true in my shop, too.

Over the years I have changed the order of work on projects requiring hundreds of identically sized wood parts, like making a sufficient number of ties to lay a new spur on my garden railway. In years past I would mill material to thickness, rip strips to width, then stand and chop hundreds of parts to length. I found I was beginning to run the danger of "concentration vacation" and I have now altered the final operation to a series of cutting events, with a break between to ward off the monotony.

All remained well until, once again, I reached over the top of an unguarded table-saw blade to clear sawn material for the next pass and, in the blink of an eye, lost half of my left index finger. I may not be able to return to the shop anytime soon but you can bet that, when I do, it will be with a new dedication to workshop safety. Your editorial was "spot on." *—Ed Glenn, Boardman, Oregon*

Your editorial in the April issue touched on a relevant topic for our aging population. I receive your magazine because I'm a long-term garden-railroad enthusiast with a relatively large railroad (1,000 feet of track) and about 100 scratchbuilt structures. However, I'd like to comment on this topic in a broader context.

For the last 15 years I've been a volunteer on an operating railroad run by the California State Railroad Museum. I'm in charge of conductor certification, I'm a fireman on our steam engine, a locomotive shop worker, etc. We have about 150 volunteers in various crafts. I am one of six volunteer/managers responsible for routine testing of operating-crew members (people who actually run the trains vs. car attendants, ticket agents, etc.) under the CFR49 Part 217.9 testing program. The question we wrestle with is, "When is it time to give up the car keys?"

In both the public and private sector of paid jobs, this decision is usually made for the employee by a mandatory retirement age. In the volunteer sector, as well as in our own personal workshops and hobby endeavors, there is no clear standard. After years of working for a living, any person can volunteer and attempt to qualify to perform many somewhat-dangerous activities. Unless we clearly cannot perform the function or we fail a series of certification tests, how do we police ourselves and recognize when the time has come? What are the warning signs and do we recognize them?

On our railroad, the median age for crew members is between 65 and 75 years. I am 74 years old. We routinely get on and off moving equipment and much of what we do is physical, strenuous, and somewhat dangerous. As part of our testing process, each testing manager develops an informal watch list in his mind of volunteers who appear to be deteriorating. My observation is that "situational awareness" is one of the most critical skills to deteriorate. I've seen numerous cases where the brakeman or conductor did all of the right things but was still injured because he had lost the awareness of where his fingers were on a handbrake, where the blowdown port was on a steam engine, or what foot he was using to get off of a moving train. That sense of being "street smart"—always observing, feeling, and hearing the sights and sounds around you—fades with age. As we age, it takes more of an effort to focus and concentrate on the job at hand. It is easier for the mind to drift and wander.

I've noticed through personal experience—ones that careless or sloppy techniques that one could get away with in younger years—are now far more unforgiving. Recently, I was standing on something precarious in the cab of our steamer, unscrewing the steam gauge for its annual calibration. I slipped and my body didn't react until I had hit every pipe and valve on the way down and cracked two ribs. Not a big deal—lots of jokes about how hard it is to heal when you're old. However, this accident would not have happened to a younger man. He would have jumped, instinctively protected himself, or had a better sense of balance.

Your editorial about your shop incident noted that you followed all of the safe procedures and yet you were hurt. Only you know what you did but I find we do get complacent over time—fingers a little too close to the saw blade, laziness about putting on hearing and eye protection, easy distractions, etc. I try to be more

VIDEO 101

JOHN CUSHMAN

Using editing software

My Apple Store instructor advised, "The trainyard is your media; the train is your story. Assemble the tracks you need. Then create the trains to run on them."

Postproduction

Transforming rough clips and music files into videos is called "postproduction," which refers to all the stages of media selection and assembly, data editing, and blending the video and sound into a single movie file. Postproduction is where we create our stories.

For every hour spent collecting videos on location, figure three hours at the computer in postproduction to make about one minute of finished video.

So, after loading the video files onto the computer, after editing still photographs, after creating a folder of railroad songs (or obtaining permission if we plan to show our videos online), after outlining our story, let's make a movie.

Selecting software

There are over a 100 different video-editing programs to choose from. Some are shipped with PC and Mac computers, GoPro, Garmin, smartphones, and tablets. Others are available at app stores.

For demonstration, I'll use my iMovie software, which has easy-to-learn features and a variety of consumer-level libraries and templates. Other consumer-level software packages will be similar.

The home screen shows three important sections, circled in red in the video accompanying this story. Upper left are links to video files, still-image files, music files, sound effects and recording capability, titles, backgrounds, and transition options. Upper right is the viewing box to view and edit the video files. Here, colors can be adjusted, and we can even run the clip backward with the click of a box. At the bottom is the movie timeline, where the parts are assembled, timed, and trimmed.

The associated video combines all three sections, rendering a video filmed on Richard Murray's railroad in Millbrae, California. The video highlights the parts of the home screen and shows the timeline that underlies the finished video. (*See Garden Railways*, Aug. 2015, for the story on Richard's Green Hills Railroad).

Visit www.GardenRailways.com *and type the author's name into the search box to view the related video.*

careful now than when I was younger. Life becomes more precious as we age and we don't want to lose it to a lapse in judgement. It takes effort and the realization that we are no longer what we used to be.

With volunteerism within such easy reach for many of us, we need to address how to protect people from their dreams. On the railroad, we do have the ability to move crew members to less dangerous jobs but, if it is mandated, it is resented and we usually lose the volunteer. When my time comes, I'm not sure I'll have the courage to objectively evaluate my own shortcomings or the strength of character to recognize that the time has come. —*Chuck Maley, Auburn, California*

The only age-related (without specifying what age would be the threshold) advice I would add to your editorial would be to focus solely on the job you are attempting with any power tool. Studies have shown that humans don't multi-task nearly as well as we think we do and a mind that is trying to process many things at once is not well focused on any of them. At the least, we can come to our work without the extra distractions that lead to accidents. —*Tom Beckett,* tgb3@sbcglobal.net

Santa Rosa & Pacific will experience some delays

Our Santa Rosa & Pacific Railway has been a testing place for cameras, video angles, and lighting. It includes models of the photography headquarters of William Henry Jackson, who is our inspiration, and the red barn that is one of my favorite roadside views as I ride my bicycle. But the Santa Rosa & Pacific will be experiencing delays in service.

In the night, a heavy branch from our Gravenstein apple tree dropped across the tracks with a loud crash, injuring some residents and crushing a few stores. The large limb narrowly missed the station, church, and photography buildings. Engines and passenger cars had been stowed on the backyard deck for the evening. However, the roadbed suffered and will have to be rebuilt. We loved the apple tree, which was an anchor for the elevated tracks, a source of shade, and the supplier of pies that we shared with friends. I doubt that we'll be able to grow another 60-year-old apple tree any time soon. —*John Cushman, Santa Rosa, California*

Age

I am 70. I did my first 400' of track laying between 1993 and 2000. I am starting another railroad at my new home. I have read many times about guys complaining that they are too old to do outdoor railroading. True, some guys are not able to get on their knees, bend over, etc. But many of us still can! Why all this negative stuff about not building a railroad because of age? I say drop the attitude and get out there and build it. —*Larry Leggett,* l.leggett@sbcglobal.net

If you have something to say, send your comments to "Letters," c/o *Garden Railways*, PO Box 460222, Denver CO 80246 USA; or e-mail them to *mhorovitz@gardenrailways.com*

KEVIN STRONG

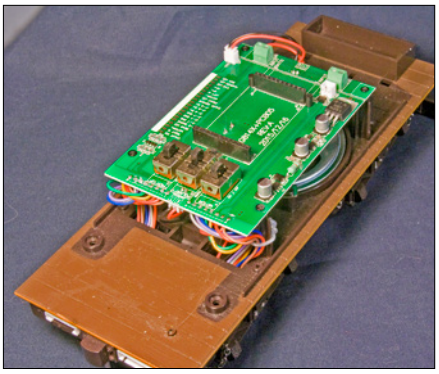
Taking apart a locomotive: Part 1

A Bachmann Mogul glistening in the sun is a thing of beauty, but it's what's inside the locomotive that makes it a joy to run. Getting inside it or any engine can be an exercise in educated guesswork. PHOTOS BY THE AUTHOR

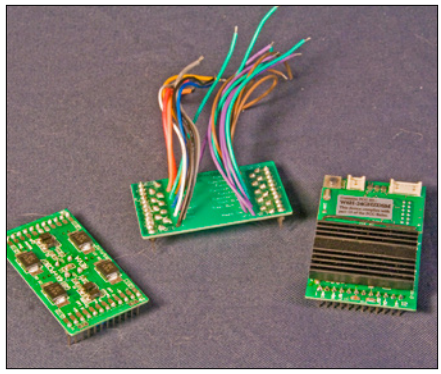
My family-room bookshelves are filled with my locomotives. They are, by many measures, works of art worthy of display. Beauty, however, is only skin deep, as they say. For most people, there will come a time when we need to take a locomotive apart. This could be for any number of reasons—to kitbash or make other physical modifications, to install new control electronics, to repair a broken something-or-other, or routine maintenance. Getting inside our engines is not as easy as it may seem. Few manufacturers include instructions for this and many excel at hiding necessary screws and other bits needed for disassembly. Once inside, many locomotives are full of electronics whose function is known only to the designers. Sorting through all of that can be nerve-wracking, especially for someone who's not done it before.

In this article and the next, I'll walk through the disassembly of a Bachmann 2-6-0 to see how locomotives are put together, some of the tricks manufacturers use, common things to watch out for when taking things apart, and what's what in the "guts" of the engine. While the 2-6-0 is my specific guinea pig, many locomotives utilize similar assembly techniques, so things that are specific to this locomotive will likely have application on other engines as well.

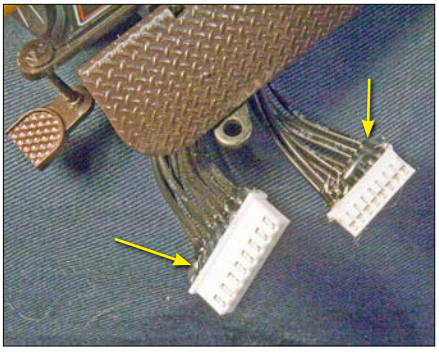
To start, let's look at the locomotive as it comes out of the box. That will offer some clues as to how things may be configured. In this case, the locomotive is advertised as "DCC ready." This tells us that the wiring inside the engine is set up to accept third-party control electronics. Wires from the track pick-ups on the wheels do not go directly to the motor or lights, but to a central control point from where it is distributed to those various features (**photo 1**). That makes life easy for those wanting to install third-party control electronics, but it means lots of extra wires (**photo 2**). This being a steam-outline locomotive with the main control printed circuit board in the tender also means lots of wires between the locomotive and the tender. To relieve stress on the wires in these plugs, you can run a



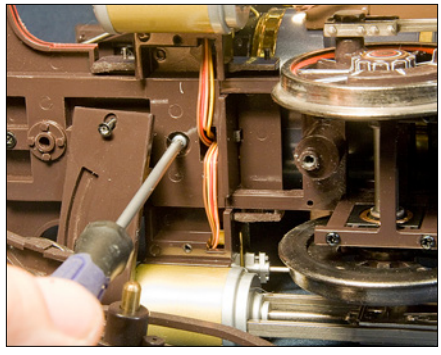
1. A "DCC-ready" locomotive will have a central PC board somewhere in the engine that takes power from the rails and distributes it to lights, motor, and smoke units. In this case, Bachmann uses a 23-pin socket into which various controls can be easily plugged.



2. Bachmann includes a few different boards to help interface control electronics. The first is commonly called a "dummy plug" (left) and allows the locomotive to run on standard track power. A second board (center) plugs into the socket but has 23 wires coming from it, each going to one of the pins on the socket. This allows you to attach any third-party command-control system to the locomotive (right).



3. Control electronics in the tender of the locomotive mandate a large number of wires running between the engine and tender. Wires on these plugs sometimes work loose or break. A bead of hot glue along the back edge (arrows) helps to reinforce the plug.



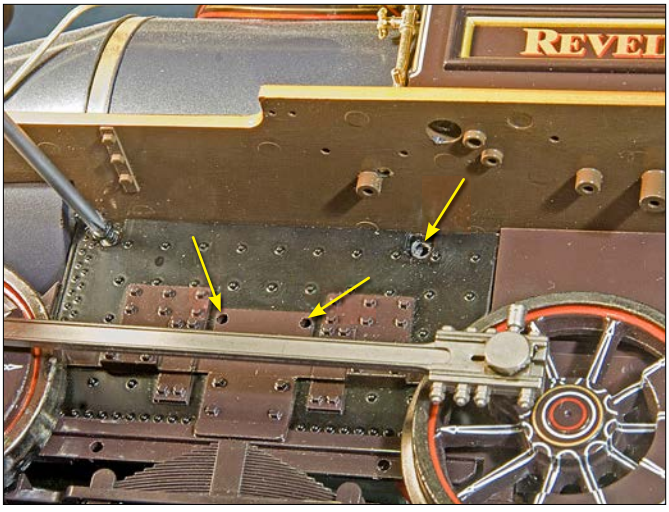
4. To get to the screw that holds the boiler to the chassis, you must first remove the plate that supports the pilot truck. It may be easier to remove the pilot truck as well during this process.

bead of hot glue along the back edge to help prevent wires from pulling loose (**photo 3**).

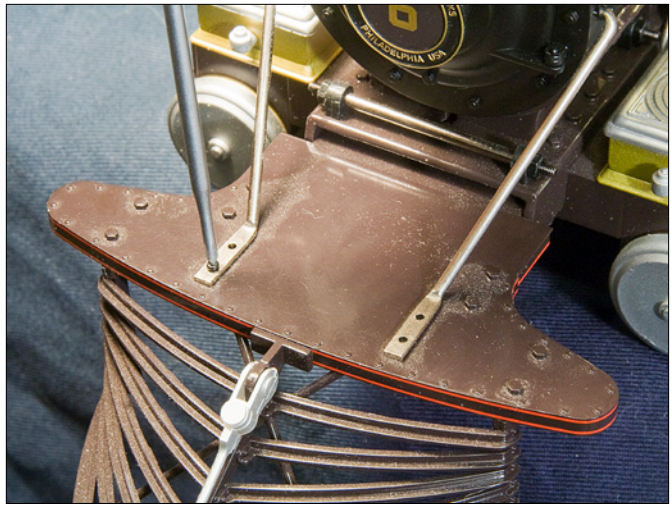
Bachmann includes exploded parts diagrams with their engines (these are also available online) that give us some idea of how things go together. I wouldn't call it a "how to take things apart" guide, but it does provide some knowledge of what you're dealing with when you begin to tear into your locomotive.

Two things are common when taking a steam engine apart. First, when removing the boiler-and-cab assembly from the chassis on most steam locomotives, look in two places for screws that hold these two assemblies together. The first is under the smokebox. There's usually a screw that runs up through the middle of the cylinder assembly into the smokebox. In the case of this Mogul, it's hidden under a plate that sits under the cylinders, which is held in place by two small screws on the ends (**photo 4**). The second place to look for screws is on the side of the firebox. The giveaway as to which screws are likely the ones holding things in place will be those that don't appear to be fastening any kind of detail in place. There are six in this instance, three on each side (**photo 5**).

Now, life would be great if, after doing that, things just came apart easily. Unfortunately, you've got to look for small details that may still be holding an assembly together. With this particular locomotive, there are two boiler braces on the



5. The back half of the boiler is held in place by six screws in the side of the firebox, three on each side (arrows).



6. Small details like these boiler braces often hold things together in addition to the larger screws. These can be fragile or held in place with tiny screws, so take care to make sure things don't break.

front pilot that must be gently worked out (**photo 6**), as well as the reverse-gear linkage, which runs from the cab to the valve gear (**photo 7**).

It's a good idea to keep a small container handy for the screws you remove. Baby food containers work well. You can also sometimes re-insert the screws into the holes from which they came (**photo 8**), which helps you to not only not lose them, but also to remember where they go—something that's sometimes easier said than done. It's amazing how similar these screws begin to look when tossed into a single container.

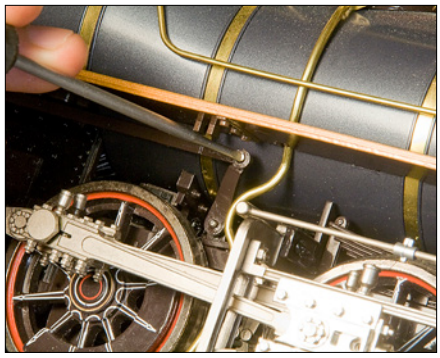
Removing details from a boiler isn't typically something that's done unless you are cosmetically changing a locomotive. Manufacturers tend to use a mix of press-in details, really tiny screws, and cleverly-hidden ones, often under dome lids (**photo 9**). This is where the exploded-parts diagrams (if available) come in handy. If it's not obvious, the rule is gentle persuasion. Typically, press-fit pieces will give way without much effort. If you begin to bend something to try to pry it loose, there's a good chance there's a screw or something else holding it in place.

Locomotives with long wheelbases, such as Bachmann's Mogul, often have sprung suspension on the chassis to keep all the wheels firmly on the rails. This makes for complex chassis assembly. In the case of this engine, individual bearing blocks slide up and down in openings in the locomotive's frame, similar to the prototype. If you must remove the drivers from the frame for any reason, look for a retaining plate on the bottom of the frame that holds these bearing blocks in place (**photo 10**).

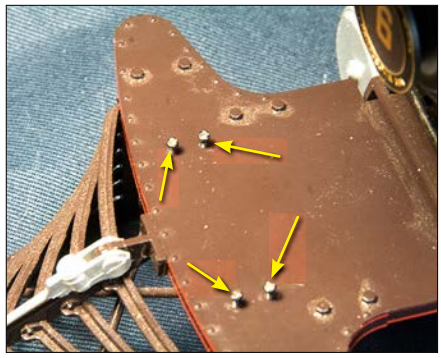
Wheels are held onto axles by one of two methods—press fit or screws. This Mogul uses screws through the drivers, into the axle ends, hidden behind press-fit caps (**photo 11**). These screws can sometimes work loose over time, so you should check all wheels to see if they need tightening every once in a while.

The side rods on this locomotive are held in place with hex-head screws (**photo 12**). Most engines use screws of this type to hold the rods in place, though some use plastic press-in pins. I'm not a fan of the latter, as they tend to break easily. It's good practice to check that these screws are snug once a season or so—more if you run heavily. If a side-rod screw works loose and the side rod drops to the ground while the locomotive is running, it creates a derailment risk and will often throw the locomotive on its side (and invariably down the embankment or into the pond). Also, once a screw hits the ballast, it opens a portal to a parallel universe, disappearing forever.

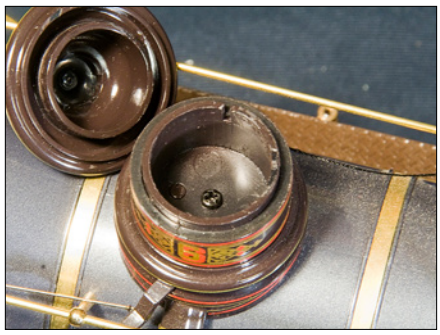
Next time, I'll take a closer look at the tender and investigate the electronics on-board the locomotive, following the electrons as they flow from the wheels to the motor, lights, and smoke unit. Knowing the path the electrons take will help you troubleshoot if they stop flowing as they should.



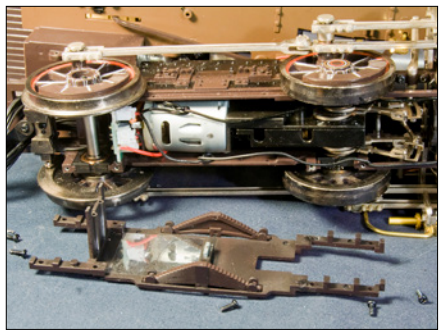
7. When disassembling a locomotive, you may need to disconnect one or two links in the simulated valve gear. These screws are often tiny and easily lost.



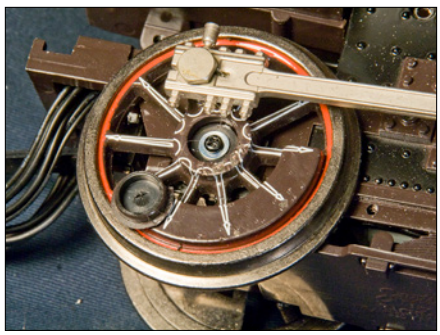
8. You can replace removed screws into their holes to keep from losing them (arrows).



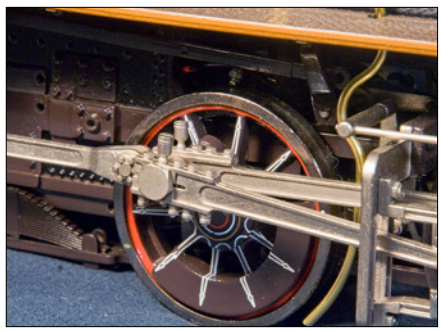
9. Manufacturers make extensive use of press-fit details to hide screws that attach other details. In this case, the lid of the sand dome comes off to allow access to the screw that holds the dome to the boiler.



10. The wheels are held into the frame of the Bachmann Mogul by a retaining plate that attaches to the bottom of the chassis. If you remove this, the wheels will drop out.



11. Screws that hold the wheels to the axles are hidden behind caps over the center of the drivers. These screws occasionally work loose, so a periodic tightening should be part of your routine maintenance.



12. A hex-head screw holds the side rods to the drivers. It's a good idea to occasionally check these to make sure they're snug.

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2018

LGB 50th Anniversary Tour – Steam Paradise Saxony – May 2018

This tour will include many LGB prototypes and steam train excursions with the Fichtelbergbahn, Loessnitzgrundbahn, Traditionsbahn Radebeul, Weißeritztalbahn, Dresdner Parkeisenbahn and Zittauer Schmalspurbahn. One of the highlights will be a steam festival at the Pressnitztalbahn (Pressnitz Valley Railroad) celebrating the 50th anniversary of LGB. We will explore Saxony, the state in East Germany with a history, spanning over 1000 years. We will visit the cities of Dresden, Meissen and Chemnitz with an architectural glory and fine traditional folk crafts. We will also visit the Transportation Museum in Dresden and the Eisenbahnwelten in Rathen - one of Germany's largest garden railways. Another highlight will be an Elbe River cruise on board a historical steam paddleboat. You will also have the option to visit Prague to discover the history and explore the famous squares, towers and castles.

LGB 50th Anniversary Tour – RhB in Switzerland – July/August 2018

On this tour, we celebrate the 50th anniversary of LGB in Switzerland. LGB will be producing a 50th anniversary locomotive for 2018. Our tour program will include this prototype on special excursions with exclusively chartered trains of the Rhaetian Railway. We will travel through Graubuenden, the most scenic Canton of Switzerland and explore the Albula- and Bernina line, a UNESCO World Heritage site. The spectacular stretch between Preda and Bergün is a masterpiece of rail engineering. We will cross over the famous Landwasser Viaduct on board the historical Crocodile locomotive, and take a round trip on the beautiful Bernina Railcar. We will have plenty of opportunities for photographing amazing train scenes during stops crossing over the Landwasser Viaduct and the Wiesener Viaduct. Another highlight will be a guided tour of the new Albula Tunnel in Preda. We will also ride the Arosa train, which climbs more than 3,200 feet. An exclusive RhB souvenir wagon will be produced especially for this tour!

Photos copyright: Weißeritztalbahn/Kati Schmidt and John Rogers

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NANCY NORRIS

Take steps to make stairs

1. On the gravel division of the author's Aggie (a ⅞" railway in 1:13.7 scale), work piles up, but it's time to take a break on the front steps. Lake Phillips welded steel stairs and wrap-around decking for the ceramic mine office, modeled by Chris Greenwald (C&N Designs—*candndesigns@msn.com*) after one in Wales. The raised concrete foundation doubles as an access pit to a water valve and electrical connections for the water feature. Sweet marjoram (*Oreganum majorana*, Zones 6-11) surrounds the scene on the left/front and dwarf sweet myrtle (*Myrtus communis* 'Compacta', Zones 8-11) to the right of the building. PHOTOS BY THE AUTHOR EXCEPT AS NOTED

Steps and stairs suggest motion in your railway. Their zigzag architectural lines visually break up the organic pattern of nature. In gardens, these scale structures can also prevent erosion. Why not add a miniature staircase to lead us to a wonderful elevated structure and invite us to climb (although sometimes we find tired workers sitting on steps—**photo 1**).

Lastability

Let's be sure the materials will hold up over the seasons. Enhance a hillside scene with stone steps sculpted from cliffs, but first beef up the area under these stairs with rebar and mortar (**photo 2**). Scale boards, railroad ties, or half-round logs

Strong steps from good materials

Large-scale structures

- Welded steel steps, deck, and railings (**photo 1**)
- Sheet-metal steps on rolling stock (**photo 5** and "Staff corner" in "Links" sidebar)
- Ladders on towers—plastic, metal, wood (**photos 9** and **10**)
- Ladders on rolling stock (**photo 8**)
- Wire/cable/chain railings on bridges/decks (**photos 4**, **6**, **9,** and **10**)
- Tree-house ladder, cut one space wide from ½" hardware cloth (**photo 6**)
- Rungs sunk into concrete piers or wooden retaining walls (**photo 8**)

Large-scale landscapes

- Tile, glued (**photo 5** and Ray Turner's regional report)
- Slate, mortared (**photo 2**)
- Wooden ties or lumber, glued and nailed to a board (**photos 3, 4,** and **6**)
- Steps carved into wet mortar/concrete with a trowel (**photo 7**)
- Stepped flagstones retain hillsides or build water features (**photo 7**)
- Tiered cribbing or retaining walls (See "Terraces" in "Links" sidebar)

REGIONAL GARDENING REPORTS Zones are USDA Hardiness Zones

How did you add stairs to a mine building?

Richard Murray
Milbrae, California, Zone 10
Woodworking

I had to take out about a dozen head-size rocks and about five plants to create the space for the stamp mill. I wanted an extra point of interest on the side of the mill so I decided on a set of stairs. In addition to the stairs, a door was added to the side. Unfortunately, the angle between the door on the bottom and the track on the top was quite steep, but I figured the workers would get some extra exercise.

The first step was to fix the placement and size of the landing outside the door. The stringers needed to be placed between the edge of the top and bottom landings. Next, to determine the spacing of the stairs, I penciled right-angle notches on a stringer. Normally, the sum of the tread and riser depths equals 17 but, these stairs being just a model, some deviation to the rule was okay. Since I don't have a bandsaw, I cut all of the right-angle notches with a razor saw. I cut both stringers at the same time. Because these stairs were to be "open," I left off the risers and made only treads. Finally, I attached the newel posts and railings. If you haven't already Googled "stairs," here is a primer: *https://en.wikipedia.org/wiki/Stairs*

Ray Turner
San Jose, California, Zone 9
Plastic above stone

The building—my mine and ore processing plant—is scratchbuilt from cast concrete. The stone on the steps are Stoneworks pieces glued into steps. See *rrstoneworks.com*. Their tile pieces are used to build the wall that supports the building's overhang and the mine plant's foundation. The stairs up to the second-story office are commercial plastic step sections (two glued together). I added the handrails.

Small ore cars use a tight-radius track within the mine yard at the stamp mill on Richard's mainline. He first learned how to make stairs by following an article in *GR* years ago (Ted Stinson's plan "1:20.3 Elevated watchman's tower," referenced in the sidebar).

Ray made a foundation for the building with Stoneworks "tiles," repeating that look to support the overhang, steps to the first floor, and the first few steps up to the second floor. RAY TURNER

make good steps, but need a sub-structure to prevent rain from washing them away. Paul Blondefield used scale boards, but he retained his slope as well with a substructure amid plants (**photo 3**). A pressure-treated board, hidden under glued-and-nailed scale steps, can be anchored into the ground with rebar or glued to pavers, as in **photo 4**. Marcus Kollmann flanked his flight of tile stairs with boulders; he then mortared the whole structure for strength, easy maintenance, and clean looks (**photo 5**). Rocks frame the staircase and keep away plants.

Depending on your skills, choose from a range of scale materials that modelers use to get us to the top. All the photos on these pages show strong construction, with the exception of Roger Samuelsen's scale wooden ladders in **photo 9** and Ray Turner's plastic staircases in the "Regional reports." Luckily, staircases can be protected inside tower frames with hard bases or snugged against a building.

Full-size steps

Don't make "stumble stairs" within your railway. When our muscles follow a stair pattern after the second uniform step, our legs and eyes don't have to consciously take the steps and look at the stairs—we just follow that rhythm until we reach the next platform. What if each riser and step is a different height and tread? The moment we sense a difference is the moment we stumble and must remain conscious of each step, regardless of how many train

2. The boss inspects the slate-quarry division of the Ag. & Gravel El. The author mortared slate steps up to the office shack, then pushed ginger fines between steps to hide the mortar. Gold moss stonecrop (*Sedum acre* 'De Oro', Zones 4-9) and rabbits-foot fern (*Davallia fejeensis*, Zones 10-11) crop up between slate crevices.

3. Paul Blondefield fastened stacked scale-redwood lumber to join two decks that service the mainline and excursion lines on his and Elizabeth's Four Corners Railroad. The curving staircase stands out above a mixed meadow of thyme (*Thymus serpyllum* 'Elfin', Zones 4-9) and mini star creeper (*Pratia pedunculata* 'County Park', Zones 5-10).

4. Under construction at Roger Samuelsen's mine line, scale lumber, glued and brad-nailed to pressure-treated lumber, will last a long time. Of course, filling the gravel up to the track grade will cover the sides of the pavers. Dragons blood stonecrop (*Sedum spurium* 'Dragons Blood', Zones 4-9) edges up to the yard.

5. Marcus and Vanessa Kollmann's Landschaft Gartenbahn models the elegance of European rail travel. Tile has been glued (exterior glue or thinset mortar) and stacked on a bed of mortar that extends to surrounding boulders. Note the impressive railing posts. Marcus Kollmann

6. Dan and Katy Hill's Mackay Mills Railroad features a gondola station with stacked lumber steps, but the railing detail gets our full attention. Dan drilled holes around the platform for ½" galvanized-steel hardware cloth, a sturdy fence when passengers disembark.

7. Mike, Michael, and Ann Haworth stacked flagstone into steps for their waterfall. Under the flag, steps were carved into colored concrete before it set up. A switchback path, carved below into the concrete, calls attention to this scene on the MM&A Railroad.

8. A few hours after pouring your abutments, while the concrete is still in the green stage, remove the molds and carefully hammer in some wire staples. These 10-year-old piers on Roger Samuelsen's Golden Bear Railroad have zinc-plated gate staples for rungs. Square-head Romex staples will also work.

9. Roger Samuelsen needed to hide his tunnel-cleanout box with a tall, removable feature. Lake Phillips built a four-flight fire tower with two easy railings of cotter-pin posts and wire cable. The wooden legs of the tower are fastened to a slab of concrete among blooming gold moss stonecrop (*Sedum acre*, Zones 4-9).

10. Lake Phillips welded ladders and a frame for a paint-can water tower mounted on a concrete slab. Ladders call attention to details while showing a common feline predicament on the author's point-to-point line in the Aggie. The award-winning extra sweet Confetti cilantro (*Coriandrum sativum* 'Confetti') blooms on the right.

11. Jerry Bradley descends from his raised railway with ease and safety. Lake Phillips has created steps from the wall and anchored a galvanized steel handrail into his patio and up into the garden. With this new feature, Jerry intends to enjoy another 20 years on his Indigo Mountain Railroad.

Helpful links

"Greening ... Step up to terraces," April 2009 (steps up landscaping)
"Greening ... Verticality," April 2011 (balance steps up with flat areas)
"Greening ... Low down ground covers," Dec. 2010 (40 low plants)
"Greening ... Cement products," Dec. 2014 (no-stumble stairs)
"Plant portraits: Silver carpet," Aug. 2012 (a 1:1 green step in a wall)
"Staff corner ... steps," Feb. 2013 (scale walkways and steps)
"Staff corner ... coach," Dec. 2014 (sheet-metal steps for rolling stock)
Drawings to build a 1:20.3-scale watchman's tower plus four others (search for "tower"). Subscribers can read these articles (except the Staff corners) at *www.GardenRailways.com*

cars we're carrying. Concrete wall blocks, for example, if stacked appropriately, create 4-6"-high risers by 10-12" treads. The trick is to make them uniform (**photo 11**).

Art in the garden

Why make us search for your craftsmanship under bushes when you can enhance little stairways with flat, living greenery, like sedum and thyme (**photos 2-5**)? Instead, search *stepables.com*, by zone (USDA Hardiness Zones 2-11), climate (wet or dry), exposure (sun or shade), and site preference (example: garden stairs).

Artistically balance the vertical nature of scale stairs with a deck, a yard, or other feature. Tiny railings (photos **1**, **4**, **5**, **9**, and **10**) help to protect scale figures from falling by the wayside, a sad situation. On open days, let steps and ladders present opportunities for heightened stories to be "told" (**photo 10**). We've heard heaven has a stairway! Why not "get there" within your railway?

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PLANT PORTRAITS

NANCY NORRIS

For related resources, visit *www.GardenRailways.com*

NANCY NORRIS

Perennial

Common name: String of beans

Latin name: *Senecio radicans*

USDA Hardiness Zones: 8-10

Cultural needs: Sandy, well-drained soil, in sun or part shade

Plant size: 1" high trailing to 2' or longer

String of beans' succulent bead-like leaves grow from stringy stems and present a unique opportunity for railroad gardeners. The designers, Joel Waszak and Martha Miller of Colorado, greened up the pergola above the waiting platform to enhance a lovely depot they built for their Switzerland Trail Railroad. Although we can't see where the "vines" are planted, we assume they are next to the arbor structure. However, the limp stems must be lifted onto the structure, as they don't twine like ivy or other vines. Joel and Martha live in Zone 5, so they will need to transplant their string of beans into a pot and bring the plant indoors for the winter. Other senecios, like string of pearls (*S. rowleyanus*) and string of bananas (*S. radicans glauca*), also bear fat leaves on stringy stems. The large genus of senecio is grouped in the daisy family due to their yellow, pink, or white-petal flowers, but the leaves look more like desert plants. Native to South Africa, senecios don't dry out as readily as thin-leaved plants because they store water in their leaves. For a groundcover of ¼" thick, deserty-blue leaves, try dwarf blue chalk sticks (*S. serpens* 'Mini Blue'), shown in the inset photo.

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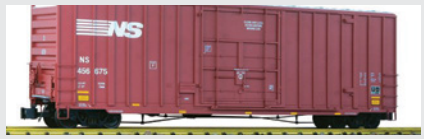

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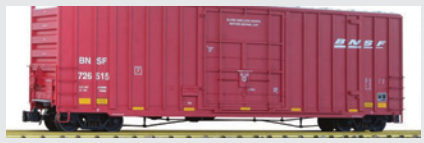

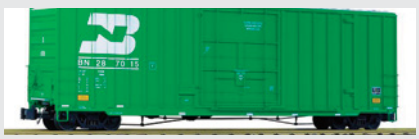

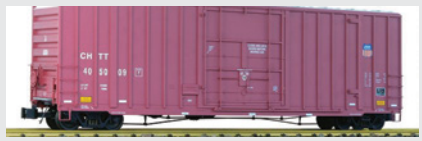

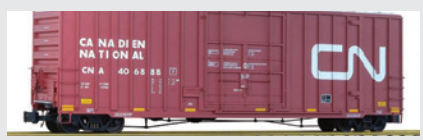

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BEGINNER PROJECT

Finishing touches

Using scale vehicles as detail modules

by Jack Verducci

PHOTOS BY THE AUTHOR

Peter's Painting Company's truck was made using the techniques discussed in this article. It's a 1936 Ford V-8 pickup. The ladder rack is similar to the contractor's truck's lumber rack, except the supports run over the cab. Ladders and paint buckets are among the things that fill the truck's bed. A work truck like this will fit in almost anywhere on your railroad.

Detail modules, as I've discussed in past articles, are small, self-contained scenes that can be placed around one's railroad. For example, a plumber's or contractor's truck can be placed almost anywhere—in front of the plumber's shop, at someone's home, or on the road. A logging truck can be in the woods, at the mill, or on the road. An auto transporter can be loading at the rail yard or off-loading at the dealership.

In this case, the detail modules are motor trucks. I have an interest in the 1930s to 1940s, so my vehicles are of this vintage. Of course the same techniques can be used for any time period, and if you are modeling the pre-automobile era, you can use horse-drawn vehicles.

I'll share some simple conversions using model trucks. Mine are Danbury Mint vehicles that I had on hand, though any appropriate scale-model truck can be used. Just search online for scale model trucks. If your trains are MTH or Aristo-Craft,

search for 1:32-scale vehicles. If you are modeling narrow gauge, you may have to compromise. There is a wide variety of 1:24- and 1:25-scale models available. These are a little too small for 1:20.3 but are often close enough.

There are a few 1:20-scale trucks and cars available, such as the old Hubley diecast vehicles, which were also sold under the name of Gabriel. Available vehicles include Model T Fords, Model A Fords, and others from the 1930s. These are long out of production so you'll have to search for them. They are metal kits that require a lot of hand work, but sometimes you can buy them already assembled.

Plumber's truck

My wife's side of the family boasted many plumbers so I named my plumbing company Palma & Sons Plumbing (**photos 1** and **2**). This was a simple retrofit. I made a set of racks out ADA plastic. Styrene is also a good choice and is available in all sizes and shapes.

On the driver's side, I made a simple set of open bins so you could see the various plumbing fittings. I used a variety of parts from my junk boxes to fill these bins. Ozark Miniatures and Trackside Details, among others, make many different fittings that can be used to represent plumbing items.

1. A simple set of racks holds a parts bin (on the driver's side) of this plumber's truck. The bin is filled with various fittings. A water heater was made from a locomotive air tank.

2. A pipe rack was added to the passenger side of the plumber's truck. Small aluminum tubing was used to simulate galvanized pipe—copper tubing can also be used. The author used a variety of parts from his junk boxes to fill the truck.

3. The addition of a simple lumber rack and some detail parts makes a convincing contractor's truck.

Removing markings from diecast models

If you don't remove unwanted markings from a diecast model correctly, there is a risk of removing the base paint. Do not use this method on plastic or to remove film-type decals!

Dip a Q-tip in lacquer thinner, then gently rub the markings until they begin to liquefy. Use a second Q-tip, lightly dipped in lacquer thinner, to blot up the liquefied material. The key is to work fast and to blot up the liquefied material quickly. Markings are usually a type of ink or paint that is not as robust as the base paint. However, lacquer thinner will remove the base paint if it is left on the surface long enough.

Contractor's truck

Another simple modification is a contractor's truck (**photo 3**). Add a lumber rack and some carpentry-related detail parts, and you're done. Here, I added a couple of Bachmann detail parts, including barrels and a drilling brace. I made some saw horses (also available ready made from Aristo-Craft). Over the years I have collected various detail parts, such as a carpenter's plane, saws, and other things. I don't recall where each came from but one good source is doll-house stores and suppliers, such as Oakridge Hobbies, Real Good Toys, Miniature Market Place, and others. They sell detail parts in what they call "H scale" (1:24 or ½" = 1'), which is close enough for garden-railway use. If you are modeling in ⅞" scale, this is close enough to standard doll-house scale (1:12 or 1" = 1').

The following examples of large motor-truck conversions are a little more involved than those above. Something I noticed while researching old trucks is that, in the 1920s and 1930s, there was not much standardization (although there were adaptations that resemble modern trucks). This was likely due to the fact that many adaptations of motor trucks were in their infancy, such as auto transporters. Today's auto transports are pretty much

4. This type of logging truck used a dolly and a drawbar. The log bunk on the truck end of the log pivots to allow the truck to turn.

5. The log transporter without the logs. Some versions of this type of transporter have no drawbar—the logs themselves form the attachment, similar to railroad logging disconnects.

6. Three automobiles can be transported on this type of carrier—one over the cab and two on the trailer.

7. To load and unload this type of transporter, the trailer must be disconnected and the autos are driven on or off by means of a ramp. This was a lot more work than on modern hydraulic transporters.

alike. In the early days, there were many contraptions used to accomplish the task of moving automobiles, which make for interesting model building.

Logging truck

For me, logging trucks are one of the more interesting adaptations. The book *Logging Trucks 1915-1970 Photo Archive* by Donald F. Wood is a good source of information. It illustrates the wide variety of trucks used in logging. I based my logging truck on photos I found in this book. The example shown here is a log-transport truck (**photo 4**). There were also log-loading trucks, trucks that ran on rails, and self-loading rigs, to name a few.

My log-transport truck began life as a Coca-Cola delivery truck. I removed the beverage body and the Coke markings. The log bunk on the truck end of the log needs to rotate to allow the truck to turn. The rear end of the rig is a dolly with a fixed log bunk and a drawbar. The dolly is connected to the truck by means of a pintle hook (**photo 5**). Some dollies did not have drawbars and were not connected to the truck at all, except by the logs themselves. This is a relatively simple rig. I used an old set of Mack truck tires and wheels to make the dolly. The log bunks and associated parts are made from styrene plastic.

Auto transporter

My dad was in the automobile business and I grew up around auto transporters. The type of transporters we have today became popular in the 1950s and, with the exception of the addition of hydraulics and the changes in truck model, they are basically the same. I was interested in finding out how autos were transported in the early days. The railroad did, and still does, a significant business transporting automobiles. However, unless the dealership is next to a rail yard, autos had to be transported by motor truck from the depot to the dealership.

There was a variety of transporters back then, and many looked homemade. I found one I liked, a three car transporter, and based my model on it. One auto is on a ramp over the cab while two more are on the trailer (**photo 6**). As today, autos were driven up ramps. With the version I modeled, the motor truck and the trailer were loaded separately (**photo 7**). Once both truck and trailer were loaded, they where hitched together.

Conclusion

Trucks and automobiles out of the box are fine but everyone else has them, too. Custom conversions will make these models unique to your railroad and will help create a railroad with a personality. If you host open houses frequently, you can place your modules in new locations each time you're open.

Sources for vehicles and details

Ozark Miniatures
ozarkminiatures.com
Trackside Details
tracksidedetails.com
Oakridge Hobbies
oakridgehobbies.com
Real Good Toys
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Accucraft's C-25 2-8-0 was able to manage a train of 56% of its weight up an 8% grade on a cool day, but only 43% on a warm day.

GRADES on garden railways

Part 1: Climbing hills with live-steam and other locomotives

by Earl Martin & Jack Verducci | Roseville & San Mateo, California | PHOTOS BY THE AUTHORS

Many modelers believe that their tracks must be flat (no grades). Full-size railroads are rarely flat—virtually all climb and descend grades. Mountain railroads that successfully climb 3% to 5% grades include the Durango & Silverton, the Cumbres & Toltec, and the White Pass & Yukon. An extreme example of such railways was the Uintah Railway, built in 1903. It provided a connection to the Denver & Rio Grande Western Railroad at Mack, in western Colorado, running 63 miles to the small town of Watson in eastern Utah. Starting at about 4,500-foot elevation at Mack, the Uintah climbed over 8,400-foot Baxter Pass on 7.5% grades, with curves up to 66 degrees (about 4' radius in 1:20.3 scale) using Shays, 0-6-2T tank engines, and, later, Baldwin 2-6-6-2T locomotives. Train lengths were short—typically a single combine with one to five flat cars. Longer, heavier trains required helper locomotives.

Model railroads can also climb and descend grades and, while we are not advocating extreme 7½% grades, a model railway built with 2% to 4% grades, using similar engines, would still be a workable model of a mountain railway. Many current model locomotives have impressive grade-climbing performance, which we discuss in the sidebar.

Two railways with grades

Jack Verducci's Crystal Spring Railroad (CSR) has a 700' mainline that climbs about five vertical feet to the summit on a 3½% grade. Once over the summit, the grades are modest, but still challenging, at 2%. Taking advantage of the lay of the land, the railroad represents a narrow-gauge line that moves freight and passengers from the port of Fog Harbor up over the coastal range to San Mateo, the central terminal. From that point the railroad serves mining, dairy, and lumber operations, as well as common freight and passenger traffic. A separate logging branch hauls timber from the log landing to the sawmill. The grade

Grade-climbing performance tests

The chart summarizes the results of tests, with trains being pulled upgrade by different locomotives. Most were live steam, climbing with various train weights up an 8% grade on both cool- and hot-day conditions. The track used in these tests was Llagas Creek Code 215 aluminum. These were not scientific tests, but were witnessed to see how well each locomotive and train handled challenging grades.

Tests indicated that geared locomotives pulled the highest percentage of their own weight. This was not surprising, as Shay, Climax, and Heisler locomotives were designed specifically to pull heavy loads on grades. A bit of a surprise perhaps, was that even the small WD 4-6-0T and Darjeeling B 0-4-0T locos pulled trains weighing about the same as the loco. Also good climbers were the 20 pound, onboard-battery-powered Bachmann 2-6-6-2T and the 18-pound K-27 locos, which pulled 20-pound trains up the 8% grade. Larger Consolation C-25 (2-8-0) and Garratt 0-4-0+0-4-0 locos also pulled well on the 8% grade without wheel slippage.

Interestingly, the 30-pound C-25 loco pulled a train weighing 18 pounds up this grade on a 60° day, but testing on a subsequent 86° day indicated that it would pull only a 13-pound train. The 18-pound Garratt pulled a 17-pound train up the grade under similar conditions.

In another test, small locomotives such as the 2-4-2 "Ruby" and the 0-4-2 plantation engine each pulled two-car trains up a 6% grade. By way of comparison, full-size locomotives used on the Uintah Railways 7½% grades were typically rated for pulling trains weighing slightly more than the weight of the locomotives.

Performance of various locomotives on an 8% grade

Grade-climbing performance by loco type, all 2-channel R/C	Loco wt. (lbs.)	Weight of train (lbs.)	Percentage of loco weight	Approximate ambient temp (°F)
Accucraft C-21, w/ ⅝" cylinders	33	20	60.61%	65
Accucraft C-21, w/ ⅝" cylinders	33	12	36.36%	86
Accucraft C-25	30	17	56.67%	60
Accucraft C-25	30	13	43.33%	95
Accucraft Climax	17	22	129.41%	86
Accucraft Climax	17	20	117.65%	65
Accucraft SP 4-6-0	27	8	29.63%	86
Accucraft 3-cyl. Shay	8	15	187.50%	92
Accucraft WD 4-6-0	11.5	10.5	91.30%	85
Bachmann 2-6-6-2 battery, sound	20	20	100.00%	80
Bachmann 2-8-0, sound	18	20	111.11%	80
Bachmann K-27, battery, sound	22	20	90.91%	80
Roundhouse Darjeeling B 0-4-0T	11.5	11.5	100.00%	80
Roundhouse Darjeeling Garratt	18	17	94.44%	95

This Roundhouse engineering Darjeeling Class B 0-4-0T pulled 100% of its own weight up the grade.

on this branch is 8%. The main freight engines are Accucraft live-steam C16s. An Accucraft two truck, two-cylinder Shay is used as a helper engine on the grade. Jack's railroad was featured in *Garden Railways*, June 2005 and December 2015.

Earl Martin's Thunder Valley Narrow Gauge Railway (TVNGRy) has about 350' of track, and is a point-to-point railway connected by a loop for continuous running. Grades are 2% to 4% on the loop section. His railway serves a town, two mines, a quarry, and a sawmill. For convenience, the section used for servicing live-steam locomotives is 34" above ground level, with a 36'-long ramp connecting with the ground-level tracks. This results in an 8% climb to, or descent from, this steamup area. Another area includes switchbacks leading to mines and a quarry, with 6% to 8% grades. Thunder Valley Narrow Gauge Railway was described in *Garden Railways*, August 2005, and in *Steam in the Garden*, March 2012.

Locomotives on the TVNGRy are gas-fired live steam, all radio controlled using 2.4GHz R/C. They include the following Accucraft locomotives: C-21 and C-25 2-8-0s, a Climax, a "Fairymead" 0-4-2T, a War Department 4-6-0T, a plantation-type 0-4-2T, and a "Ruby" 2-4-2, as well as a Roundhouse Darjeeling Garratt 0-4-0+0-4-0 and a Darjeeling Class B 0-4-0T loco. Guest locos included a three-cylinder live-steam Shay, as well as a Bachmann K-27 2-8-2, Consolidation 2-8-0, and 2-6-6-2 articulated locos, all radio controlled and powered by onboard batteries. These locomotives will all climb grades. Having challenging grades available on Earl's railway inevitably led to grade-climbing testing to see if his engines had the right stuff (see sidebar).

Locomotive selection

Just as full-size railroads select the right locomotives for the job, model railroaders also need appropriate locomotives. All live-steam locomotives have, in effect, a gear ratio enabling them to do the job. Larger-diameter drivers constitute a higher-geared engine, while smaller drivers constitute a lower gear ratio. (This does not necessarily apply to electric engines, since they have gears in the motor block.) Steam engines with smaller drivers can therefore be considered as being geared lower and are therefore better suited for

On the 8% grade, the Roundhouse Darjeeling Garratt 0-4-0+0-4-0 was able to lift a train weighing 94% of its own weight.

pulling grades, while engines with large-diameter drivers are designed for higher speed. For example, NYC Nº 999, a 4-4-0 with tall drivers, recorded a speed of 112.5 mph on May 9, 1893 on flat ground. A geared locomotive may have a top speed of only 10 to 15 mph on the flat but they have more pulling power on grades.

Control and operation on grades

Operating trains on grades demands a way of controlling train speed. On both full-size and model railroads, runaway trains can be disastrous. Model locomotives can be controlled in three ways: by throttle settings on track-powered engines, electronic speed controls on battery-powered engines, and radio control (R/C) servos on live-steam locomotives. R/C is not as critical with geared locomotives as it is with rod engines. Geared locomotives do not tend to run away on down grades, due to their low-ratio gearing, while rod engines require continuous adjustment to keep their speed under control.

Climbing grades also requires R/C for adjustment of the throttle and reverser (Johnson bar). Once at the summit, the throttle can be cut back. Going downgrade, the throttle can be turned down. The Johnson bar can be used alone to control a decent. When setting up the throttle servo, we crack the throttle open a little and set the servo linkage so it is all the way closed. In other words, even when the throttle servo is in the "off" position, a little steam is still available. This allows one to use the Johnson bar as a vernier control to regulate the speed. This also helps achieve a smoother start. The throttle is opened for one second, then closed to use the Johnson bar only to start the engine moving. Once the locomotive is moving, open the throttle as needed to maintain the desired speed. Running live-steam engines on a flat track requires only occasional tweaks of the controls to maintain an optimum setting.

Railbuses like this one, along with other single-unit trains, should have fewer problems on steep grades.

Reducing curve drag

As a train enters a curved section of track, the track produces drag and rolling resistance. One section of Jack's railroad is particularly challenging—it has a curve on a grade. In addition to the pull of gravity on the grade, there is the added drag of wheels against the rails. To reduce drag, ball-bearing wheels are used to eliminate the differential effect. Frequent lubrication of the journal boxes also helps.

Couplers

Some model railroad cars come equipped with truck-mounted couplers. These can be troublesome going down grades. If you have a runaway car flying down a steep grade, you'll understand the importance of good couplers. The weight of coasting cars can cause jack-knifing and derailing of cars. The cure is body-mounted couplers. Jack's Accucraft cars came with body-mounted couplers. He found that these stock knuckle couplers work well, but sometimes the lift pin will hang up, causing cars to accidently uncouple. He recently converted all of his cars to Kadee couplers. Kadees are not perfect, but they seem to work the most reliably of the various types.

Kadee #1850 couplers can be used in an Accucraft draft-gear box with a few modifications. The main pivot hole in the coupler must be drilled out to fit Accucraft's pivot pin and the centering springs have to be shortened. Another modification Jack does is to remove the steel trip pin and replace it with a brass screw. This prevents seizure due to the steel pin rusting. To uncouple cars, he uses a tool similar to a flat-blade screwdriver. This is inserted between the couplers and twisted to release them. Earl uses both Accucraft and Kadee couplers.

In the second part of this two-part series we'll take a look at helper engines, track considerations, railway design, and more.

A 28-year project—building extended Mamod coaches

Mamod, the British steam company, produced the first commercially available, complete, live-steam train set in over half a century in 1980. Both the locomotive and the rolling stock were well proportioned. They were made to 16mm scale and (initially) ran on gauge 0-track.

I was as taken as anyone with these new trains. As a passenger-train aficionado, I particularly liked their little two-axle coaches. I thought that maybe three of these steel bodies, ganged on a single chassis, would make an attractive longer coach. With that in mind, in 1988 I wrote to Mamod to see if they would consent to sell me just the parts I needed—specifically doors, seats, and sides/ends. They kindly agreed, so I placed an order for enough parts to make three coaches. A box containing all of the goodies arrived in due course, which I promptly put on a shelf and forgot about. In cleaning up my storage closet a few months ago, I came across my lost treasure and decided to finish this project.

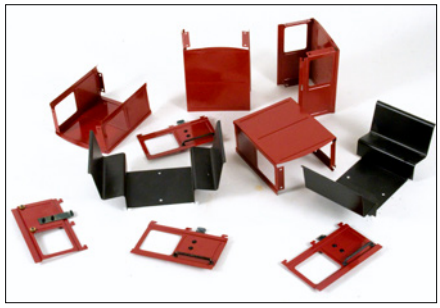
I had a look at the bits (**photo 1**). An end wall and a third of each side were formed as a single unit. Two of these, with a space between for the doors, defined one coach. Seats were just a basic shape, folded up from a single piece of sheet steel. All of the parts supplied by Mamod came prepainted and with mounting holes already punched. Who could ask for more?

I taped three complete bodies together and carefully measured the positions of all of their mounting holes, also doing a sketch to determine the size of the new floor. I cut three floor blanks from sheet steel, marked them out, and drilled matching mounting holes.

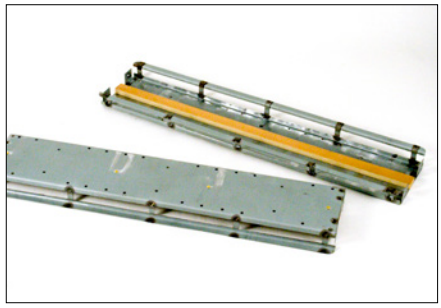
I found three pairs of anonymous scratchbuilt trucks in my scrap box. These were quite basic but were solid, stable, and free rolling, so I decided to use them. Based on the dimensions of the trucks, I cut wooden center sills for the cars and screwed them into place. I also made some brackets to hold the end beams, and spot-welded them to the floors.

I made full-length steps for each car and spot-welded these in place, too (**photo 2**). The end beams I made of maple.

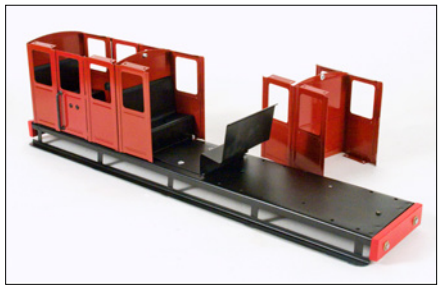
An Archangel *Marmaduke* easily handles three new all-steel coaches on the author's railway. The coaches were made using parts supplied by Mamod 28 years before.



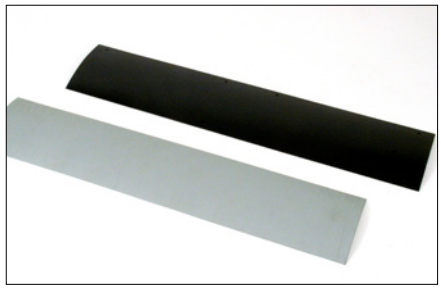
1. Coach parts supplied by Mamod. Each body is comprised of two end/sides sections and two doors. The black pieces are seats for the spartan interiors.



2. Full-length steps and supporting brackets were spot-welded to the floors.



3. Body parts were pop-riveted to each other and to the floors, in true Mamod fashion.



4. Roofs were rolled out of sheet steel and painted before mounting holes were drilled.

5. A finished coach, ready for the rails.

Next came my least favorite part of any job—painting. I got through it, however. The floors are black, the end beams red.

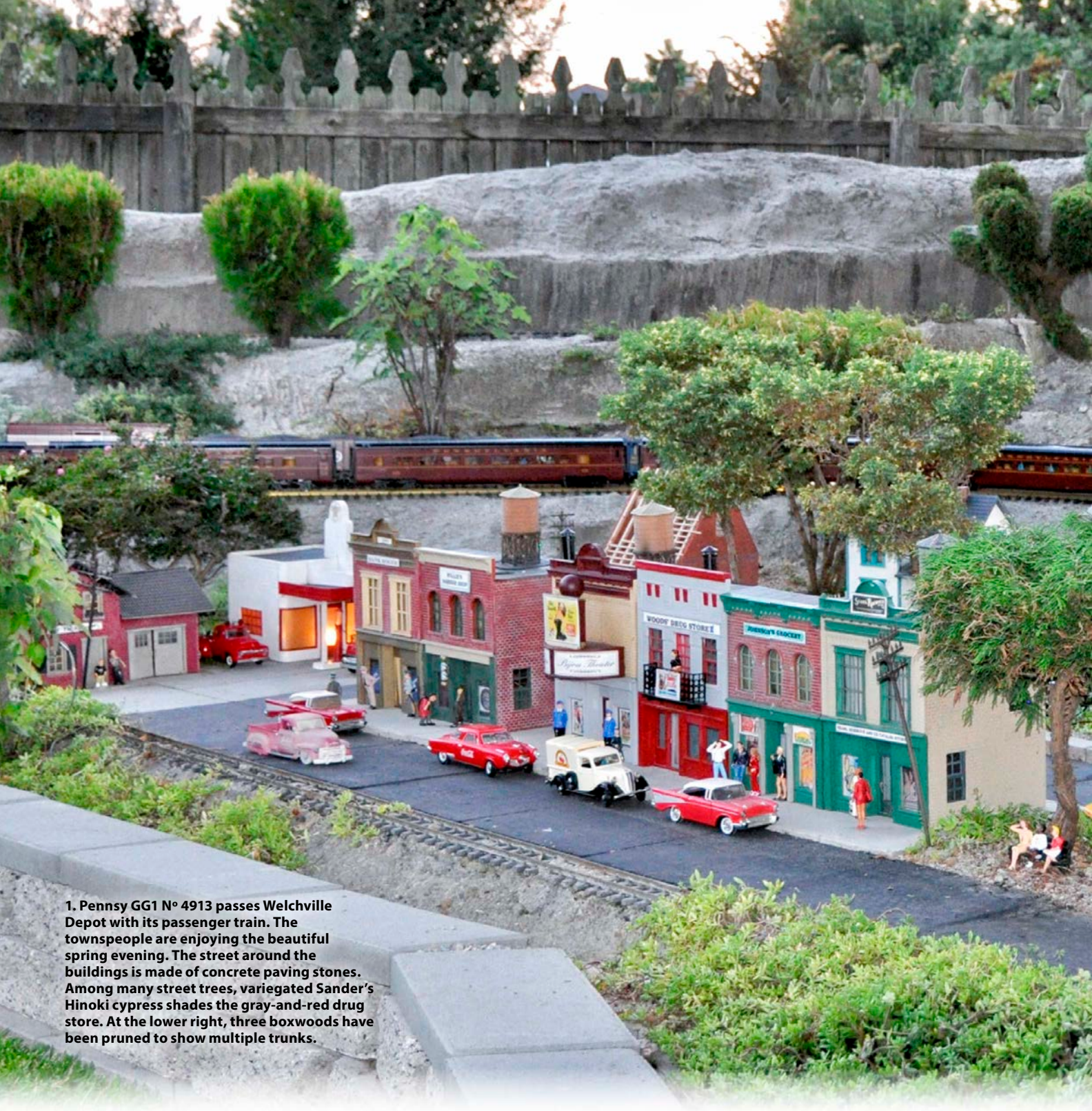
Then came the fun part—attaching the Mamod bits to the floors. In true Mamod fashion, I affixed all of the factory-supplied pieces with pop rivets. **Photo 3** shows a coach partially assembled. A proper assembly order had to be rigidly adhered to—otherwise the seats wouldn't go in correctly.

Roofs were made of the same sheet steel as the floors. I first rolled a large sheet to the proper curvature. This was first cut to the proper length but more than three times the width of a single coach. Once the sheet had been rolled, I cut the three roofs to the proper width, then painted them black to match the floors (**photo 4**).

All that remained were couplers. I just milled some simple link-and-pins out of brass bar. These I chemically blackened and screwed to the end beams.

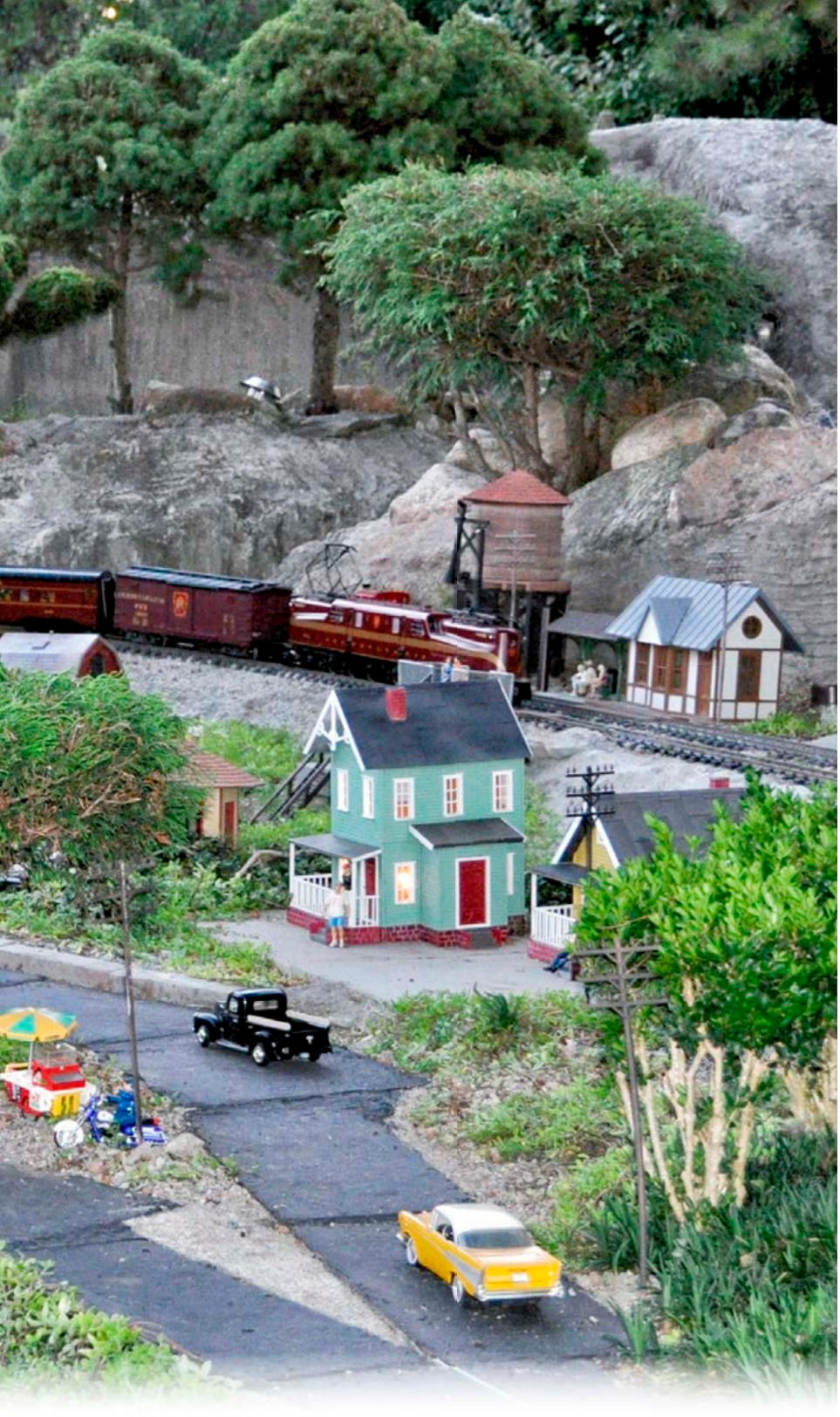
The coaches were finished (**photo 5**). They came out a little heavy, I thought, being made entirely of steel. However, they rolled well on the track, so I decided to give them a test run. I suppose I should have used a Mamod locomotive but I wanted to see what the coaches would look like with something a little taller. I chose an Archangel *Marmaduke*, a live-steam 0-4-0T powered by a single cylinder between the frames. The engine just walked away with the train. The coaches were heavy enough to give a little exhaust chuff and they provided enough inertia to make their operation a little more realistic. In all, I was pleased with the outcome of the project, even though it did take 28 years to come to fruition.

Marc Horovitz has been a model railroader since he was a child. He enjoys scratchbuilding live-steam locomotives, rolling stock, and structures out of wood and metal, usually to his own designs.



1. Pennsy GG1 Nº 4913 passes Welchville Depot with its passenger train. The townspeople are enjoying the beautiful spring evening. The street around the buildings is made of concrete paving stones. Among many street trees, variegated Sander's Hinoki cypress shades the gray-and-red drug store. At the lower right, three boxwoods have been pruned to show multiple trunks.

An eastern line serves SMALL MOUN



The Capleville & Sugkat Valley Railroad **by Teya Caple-Woods** | Chesapeake, Virginia | PHOTOS BY THE AUTHOR

TAIN TOWNS

From the age of four I can remember Lionel trains, but they were mainly for my older brother and, later, my two younger brothers. I always watched my father when he was building anything. Today, none of my brothers have any interest in trains. I subsequently lost interest for years, but decided to build my first HO layout in 1985, when I was living in Hawaii. I also worked at a local hobby store in Honolulu until 1989.

We moved to Chesapeake, Virginia, in 1993. I was a member of the NMRA by then, so I joined the local division, which had a small large-scale group. I joined this group to learn more about that segment of the hobby, then joined the Tidewater Big Train Operators (TBTO G-scale club) in 1995. At the first meeting I attended I saw my first outdoor railway, and I was truly hooked.

My mother suffered a massive stroke in 1996, so I had to move her into our home. That marked the end of my third HO layout; the only other space available for a model railroad was the backyard. By that time I owned several LGB engines and as well as a few pieces of rolling stock.

The planning stage

After lengthy discussions with fellow club members, and especially Buddy Starks (who drew up several trackplans based on our conversations), I borrowed some gauge-1 track and switches from the club to get a better idea of what I might want for the railroad's mainline and branch line. I later ordered a good amount of track, which fortunately was a lot less expensive then than it is now.

The railroad name is my last name (Caple) and my father's nickname (Sugkat), which is entirely fitting, as he got me started in the hobby. I love the 1940-60s era, so I chose that to model. My world, my railroad, and my way!

2. Overview of the Capleville & Sugkat Valley Railroad after 19 years of construction and maintenance.

I began working on the railroad April 1997. Buddy had no idea how much dirt it was going to take to build my railroad. Based on his calculations, I made major changes to both phases of construction. The dirt would be four-feet high in Phase 1, for laying track or creating mountains. The railroad was built in two phases with three later expansions.

Construction

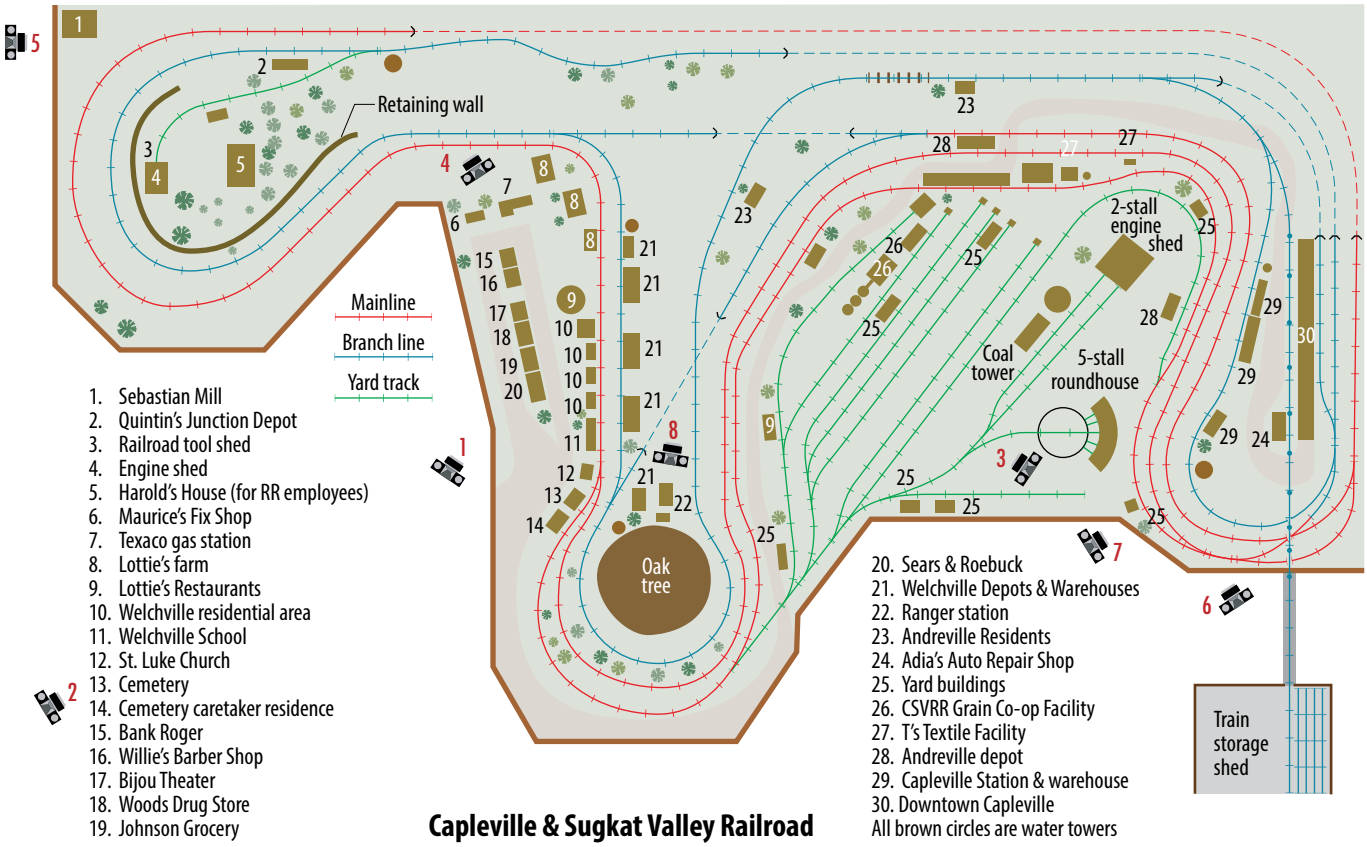
A neighbor installed a pool, so I was able to get four truckloads of free dirt, but it wasn't enough to complete both phases. I also purchased three construction-truckloads of dirt when a nearby road was widened. My husband Roger built the basic framework with landscaping timbers. I wanted to put a train on the track without having to kneel, so its lowest area is 18"-36" off the ground. The retaining wall for the back of the railroad is treated plywood, wrapped in heavy, black plastic. Roger also moved all the dirt from the side yard into the railroad area by wheelbarrow. When he was finished, he proclaimed in no uncertain terms, "I am done working on your railroad." Of course, that turned out to not be true! The trackplan was changed several times because I had Roger remove a tree here or there or I discovered ways to improve the trackplan.

Phase-1 construction provided opportunities to explore ideas I'd read about, and I gained valuable experience trying to find less expensive or better ways of doing things. I used a lot of blue foam-insulation board for constructing the mountains, viaducts, and retaining walls. The mountains in Phase 1 are shaped sections of blue board that were screwed to the backside of the retaining wall, with a narrow trench dug to hold forward sections in place at the front. Newspaper was stuffed between the foam layers and screening draped over this structure to form the depth and hold the Portland-cement mixture that formed to the outer surface.

I scribed the front sections of the blue board with a wire brush to provide a texture that would help retain the wet cement, then applied several layers of a mixture of Portland cement, mortar, and sand. I then used a small broom and my fingers to texture the mountains.

The mountains in Phase 2 were built over a wood framework, with strips of blue board for support, chicken wire to form the shapes, and screening to hold the Portland-cement mixture. There are two tracks behind this section, with pedestrian access behind the railroad when necessary to get to the trains.

3. There's not much action on this quiet morning at the Sugkat Valley Yard. The tall coaling tower dominates the scene.



Capleville & Sugkat Valley Railroad

Soldering the track

I used Chem-Wik rosin braid for jumper wires across rail joints. I soldered large sections of track with a resistance-soldering unit in my garage, then carried them outside. If a joint braid comes loose now, I replace it with a Split-Jaw rail clamp. Joints are supported with a 3" x 5" (or longer) piece of Plexiglas, if needed, plus brass screws, and plastic tent stakes. A stake is pounded into the ground between the joined tracks. Then the track, Plexiglas, and stake are screwed together with ¾" brass screws in pre-drilled holes.

The rest of the track floats on rock screening poured into trenchwork. I used Split-Jaw clamps on all my switches so I could easily remove them. Every switch is screwed to a piece of Plexiglas in the shape of the switch so that the entire switch rests on a flat surface.

Cinder blocks and black drainage tubing make up the tunnels. Each has a rerailer track in the middle to help minimize derailments. Portals were cast in a wooden form using concrete and chicken wire, then scribed with a nail. Clyde's Gorge trestle was built by Buddy Starks. I bought a couple of cedar fence boards, planed them, and gave them to Buddy so he could take care of the hard part.

The original landscaping timbers for the border started to deteriorate, so I began replacing them with retaining-wall blocks several years ago. Completing the first phase of the railroad allowed me to run trains while I worked on the second phase.

Expansion

The original Phase 2 was expanded several years ago so I could have a larger train yard with a better turntable. A fellow club member, Bob Maisey, and I built two turntables out of 4' x 8' PVC plastic sheets. The circle was easy to cut but the turntable-pit wall had to be heated, then placed in a

The railway at a glance

Railroad name: Capleville & Sugkat Valley Railroad
Size: 90' x 35' x 30'
Scale: 1:22.5-1:32
Era: 1940-1960s
Theme: Small mountain towns and big railroads
Age: 20 years
Motive power: Track and battery
Length of mainline: 350'
Maximum gradient: 3%
Type of track: Aristo-Craft and LGB; LGB switches
Minimum radius: 10'
Structures: Piko, Pola, Korber with modifications, Colorado Structures, Stoneworks
Control system: Aristo-Craft Train Engineer, Revolution, and MTH

4. Just another busy day on Capleville & Sugkat Valley Railroad, as the Pennsy GG1 hurries its passengers past the freight on the upper track, hauled by a New York Central Hudson. Between the two engines, Silver Mound artemisia breaks up the green landscape with a patch of silvery blue.

5. Nº 138 passes Sebastian Mill, which is a Stoneworks structure purchased built-up at the 2015 National Garden Railway Convention. This is the only water feature on the railroad.

curved frame to form the wall pieces. The turntable is 38" in diameter and is not motor driven—that's a future project.

The trackplan allows me to run two trains and to reverse direction on either line. Phase 2 was completed by May 10, 2000, when I connected the last piece of track. A full-size railroad spike marks the spot.

On June 10 of that year I had a Golden Spike ceremony and another club member, Jon Miller, named my railroad The Sink Holes & Money Pit Railroad. A reporter from the local newspaper, *The Virginia Pilot*, attended the celebration and wrote a lengthy article about the "Whys and Hows of the Capleville & Sugkat Valley Railroad." That's when Roger found out how much I had spent.

The railroad is electrified except for my last expansion, the rail yard. Wires were pulled through conduit attached to the back of the railroad and run under a walkway into the electrical panel in the garage. A separate 20-amp circuit breaker was installed just for the railroad. There are also electrical outlets located at each end of the railroad. The railroad is powered by 20-amp modified Navy regulated power supply located in my garage, and by two Aristo-Craft receivers in a plastic box attached to the retaining wall outside. A 20-amp ground-fault-circuit interrupter (GFCI) electrical outlet was installed for AC current to the transformer.

Roads and structures

I tried several methods of making roads, but I now use painted concrete patio blocks. I have also replaced all the blue-board

Plants on the Capleville & Sugkat Valley Railroad

Chesapeake, Virginia, USDA Hardiness Zone 8

DWARF CONIFERS

Variegated Sander's Hinoki cypress
Chameacyparis obtusa 'Saffron Spray'

Dwarf twisted Hinoki cypress
Chamecyparis obtusa 'Tsatsumi'

Dwarf Golden threadbranch cypress
Chameacyparis pisifera 'Filifera Aurea Nana'

Dwarf Alberta spruce
Picea glauca 'Conica'

Jean's Dilly spruce
Picea glauca 'Jean's Dilly'

Paul's Dwarf mugo pine
Pinus mugo 'Paul's Dwarf'

Berckman's golden arborvitae
Platycladus orientalis 'Aurea Nana'

Peve Minaret bald cypress
Taxodium distichum 'Peve Minaret'

SHRUBS AND TREES

Dwarf English boxwood
Buxus sempervirens 'Suffruticosa'

Emerald Gaiety euonymus
Euonymus fortunei 'Emerald Gaiety'

Schillings dwarf Yaupon holly
Ilex vomitoria 'Schillings Dwarf'

Dwarf crape myrtle Pocomoke
Lagerstromia indica 'Pocomoke'

Creeping rosemary
Rosmarinus officinalis 'Prostratus'

Seiju dwarf lacebark elm
Ulmus parvifolia 'Seiju'

Golden globe arborvitae
Thuja occidentalis 'Globosa Aurea'

GROUNDCOVER

Silver Mound artemisia
Artemisia schmidtiana 'Silver Mound'

Miniature wintercreeper
Euonymus fortunei 'Kewensis'

Ivy, Spetchley
Hedera helix 'Spetchley'

Grace Ward lithodora
Lithodora diffusa 'Grace Ward'

Dwarf mondo grass
Ophiopogon japonicas

Two-row stonecrop
Sedum kamtschaticum 'Variegatum'

John Creech sedum
Sedum spurium 'John Creech'

foundations under my structures with the same blocks so I don't have to repaint them.

Structures are from Piko, Pola, Korber, Eaglewings Iron Craft, and Colorado Model Structures (some with appropriate modifications). The wall and flats creating the downtown Capleville in Phase 2 are made from blue foamboard. I used a pencil soldering iron to carve in the brick pattern. Included are a number of half buildings to add depth to the flats. This area was rebuilt in 2010 in preparation for a new raised track to run to a shed for train storage.

Storage

I was truly tried of carrying trains out to the track, so in 2010, Roger and I built a five-track transfer table in my shed. The table is 13' long and is built like a ladder of 2 x 4s with ¼" plywood on top. The table has four drawer slides, so it pulls out sideways, like a cabinet drawer, and pushes back to the wall when you are done. This addition has made train operation easier and a lot more enjoyable.

6. Central of Georgia Nº 138 with a string of freight cars in tow starts its climb to the mountains at Capleville. The rail yard is visible in the background.

The railroad's past

This is my railroad, but Buddy Starks was a major player in building it (and spending my money). Buddy had an obsession with switches, which is why I used to have 13 of them between the mainline and branchline. Some have been removed but more were added to enlarge the rail yard.

Buddy boarded the train to Jordan in 2009, before I had completed the rail yard. In our last conversation, he said he had figured out a better way to enter the yard, but I had already made the changes and all he could say was,

7. Nº 138 starts up the hill at Capleville. Downtown Capleville is in the background. Mountains are made of a concrete shell over mesh forms.

RIGHT: 8. Nº 673 Big Boy winds through the mountains with its train, heading down Buddy's Hill. The trestle in the background provides passage across Clyde's Gorge. At the bottom of Buddy's Hill, a row of dwarf mondo grass helps prevent erosion.

BELOW: Good friend Buddy Starks was instrumental in helping to plan and construct the author's railroad.

"did you use a larger-radius switch?" His family had his memorial service with full military honors at the Capleville & Sugkat Valley Railroad, because he was most at home here.

The railroad was also featured in the book *Getting Started in Garden Railroading* by Allan W. Miller in 2001, and on local WAVY TV-10 in December, 2010.

The future

In 2015 my railroad was starting to show its age, so Roger and I did a lot of repair that will, I hope, last another 18 years. Once we were done, he asked me "How long do you plan to continue doing this?" My answer was, "Until I die!"

After returning from the National Garden Railway Conventions I have suggested to "Bank Roger" that I should tear the railroad down and start over because I love the construction part of this hobby. That didn't go over very well, so I will focus on adding new buildings, repairing Clyde's Gorge trestle, converting engines to battery power, taking care of train repairs, and having fun running trains.

About the author

After completing her education, Teya Caple-Woods worked in Connecticut, moved to California, then back to Connecticut, then to Honolulu, Hawaii, where she met her husband Roger Woods, to whom she's been married for 37 years. They have one daughter, Adia. Teya worked with the Honolulu Police Department and at the Honolulu Trains & Hobbies store. Teya and Roger moved to Virginia in 1993. Roger retired from the Navy in 2001 and now is a planner at Northrop Grumman. Teya managed a Hancock Fabric store for 13 years, until 2012. She now devotes full-time effort to the railroad and related projects, while Bank Roger provides the funds for her hobby. She says, "Yes, it's great to be a woman in this hobby!" Her other love is traveling and spending time with their first grandson, Sebastian, whom she is teaching about trains.

BEGINNER PROJECT

The shingles on this schoolhouse were made using the method described here. The result is neat and convincing.

Make your own shingles

This method is simple and effective

by Richard Nelson | Salina, Kansas

PHOTOS BY THE AUTHOR

During the past 10 years of building structures for my garden railway, I have used asphalt, cement board, and metal in making roofs for my buildings. I had never used wood for shingles, as the only ones available were the individual wood shingles used in dollhouse roofs. I avoided them because of the time it would take to cover a large-scale roof.

The last building I added to my garden was a schoolhouse, one of the smallest structures I have built. I decided that, it having a smaller roof, I would try wood shingles. This way I could test out an idea I had on how to make the shingles easier, cheaper, and quicker to install.

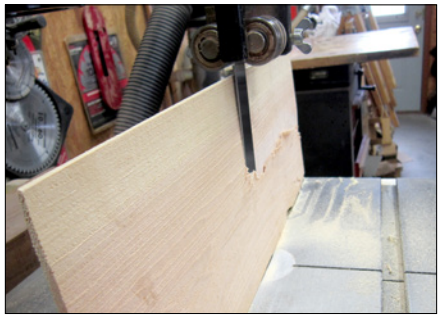
I thought of the three-tab asphalt shingles on real houses, which have three shingles (tabs) in line, with a solid sheet behind them, on top of which are added the next line of shingles. What if I could make a long strip of shingles out of wood? The strip could be as long as my school's roof line. I could then lay shingles from one side to the other in a single step.

There are two ways to create small shingles. The first is with power tools. You could make the shingles out of leftover, discarded cedar siding. It would take a little work but there would be no cost. The second way is by purchasing material all ready cut to a thickness of 3/32". I did some research and found some basswood at our local Hobby Lobby that was 3/32" x 4" x 24" for $2.79 apiece. Basswood is easy to work with but would need to be painted to preserve the shingles.

Here is what I came up with, using discarded wood siding. I found some cedar siding in multiple lengths that was 7" wide x 7/16" thick on one side, tapering to 1/8". I first used a bandsaw to remove large amounts of the excess thickness (**photo 1**). Then I used a benchtop planer to reduce the thickness to a uniform 3/32" (**photos 2** and **3**). Next, using a bandsaw, I cut long strips, 1" wide (**photo 4**). My school roof was 17" long, so I cut the strips at least this long or longer. I drew a line down the center of each 1" strip, one half being for the shingles and the other, solid half for the next row of shingles to rest on.

On the front (shingle) edge of the strip, I drew a line 3/4" in from the end and 1/2" deep. From that line, I drew lines 3/4" apart and 1/2" deep, down the length of the board to define the shingles (**photo 5**). I also used this as a pattern for marking subsequent strips. On the bandsaw (or saw of your choice), I cut on the lines all the way down the strip, being careful when backing out the saw blade so as to not break off the shingle (**photo 6**).

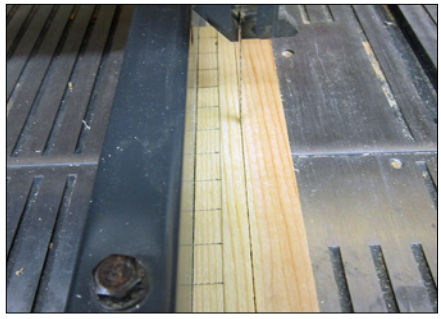
The roof material upon which the shingles will be laid must be sturdy and



1. A bandsaw with a resaw blade is used to remove some of the thickness from a piece of full-size cedar siding.

2. The board is put through a planer the ensure uniform thickness.

3. A thickness of 3/32" is used for the author's miniature shingles.



4. The 3/32" board is cut into 1"-wide strips on the bandsaw.

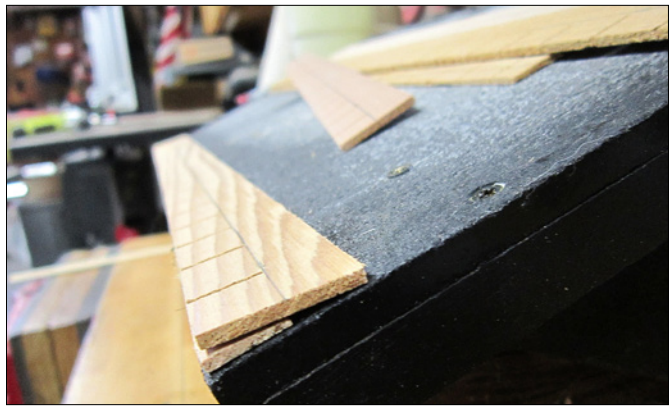
5. Each strip is longitudinally divided by a line at the 1/2" mark, then individual shingles marked off at 3/4" spacing.

6. Shingles are then individually cut on the bandsaw.

7. The first (bottom) row is a solid 1/2" strip, thinned on one edge to a taper.

8. Glue is carefully applied to the back of the shingle strip.

9. The strip is clamped in place over the starter strip.



10. When dry, the strip is ready for the next one.

11. The process is repeated, each new strip being clamped in place until it has set. The saw cuts between the shingles were offset on each layer.

12. Blank strips, ½" wide, are used for the roof cap.

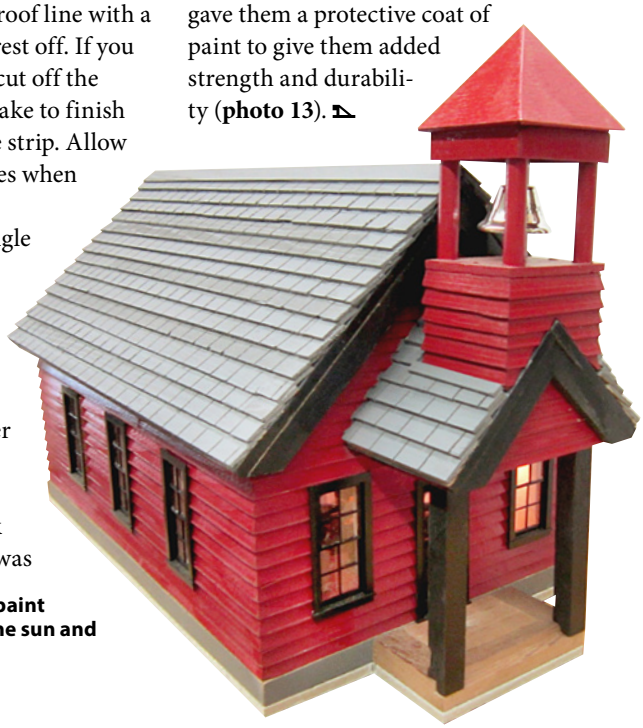
not prone to warping or deterioration. I use cement board, as it is strong, moisture will not harm it, and it will not warp. A cheap set of cement drill bits makes it easy to drill holes for mounting the cement board to the structure. I use two bits—one to clear the body of the screw and a larger one to countersink the screws.

I measured the roof from the lower edge to the peak, divided that number by ½", then multiplied it by two to get an estimate of the number of strips needed for both sides of the roof. For example, if your roof is 10" from the lower edge to the peak, it will take 20 strips, or 40 for both sides of the roof.

To start laying shingles, I first cut a solid ½"-wide strip out of the shingle material for the bottom (first) row. On a belt sander, I tapered this ½" strip on one side so that the first row of shingles will rest properly on the starter row (**photo 7**). I glued the starter strip on with a waterproof glue, with the thinner edge toward the peak, and clamped it down. While this was setting up, I worked on the other side.

I then took a strip of the new shingles and glued it over the starter strip on the first row (**photos 8** through **10**). The starter strip shows through the cuts in the shingles, which gives it the look of a real roofing job, and it should not leak. If your strips are a little longer than your roof line, just make a cut at the roof line with a sharp knife and break the rest off. If you come up a little short, just cut off the number of shingles it will take to finish the row from a new shingle strip. Allow a 1/32" space between shingles when adding the strip.

I continued adding shingle strips, offsetting the gaps between the shingles on each row, and clamping each to make sure it would not move until the glue set up (**photo 11**). After I applied several strips, I measured from the lower edge on each end to a mark on the roof to make sure I was getting the shingles on straight. I continued this until I reached the peak on both sides. On the peak, I used blank ½" strips on each side to make a good-looking ridge cap (**photo 12**). Because the roof shingles are thin (as most model shingles are), I gave them a protective coat of paint to give them added strength and durability (**photo 13**).



13. A coat of exterior-grade paint protects the shingles from the sun and elements.

BEGINNER
PROJECT

The author's battery-powered LGB railtruck at work plowing the snow. Learn how he did this simple conversion.

Try a simple BATTERY CONVERSION

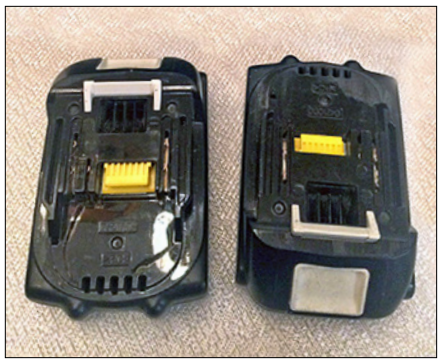
A commercial battery-powered drill provides the solution

By Neptali Martinez | Douglaston, New York | PHOTOS BY THE AUTHOR

Working on the landscape, track, and structures on my railway comes easy to me. However, when I approach the electrical and electronic side of the hobby, I struggle. So, when I decided to convert my LGB AHA railtruck into a battery-powered snowplow (**photo 1**), it took me a while to get over my apprehension of jumping into the electrical part

1. LGB's AHA railtruck, awaiting battery conversion. It already has a new plow and headlight.

2. The Makita DC18RA charger and two batteries as supplied with the author's drill.



3. The rechargeable 18V drill set as it came.

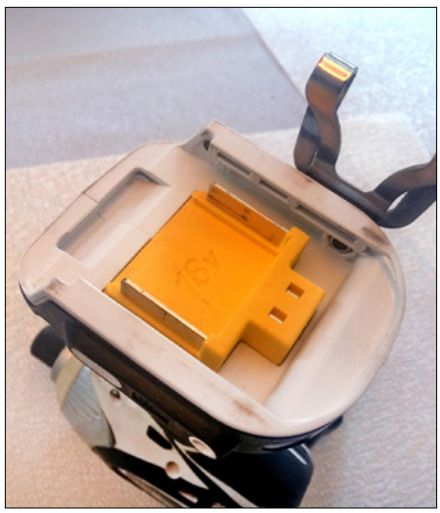
of this project, as simple as it may seem. I started with what came easy for me—building a simple plow to attach to the front of the truck. However, when it came to altering the electrical connections, I dilly-dallied, procrastinated, and buried my head in the sand for quite a while. No matter how many battery-conversion articles I read, when it came to AC or DC voltage, ohms and amps, analog or digital, capacitors and resistors, and all the rest of the electrical terms and components, my eyes just glazed over and my mind turned into mush.

The solution

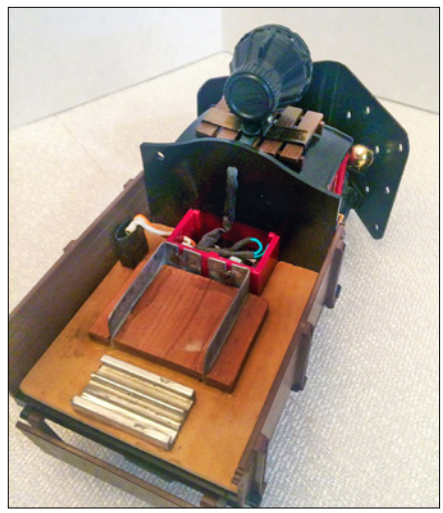
Putting aside my concerns about correct battery sizes, types, capacities, chargers, etc., and armed with my basic understanding that large-scale powered units use between 18 and 24V DC, I looked for an easy way out. One day, while using my battery-powered drill, it hit me! I already owned the perfect battery system—a Makita DC18RA charger with the accompanying battery-powered drill set. It is 18V; batteries recharge fully in half an hour. The batteries keep their charge for long periods of time, there are no loose wires or connectors to mess with, and best of all, my drill set came with two batteries and a charger (**photos 2** and **3**).

The elegance of the coupling mechanism, which allows the battery to be attached quickly and securely to the drill or to the charger, rests on a simple shoe (**photo 4**). The challenge for me, then, was how to recreate this shoe to clip the battery onto the LGB truck.

Using some thin plywood and a couple of thin strips of metal, I built a functional shoe that I mounted on the flatbed of the truck. I disconnected the motor wires from the track pickup mechanism and reconnected them to the newly built shoe,

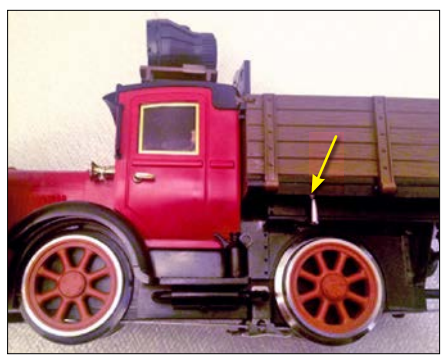


4. This shoe, seen here on the bottom of the drill, provides the connection to the battery.



5. The author's home-made shoe installed in the railtruck. The aluminum piece at the back prevents the battery from moving.

6. Railtruck with battery installed. The weight of the battery provides extra traction.

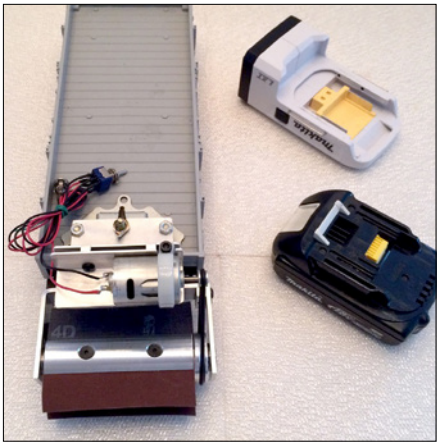


7. Behind the cab, below the bed, is an on-off toggle switch. No speed controller was used.

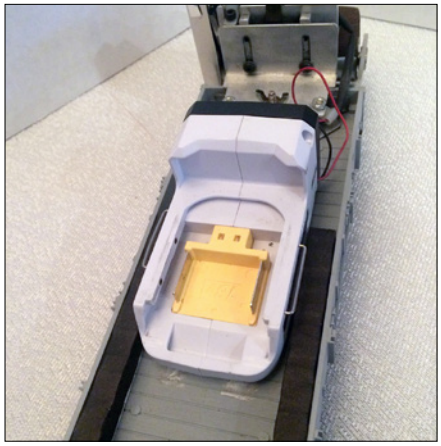
with an on-off toggle switch in between to control the operation (**photo 5**). All the wiring fits nicely in the truck's toolbox (from where the new roof-mounted headlight obtains power). The two thin metal strips connected to the wires in the toolbox engage the contacts in the battery. The shiny piece of metal at the back of the flatbed acts as a stop to keep the battery in place. The weight of the battery provides additional traction to the truck for those wet and snowy days when the service of the snowplow will be required (**photo 6**).

I installed the toggle switch on the left side of the truck, by the rear wheel, because that side is the most accessible for me (**photo 7**). I have a waist-high staging track where I can start the plow off on a run and where I'm also able to catch it on its return to turn it off.

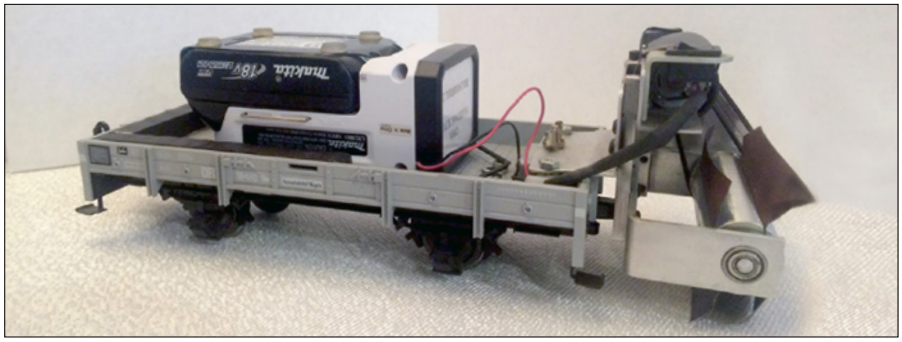
At 18V, the plow runs at a good clip—not too fast and not too slow. No speed controller was incorporated into the circuit. The plow works best with about two



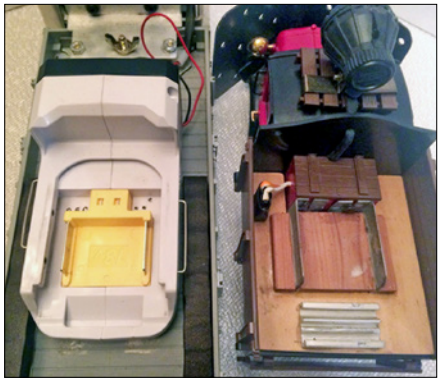
8. The flatcar with the track sweeper installed. To the right (above) is the flashlight. The battery can be seen under it.



9. The flashlight, with its built-in pickup shoe, installed on the flatcar.

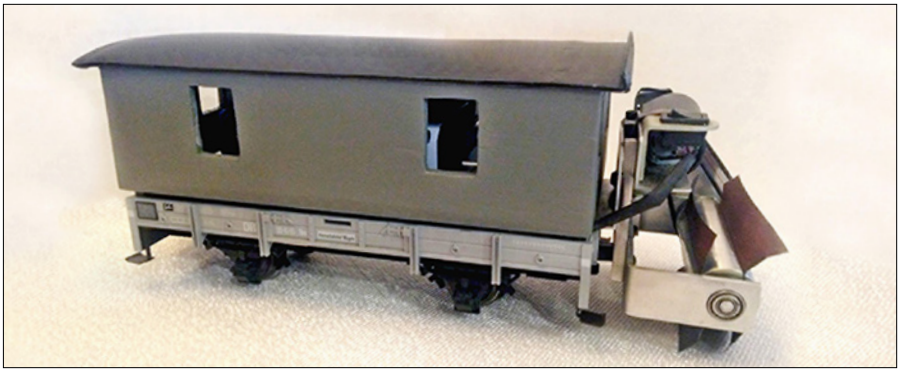


10. Battery installation is complete, counterbalancing the weight of the cleaning mechanism.



11. A comparison of the track-sweeper installation (left) and the railtruck.

12. The on-off rocker switch located near the sweeper's motor. The switch turns on the rotating sweeper.



13. With the body in place, access to the battery is limited, which is why the control switch was located outside.

to three inches of fresh, light snow. Anything more than three inches, or if the snow is wet and heavy, the railway has to shut down operations.

Another installation

If you don't want to scratchbuild one of these shoes, do what I did for my second battery installation of this type, this one in my new Rail-Kleen track sweeper (**photo 8**). After I did the AHA truck conversion, I remembered that my drill set came with a flashlight. I never used this flashlight, which of course has a shoe for the same 18V battery, so I converted the flashlight into the battery shoe for the Rail-Kleen track sweeper (**photo 9**). I believe you can find one of these flashlights at big-box home centers for about $20 (batteries not included).

This conversion was even easier than the first. All I had to do was to connect the existing wires inside the flashlight to the track-sweeper motor, with a switch in between to turn the cleaner on and off. You can leave the LEDs in the flashlight disconnected, or remove them like I did.

In this case, the battery's weight also provides stability, as it helps counterbalance the weight of the cleaner mechanism that hangs off the front of the flatcar (**photo 10**). On the right side of **photo 11** you can see the handmade shoe installed on the truck bed. On the left is the flashlight, installed with double-sided foam tape on the flatcar.

The switch on the flashlight is used to control the sweeper's motor, which the battery powers. I mounted a secondary rocker switch next to the sweeper motor (**photo 12**) because the enclosure on the flatcar prevents reaching the flashlight switch (**photo 13**). Once turned on, the roller motor goes full blast, polishing the track, while a pusher engine determines its speed running on the track.

I understand that this solution is not for all battery conversions but, in these two cases, it works just fine. I like the convenience of being able to quickly clip the battery onto the truck or the cleaner and I like the fact that I'm ready to operate quickly. Of course, having two batteries that can be recharged in a half an hour gives me a virtually unlimited source of 18V electricity to help me keep my garden railway operational.

BEGINNER PROJECT

The single-ball signal on the author's railway. Highball signals such as this one were once common on early railroads, especially in the eastern part of the United States.

How to build a HIGHBALL SIGNAL

This early form of railroad signal is simple to construct

by Todd Haskins | Brewster, Massachusetts | PHOTOS BY THE AUTHOR AND ILLUSTRATIONS BY MARC HOROVITZ

On a recent trip to New Hampshire, my wife and I stopped off at the Conway Scenic Railroad. I walked around the grounds, snapping photos of the trains and supporting equipment. One antiquated piece of railroadiana they have restored is a double "highball" mast (**photo 1**). These were used as signals during the steam era. The red ball would be hoisted up the mast to tell the engineer that he could proceed, or lowered to tell him to slow or stop. I found the highball mast to be quite interesting and knew I had to build one for my railroad.

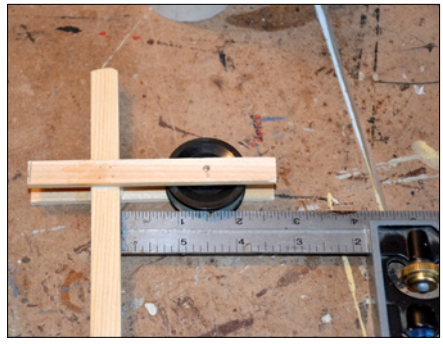
After some online research I discovered that these highball masts came in many different sizes and configurations, including double and single signals, and one where the ball was lowered into a barrel. I built a double-ball signal mast similar to the one at the Conway Scenic Railroad but, for this how-to article, I will show you how I built a barrel-type single-ball signal. As you will see, it is an easy design and can be altered in different ways to fit the needs of your railroad.

Materials

I started with a piece of wood that I cut on my table saw to ½" x ½" square and another at ⅛" x ½". These are not exact dimensions and you can use different

1. The full size, double-ball signal at the Conway Scenic Railroad in New Hampshire.

2. Pulleys made from plastic wheels—see figure 1.



3. Arms, with the pulley in place, are glued and tacked to the mast.

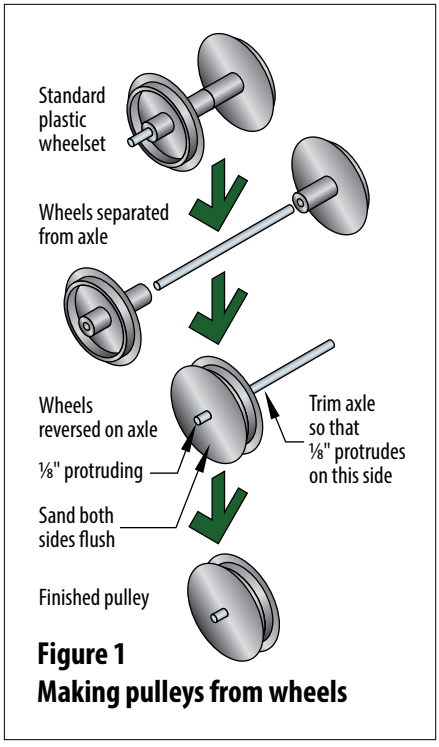


Figure 1
Making pulleys from wheels

4. The finished mast, with pulleys and additional bracing for the arms.

5. The barrel (a section of PVC pipe) marked for cutting.

6. The barrel with cutouts fits over the lower arm. The ball descends into the barrel.

sizes, but make sure that the pulleys are free to spin, which means a mast at least ½" thick. My double-ball mast needed to be thicker to more closely resemble the prototype, so I used a piece of wood that was ⅝" x ¾".

An essential piece of a high-ball mast is the ball. For this you can use a small fishing bobber, as I did. Bobbers can be found at various sporting goods stores and they come in different sizes and styles. Choose one that best fits your project but keep in mind that it needs to fit inside the barrel pipe. The bobber I used was 1¼" in diameter.

You will also need a length of chain about 24" long, which can be found at hobby or craft stores. You could also use string. I found a good source for great-looking string is the fishing shop. Anglers use a backing material on their reels to which the monofilament fishing line attaches. This line comes in green or black, is sold by the foot/yard, and comes in various thicknesses.

The barrel is a piece of 1½" PVC pipe, 3½" long. The bobber has to fit inside this pipe. Pulleys are difficult pieces to source, so I made my own from leftover plastic wheels from rolling stock that I had swapped to metal.

Construction

To start, take apart the plastic wheels. This is easier if you have a vise and a punch to tap out the metal axle. One axle will make one pulley. Once apart, take a plastic wheel and cut and file/sand flush the front and back faces of the pieces that hold the metal axle. Do the same to the other wheel, then place the wheels together with the flanges to the outside. Tap the axle back through the plastic wheels (**photo 2**, **figure 1**). Leave ⅛" of the axle sticking out on one side of the wheels. Measure ⅛" of the axle on the other side of the wheel and cut the excess off with a hacksaw.

I chose to use a ⅛"-thick piece of wood as the top and bottom mounts for the pulleys, so I made sure that ⅛" of the metal axle protruded from both sides of the new pulley. Spread the wheels apart just enough to squeeze a bit of E6000 glue (or similar) between them, then press them back together using clamps. Wipe off the excess glue and let it sit overnight to dry. Do the same for the other pulley.

Now we are on to the mast. You will need to decide where the signal will be placed on your railroad. I wanted this barrel-type highball mast to be movable for now, so I gave it a wide base for support. For this I used a piece of 2¼" x 4¼" Plexiglas, the barrel and mast being glued to it with E6000. You could also use styrene or wood for the base. My double-highball mast has a smaller base that I screwed into the benchtop in my main train yard. If you want to plant your signal mast in the ground, cut the mast longer to provide several inches that can be pushed into the soil to make it stable. My tallest engine is 9" so the signal needed to be seen above that. I chose to make the mast 14" tall.

The arms that hold the pulley are made from the ⅛" x ½" wood, cut to a length of 4". Stack four of these together

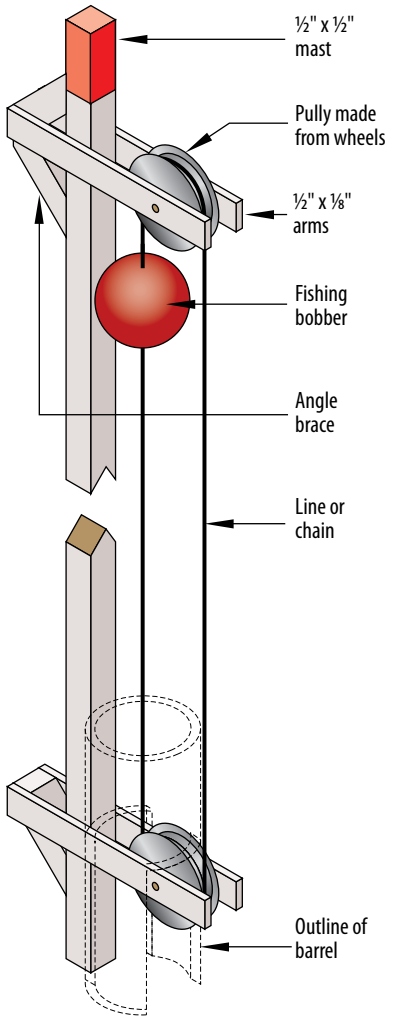


Figure 2—Assembly

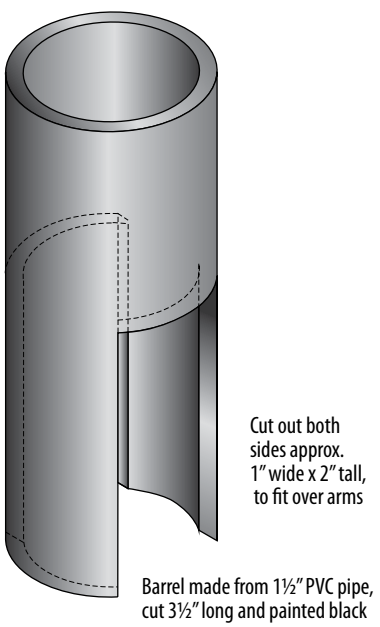


Figure 3—Barrel

7. The finished signal on the author's railway. Across the track is a double-ball signal.

for both arms and drill a ⅛" hole through them, 1" from one end and centered on the boards.

Take two of the pulley arms and place a pulley between them, inserting the axle ends into the drilled holes. From the top of the mast, measure down 2" and attach the pulley arms so that the centerline of the pulley is 1½" from the edge of the mast (**photo 3**), using wood glue and a few pin nails to hold it in place. The bottom pulley arms are glued and tacked in place 1" from the bottom of the mast.

Extra bracing is up to you. I used pieces cut from the ½" x ½" piece. These were cut at 45° angles and fitted inside the back of the pulley arms (**figure 2**). The bracing is not needed but it gives the mast assembly a bit of heft and I think it looks better (**photo 4**). If you want to make the bracing more extreme, simply cut your pulley arms longer on the back side so they project farther. The front side of the arms still needs to be at least 2½" long so that the signal ball can be raised and lowered.

The PVC barrel, which has been cut to 3½" long, will need to be notched and sanded so it will slip over the pulley arms at the bottom of the mast (**photos 5** and **6**, **figure 3**). The cut-out section on both sides of the pipe measures approximately 1"x 2".

Once the glue has dried, the mast can be stained or painted as you like. I painted my barrel black and the bobber red. The painted pieces also received a coat of clear matte varnish to protect the finish. When all the pieces are dry you can then glue the mast and barrel to the base, or the barrel to the mast if you choose not to have a base.

The benefit of using a fishing bobber for your signal is that it is designed to attach directly to fishing line using little hooks at the top and bottom. It was easy to attach the bobber to a chain link, thread the chain through the pulleys, then cut the chain to attach it to the bottom of the bobber. Make this as tight as possible. If necessary, you can remove or add a link or two. If you are using backing line, you will need to tie knots to attach the bobber.

Operation

What is really neat about this signal is that it can actually be used by your railroad. In the front of the barrel I drilled a small hole to receive a tiny nail that I glued in place. I can raise or lower the ball, then slip a link of the chain onto the nail to hold the ball in place. On my double-ball signal (**photo 7**), the stop nails were attached to the mast. If you use the backing line, you will have to make it tight so it does not slip over the pulleys.

In its era, the signal-ball mast was essential railroad equipment, used to keep trains safe. It is easy to build this interesting piece of railroadiana so why not make several where, even if you have a modern line, they could be viewed as a throwback novelty.

DON PARKER

10 creative ideas for garden railroads

1. This plunging waterfall is on the author's Hoot 'n' Holler Railroad in northern Ohio. It is "pondless," with an underground pump reservoir beneath the mill. PHOTOS BY THE AUTHOR EXCEPT WHERE NOTED

Most of us have a favorite item or scene on our railroads that was the product of insight or careful thought and planning—in other words, creativity. Part of the benefit of being in a club or informally sharing the hobby with other garden railroaders, or reading this magazine, is getting ideas from each other. One person's novel creativity may become another's solution to a persistent question or problem. In that spirit, I'd like to share some ideas I've put to use or seen used in garden railroads I've visited.

I've always enjoyed hands-on activities, whether in painting or model railroading, as opposed to visiting museums or running trains. Finding ideas, puzzling out how to make them work, plunging in and trying them out—these are the things that turn me on. Infrastructure maintenance? Weeding? Track work? I'd rather be in my shop tinkering or in the garden putting in a new plant.

Photo 1 shows a composite of several innovations I've come up with. The multi-level waterfall ends up in an underground reservoir to recirculate to the top (a "pondless" water feature). The upper bridge was left over from my former garden railroad and the river was planned to accommodate it, with flat, blocky rocks to support its ends. There was no bridge to carry the lower tracks, so that structure had to be built. At the same time, the water-powered mill needed a source of water at the right height to turn the wheel.

2. The waterwheel from the mill in photo 1 is built around a section of 4" plastic drain pipe. It's had only minor repairs in 20 years of service.

3. This telltale on the author's railroad alerts brakemen on top of railcars of an approaching low overhead clearance.

4. This partially burned hotel is on the author's former and current railroad. (Photo taken on the former railroad.)

5. John D'Aloia came up with this idea to make a weatherproof storage track for his trains.
PHOTO BY JOHN D'ALOIA

6. A floating planter allowed Dean Vande Berg to put a non-aquatic plant in the middle of his pond in Westminster, Colorado.

A friend built the sluice, which was designed to take water from the top of the lower waterfall, so the new bridge had to be high enough to allow the sluice to pass under it. That led to choosing a metal through-girder bridge, which I built of brass plate. The sluice fit snugly under the bridge and the mill was in business.

There was only enough room to place the little station in the photo on the lower track, but most of the passenger traffic was on the upper track. A two-level station platform solved that. A missing portion of a tie in the girder bridge is the location of a signal magnet, which can be raised by an air motor. In the raised position, it signals a train with an on-board controller to pass the station without stopping.

2 **Photo 2** is a closeup of the water wheel of the mill in **photo 1**. The wooden components of the wheel are glued to a section of 4" plastic drain pipe, which ensures that the wheel stays round and won't deteriorate and fall apart. This wheel has been in use for about 20 years, with only occasional repairs (notice several newer spokes).

3 **Photo 3** shows a telltale that warns brakemen on top of rail cars of an approaching low overhead clearance. This was built by a friend of mine who died a couple of years ago. Although it is a bit oversize for accurate scale, it has sentimental value that will ensure it stays where it is.

4 A burned-out building creates a scene with its own history (**photo 4**). The burned-out section was constructed as part of the whole project, carefully placing "burned" parts in a realistic fashion, showing how the roof collapsed on top of the burned rubble. Black spray paint was used to "char" the building.

5 John D'Aloia, a member of the Northeast Kansas Garden Railway Society, solved a need for out-of-the-weather train storage by running a spur under the porch

7. Cecily Allynn made a solid island in her pond to contain a vigorous escape-artist plant (creeping Jenny).

8. A little fantasy adds interest to this water feature on Curtis Jones and Judith Seaburn's railroad.

9. A ghost train haunts Chuck and Pat Ellsworth's garden railroad near Cincinnati, Ohio.

10. The Applied Imagination team built this innovative layout and train for the National Garden Railway Convention in Cincinnati in 2015.

Related reading

- **"Miniscaping—Pondless waterfall construction,"** *GR*, December 2009
- **"Building a metal through-girder bridge,"** *GR*, February 2012

on his house (**photo 5**). Quite a long train can be quickly sheltered this way.

6 Water features can stimulate creative ideas, as well. **Photo 6** shows an innovative way to add more plant variety to a pond. Dean Vande Berg utilized a floating system to show off an ornamental plant that is not a water plant. This is red-veined, or bloody, dock (*Rumex sanguineus*, Zones 5-8), which likes moist sites but must be kept above water level, since it is not a water plant.

7 **Photo 7** shows a situation similar to **photo 6**, but this is an anchored island in a pond adjacent to the Willo-Wood Railroad built by Cecily Allynn near Cincinnati, Ohio. The plant is golden creeping Jenny (*Lysimachia nummularia* 'Aurea', Zones 3-8), often considered aggressive, even invasive, but here contained on an "Alcatraz" island.

8 Whimsy can add interest to a water feature. In **photo 8**, a creative vignette incorporates a mom and baby elephant crossing a stone bridge in a setting out of a fantasy world. Curtis Jones and Judith Seaburn came up with this one for their John Galt Line in Niwot, Colorado.

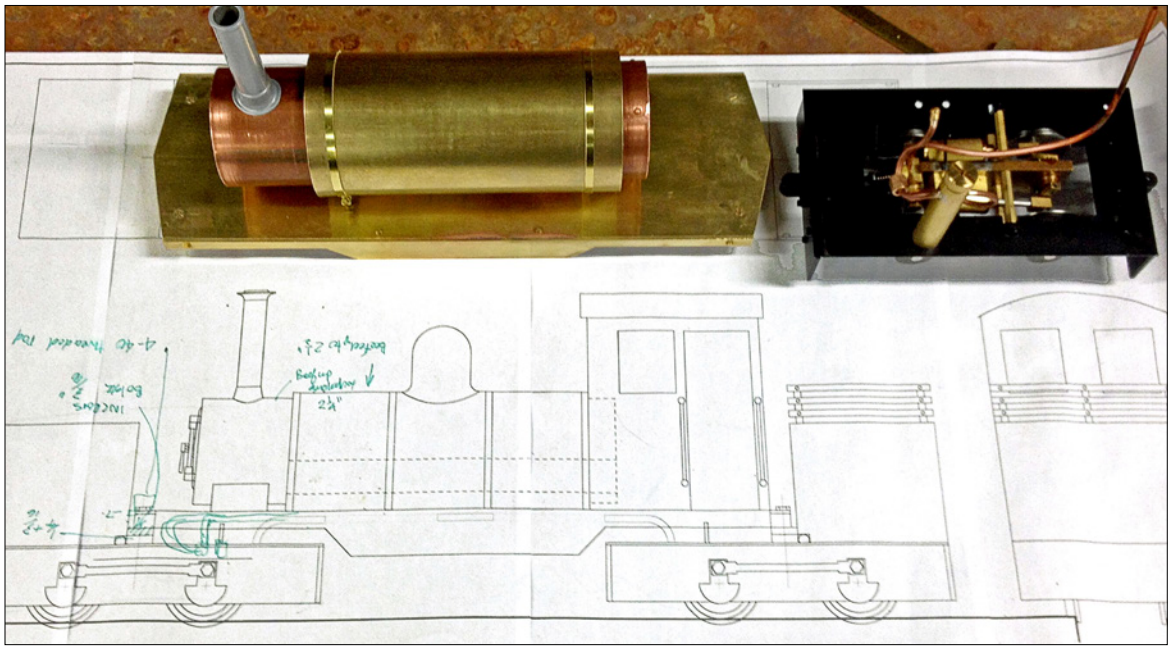
9 Back on dry land, **photo 9** shows a spectral ghost train on Chuck and Pat Ellsworth's garden railroad with a Halloween theme. This type of fantasy doesn't have to be seasonal, as everyone on the tour seemed fascinated by the Ellsworths' creativity.

10 The ultimate creativity is found in the innovations of the Applied Imagination team. The locomotive in **photo 10** appears to have a boiler made from a cucumber—and most likely it does, since Paul Busse's team uses only natural materials in their creations.

If you have a unique idea that you have used to create something special in your railroad's landscape, I'd like to hear about it. You can contact me through the form on the magazine's website (under "Our magazine").

RAISING STEAM

The group-build project



The first draft of the locomotive-design drawing, as well as the frame and boiler mockup, as seen at the design-review session.
PHOTO BY THE AUTHOR

Suppose you would like to have a live-steam locomotive that is a little out of the ordinary. Perhaps you don't have all the skills or time necessary to build it yourself. Maybe a number of your friends are also interested in building a similar engine. If so, you might consider a group-build project. That is exactly what five of my fellow live steamers and I decided to do recently.

A few months back, the five of us were sitting around at a steamup, discussing possible locomotive projects. The idea to build a freelance Garratt locomotive came up and various options were tossed about. Our collective skills, the overall cost, and available time were important considerations. After some time, we landed on the concept of using two Accucraft *Dora* 0-4-0 locomotives as the basis for a Garratt. The *Dora* engines are relatively inexpensive and would give us the necessary working cylinders and wheels ready to use, as none of us really wanted to tackle producing those parts in quantity.

First, we made a bulk purchase of 12 *Dora*s through our dealer, which meant that we got an attractive price on the donor locomotives. One of our members had named variations he had built for *Dora* locomotives after birds. It was only fitting, then, that we called the *Dora* Garratt locomotive project *Toucan*, providing further proof that we should never take our hobby too seriously.

I volunteered to write up a specification sheet that reflected everyone's design input, and this was reviewed by the group. The sheet also laid out what we would build or buy as a group for the common locomotive components, and what would be left up to the individual owner to finish. One of the key points of our group-build project was that, even though all six engines had the same boiler and frame-assembly design, they would be finished to each builder's own preference, resulting in six different engines. Also, instead of gas firing, one builder decided to opt for an alcohol-fired locomotive, requiring a slightly modified boiler.

With the agreed-on specifications complete and the *Dora* selected as the power-chassis source, my next job was to provide a scale outline drawing of the proposed locomotive. New boilers would be required, and one member of our group who is skilled with the soldering torch agreed to build them. Even though the scope of the group build was a functioning "bare bones" locomotive, I drew up a version of a completed engine so that we could visualize what might be possible. With the first iteration of the drawing distributed to our group, our boiler maker put together a mockup of the boiler design.

At our next gathering, we reviewed the drawing and mockup of the boiler and frame. After some discussion, we decided on a larger boiler and some changes to the frame design. The group was now in agreement on the design, and the various component drawings were produced using a computer drawing package, then shared with the group. We realized that the main frame components, if built in brass, would require a lot of time-consuming hand sawing and filing of the pieces (something that none of really wanted to tackle), so we decided to use a commercial water-jet cutting service to cut the parts. The computer files to do the cutting were easily generated from the component drawings. In fact, we lucked out, as a fellow railway modeler was able to get our water-jet cutting done at his place of work at minimal expense, so assembly work could begin.

Stay tuned, as a I will bring you further updates on this project and the resulting models in a future column.

EVENTS

10 September, 2017: Columbus Garden Railway Society Annual Home Tour, Columbus, OH • Info: *www.thecgrs.org*

13-15 October, 2017: 1st Annual Gathering of North American 16mm Modellers • Columbus OH • Info & registration: *www.northamerican 16mmmodellers.org*

14-21 January, 2018: Diamondhead International Small Scale Steamup • Pat Darby, *K5pat@bellsouth.net*, 985-867-8695 • Terry Smelser, *onyx1955@aol.com*, 985-373-7593 • *www.Diamondhead.org*

30-31 March, 2018: East Coast Large Scale Train Show • York PA • Info: 410-349-4290 • *www.eclstc.com*

5-9 June, 2018: 34th National Garden Railway Convention • Atlanta GA • Info: *www.ggrs.info/Georgia_Garden_Railway_Society/NGRC_2018.html*

11-15 July, 2018: National Summer Steamup • Lions Gate Hotel, McClellan CA (Sacramento) • Info: *www.steam-events.org*

Future Garden Railway Conventions

2019: Portland, OR • 4-8 September • *https://2019ngrc.wildapricot.org*

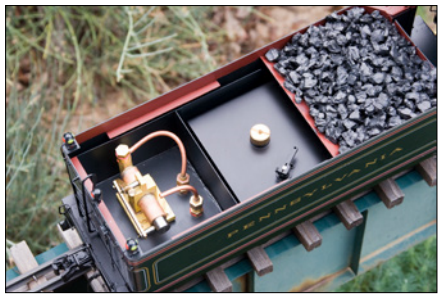
Event notices are published at no charge. We will accept, at our discretion, listings that pertain to predominantly garden-railway or small-scale-live-steam events. Listings that reach us before our deadline and fit the space available will be published. Send your listings to *Garden Railways*, PO Box 460222, Denver CO 80246, or e-mail them to *mhorovitz@gardenrailways.com*

ONLINE STATION

VANCE BASS

Since this column is about computers, and since our hobby is a product of the industrial revolution (the Steam Age), I'll start off with the perfect combination of the two: the steam-powered computer. In the early 19th century, mathematicians and engineers relied on books full of calculation tables to manipulate large numbers quickly. The calculation tables were prone to error and often full of wrong results. A mathematician named Charles Babbage, a fan of the blossoming Steam Age, became so frustrated with faulty tables that he invented the future by declaring, "I wish to God these calculations had been executed by steam!" He soon set about making it so by inventing the first mechanical computer, the "Difference Engine." Because of its size and complexity, the Difference Engine was only fully completed in 1991, with gears traditionally machined of brass and steel. More recently, a simplified version was built using laser-cut steel and machine-printed nylon gears, and powered by steam. Babbage's machine was also programmable, which eventually led to the desktop computer. It's fascinating to watch this mechanical marvel and to consider that our home computers are the evolutionary descendents of Babbage's genius: *youtu.be/t8aYkow-Fv8*

On the topic of amazing tools, I watched Larry Herget (founder of Ozark Miniatures) create a railroad coach body one afternoon, using silicone caulk to make molds of plastic master patterns, then casting epoxy parts in the molds. That ingenious and cheap technique impressed me, and I was reminded of it again when I saw this video showing how to make a ring from JB Weld epoxy. The video shows how to create a simple silicone mold and cast epoxy in it. You won't get complex, commercial-grade castings from this, but you'll learn the basics of mold-making and casting at a bargain price. From there, you can experiment with more complicated objects, two-part molds, etc. This has enormous potential for figures, detail parts, and more: *youtu.be/nHse9GSCcao*. Now you have the tools to cast your own epoxy gears and build a steam-driven difference engine!



Elegance in steam

High-drivered 4-4-2 locomotives are among the most elegant ever produced, and the Pennsylvania Railroad's E-6 Atlantics, with their low-profile tenders, are near the top of the list. Accucraft's model represents a class of 83 locomotives that were built between 1914 and 1920. These high-speed engines were used in passenger service, primarily between Washington DC and New York City. They lasted until the end of steam on the Pennsy.

VITAL STATISTICS

1:32 scale, gauge 1, live-steam 4-4-2
Accucraft
33268 Central Ave
Union City CA 94587
Price: $3,700
Website: *www.accucraft.com*

1:32 scale, gauge-1 model of a Pennsylvania E-6 Atlantic; locomotive-type boiler with five flues; superheater; 60 psi blowoff pressure; alcohol fired; hand pump in tender; axle pump on rear driven axle; bypass system; water glass; pressure gauge; blower; twin safety valves; displacement lubricator; cylinder drain cocks; two double-acting cylinders; D-valves disguised as piston valves; Walschaerts valve gear controlled from the cab; hinged cab roof; minimum radius, 10'. Dimensions (loco and tender): length, 25⅞"; width, 3¾"; height, 5¾". In 1:32 scale this works out to 69'0" x 10'0" x 15'4", respectively

Our review model is painted in Pennsylvania's Brunswick green and oxide red, with a graphite smokebox. The engine is fully lined out and is a thing of beauty. Paint and graphics are excellent. The review sample is alcohol fired (Accucraft also offers a gas-fired version). A large fuel tank sits in mid tender, behind the coal load. It is covered by the top deck of the tender, which must be lifted off for access. In addition to the filler plug on the tank, there is an on/off valve that releases the fuel to a small sump below the floor. This is the traditional chicken-feed alcohol system. Behind the fuel tank is a relatively small water space containing a hand pump. This pump can be accessed by lifting just the water hatch in the tender deck. A separate pump handle is supplied, which is used to engage the pump when more water is required.

A second pump is actuated by an eccentric on the rear driven axle. This is tied in with a bypass system, controlled by a valve below the cab on the engineer's side. The valve can be closed to fill the boiler while the engine is in motion or opened to return the water to the tender, as the pump works all the time the engine is running. With practice, the valve can be partially closed to maintain a constant water level in the boiler as the engine runs. With this system, the engine can be kept in steam indefinitely, stopping only briefly to take on fuel and water.

PROS and CONS

PROS: High fidelity to prototype; high level of detail; excellent paint and graphics; sophisticated engine; authentic working valve gear; locomotive-type boiler; cylinder drains; excellent running characteristics; can be kept in steam indefinitely

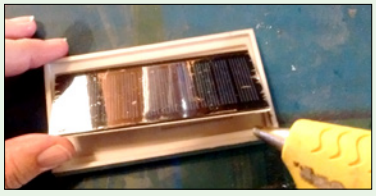
CONS: No blowdown; feedwater line fouls fire door, which cannot open fully; small gap in cab roof on the non-hinge side

The engine has a locomotive-type boiler with five flues, including a superheater flue. It has a dry firebox with wet side legs and a three-wick burner that is lit through the fire door in the backhead. Wick material appears to be a type of ceramic fiber. A wire handle is attached to the fire door for opening and closing. The feedwater line fouls the door, preventing it from being fully opened. This is not a huge deal, as an igniter can still be inserted through the opening. It would just be a little easier if the door could open fully.

The cab can be accessed via the roof, the middle portion of which is hinged and flips out of the way. On the backhead is a pressure gauge that shows through a side window in the cab. If you prefer your gauges to prototypically face the rear, I'm afraid you're out of luck. The cab is crowded and there's no room to easily turn the gauge, which would be difficult to see if it faced the rear anyway. There's a

Online extras

High-tech series



Registered users can access our series, "High-tech modeling for garden railroaders." Part 10 finishes building a railroad signal. **Visit *www.GardenRailways.com/hightech***

Video 101

Everyone can watch a video on using movie-editing software. **Type "John Cushman" into the search box.**

Related reading

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water glass on the fireman's side. Side-by-side throttle and blower valves have long extensions that make them reachable without lifting the cab roof. Twin safeties atop the boiler are set to blow at 60 psi.

The engine is powered by two double-acting cylinders. These are controlled by D-valves disguised as piston valves (which the prototype had). Walschaerts valve gear, controlled from the cab, operates the valves. Both cylinders are equipped with drain cocks. These are not the rotating kind, but slide forward and back to open and close. The engine has no springing or equalization.

To prepare the engine for operation, I first oiled it all around, placing a tiny drop of good-quality machine oil on the junctions between all the moving parts, including tender axles. Then the engine and tender were joined. There is one hose with a screw fitting; this is the feedwater line, which is under pressure. A silicone tube is used for the water-return line on the opposite side of the engine, and a third hose supplies fuel from the tender's sump to the engine's burner. The return and fuel lines were a little long, so I trimmed them for a better fit. I drained the displacement lubricator, located under the left running board, of water and refilled it with steam oil. There is no filler plug on the boiler for adding water, and the safety valves are not easily accessed, so the tender's hand pump had to be used for this. I filled the tender's water reservoir and pumped in about half a glass of water, intending to use the axle pump to bring the level up a little more when the engine was in motion.

When all was in readiness, I placed a suction fan in the smoke stack to draw the fire through the boiler while pressure was being raised, making sure the blower and throttle valves were closed. I opened the valve on the alcohol tank and, once the wicks were saturated, lit the fire through the fire door. I prefer to use a wire with a bit of wick material at the end, soaked in alcohol and lit, as an igniter. A gas barbecue lighter could also be used.

Once the pressure came up to around 20 psi, I opened the blower and removed the fan. It is at this point that the engine becomes self sufficient. Pressure came up fairly quickly. When 40 psi was reached, I opened the drain cocks, put the engine into forward gear, and opened the throttle. With the drain cocks open, there was little sputtering or hesitating. The cylinders cleared quickly, I stopped the engine briefly to close the drain cocks, and it was off and running.

This engine is a pleasure to run. The throttle is a little touchy, but I was running it light. Adding a train of coaches would have tamed it some. With those big drivers, it likes to run fast. Even so, I was able to throttle it down to a reasonable speed, after which it made lap after lap on my line. I discovered that, on this review engine, the axle pump did not work, so I had to rely on the hand pump in the tender to keep the water level topped up. With the occasional stop for a refill of fuel and water, I could have kept the engine running for hours. It is smooth and graceful in both directions. You need good track, though, as well as wide-radius curves. Since the engine is unsprung, it is pretty rigid, and will derail fairly easily on raggedy track. However, on smooth track, it glides along.

The throttle and blower valve are readily at hand, as is the reversing lever (with the cab roof open). Because the cab is pretty crowded, there's not much room for R/C gear, if you're so inclined. I'm not saying radio control would be impossible, but it would be difficult.

This is a fine engine. It is sophisticated and fairly complex, and I wouldn't recommend it for beginners, unless you have someone with experience to bring you up to speed. It's important to understand how the engine functions so that, if there is a problem, you'll know where to look for a solution. The bottom line, though is that it's a great-looking engine and a beautiful runner. **—M. Horovitz**

Fifties magic

Many of us were children during the golden age of streamliners in this country, and few things were as stirring to the soul as the sight of a 15-car passenger train, headed by a set of matching diesels in full cry. The vision of all of those perfectly matched cars, uniformly painted in your favorite railroad's often-colorful livery, was a sight to behold. USA Trains' aluminum passenger-car sets provide the potential for recreating this spectacle in your garden.

Five different body styles are offered to be prototypically correct for various railroads (more on that below). These include (A) corrugated roof and sides; (B) smooth roof and sides; (C) smooth roof, corrugated sides; (D) corrugated roof, smooth sides; and (E) corrugated roof and sides with smooth letterboards. Road names and paint schemes include Santa Fe (silver, body style C); California Zephyr (silver, body style A); Pennsylvania RR Broadway Ltd. (Tuscan and black, body style B); Pennsylvania RR Congressional Ltd. (silver, body style E); New York Central 20th Century Ltd. (gray and black, body style B); Union Pacific City of Los Angeles (yellow and gray, body style B); Northern Pacific North Coast Ltd. (green, body style D); and Southern Pacific Daylight (red, orange, and black, body style C).

In each of the above road names, the following rolling stock is available: observation, coach (2), diner, sleeper (2), Vista Dome (where appropriate—2), baggage car, and combine. The cars can be purchased separately or in sets of (usually) 10 cars. The variety of cars available for each road name is predicated on the actual prototype consists. Trains like the California Zephyr and the Northern Pacific ran more Vista Domes, so there are four different versions (car name or road number) available for those trains. Also, the Congressional Ltd. has a proper square-end observation car.

Sent for review were a Santa Fe Vista Dome and observation car. These are all-silver cars with type-C bodies. Individually, each car is impressive, being full-length models of 80' passenger cars. Consequently, they require wide-radius curves. The manufacturer claims 4' for the minimum radius, and no doubt the cars will negotiate a curve as tight as that, but they'll look far better going around curves of at least 10' radius.

Each car has an extruded-aluminum body and it rides on sprung, diecast-metal trucks. The detail level is exceptional. Wheels are all metal and are quite shiny. To my eye, they'd look better toned down a little. Power for lighting is picked up via sprung brushes that contact the backs of the wheels on one truck. Each car weighs close to 10 pounds and is free rolling.

Complete underbody detail is supplied

PROS and CONS

PROS: Accurate body types for a variety of different roads; high level of detail; robust construction; full, lighted interiors with figures; sprung trucks; accurate representation of prototypes; complete underbody detail; on/off switch for lights

CONS: Some details a little fragile; diaphragms do not compress; wheels shiny silver

VITAL STATISTICS

1:29 scale, gauge-1 passenger cars
USA Trains
PO Box 100
Malden MA 02148
Prices: All cars are $479.95 ea. except Vista Dome and observation, which are $499.95 ea.
Website: *www.usatrains.com*

Mostly metal passenger cars; extruded aluminum body; five different body styles; sprung, diecast-metal trucks with metal wheels; LED interior lighting; opening doors and fold-down steps; full underframe detail; full interiors with painted figures; working knuckle couplers; rubber end diaphragms; separately applied details; lighted drumhead and markers on observation car. Dimensions: length, 33"; width, 4¼"; height (not including dome car), 5⅞". In 1:29 scale, this works out to 79'9" x 10' x 14'2", respectively

on each car. There is also an on/off switch for the interior LED lights. On the observation car is a three-way switch so that you can turn on all lights, no lights, or just the drumhead and end lights. The observation car also has directional lighting on the rear center light—white in reverse and red when traveling forward.

There are soft rubber diaphragms on the cars. These do not compress. However, the coupler position is such that the diaphragms don't actually touch. Consequently, the spacing between the cars is somewhat more than prototypical.

All cars have complete interiors, including painted figures. These are particularly visible in the dome car. The cars are not heavily populated but there are enough people inside that you notice. Also, many of the gentlemen are wearing suits and ties, appropriate to the era. Additional figure sets are available from USA Trains. The dome car includes soft plastic, add-on roof antennae, which the purchaser must install. These easily slip into holes, though they could be glued in place.

All doors are openable and are all spring loaded. Vestibules also have fold-down steps, as per the prototypes. When the steps are in the "down" position, a floor trap folds up to keep the door open. I don't recall having seen a feature like this on model passenger cars before, and I like it. Fold-down steps give an added dimension to trains standing in stations, while passengers on the platform mill about or wait to board.

Overall, these cars look terrific. Their construction, finish, and long list of additional features represent the pinnacle of modern day, large scale, rolling-stock production. A train of them would be an impressive sight on any railway with a track that could properly accommodate it. **—M. Horovitz**

Online extras

For subscribers: Read reviews of other USA Trains products. Visit *www.GardenRailways.com* and click on "Product reviews" under "News & products."

Narrow-gauge hopper kit

Brandbright Ltd. of Great Britain is an old, established garden-railway-supply company that is now under new ownership. The new owner intends to maintain the high standard for craftsmanship set by the founding owner and, if this kit is any indication, he is certainly doing so. The model is of a four-wheel open hopper wagon that was proposed for the Campbeltown & Macrihanish Light Railway in Britain but never built, as the railway closed instead.

The kit contains several sheets of laser-cut wooden parts, both in plywood and what appears to be basswood. A hardware package is also included, which contains white-metal axle guards, brass bearings, various pins for rivet detail, and a brass rod. Wheels and couplers are not included in the standard kit but are available separately from Brandbright. The builder will have to supply glue (PVA and epoxy), tools, and sandpaper.

Six pages of instructions are supplied. These contain both text and excellent drawings. Instructions begin with general comments concerning the kit and what the builder must supply and watch out for during construction. This is followed by a labeled, exploded drawing of the car with a parts list. Following that are the assembly instructions. I found these to be well written, generally logical, and easy to understand. This is not an easy kit, however, and I'd not recommend it to those with no model-building experience. However, if you've assembled laser-cut wooden kits before, this one should hold no particular terror.

Most of the difficulties with this kit have to do with the odd angles formed by the hopper panels as they join the square sides. The instructions offer several

VITAL STATISTICS

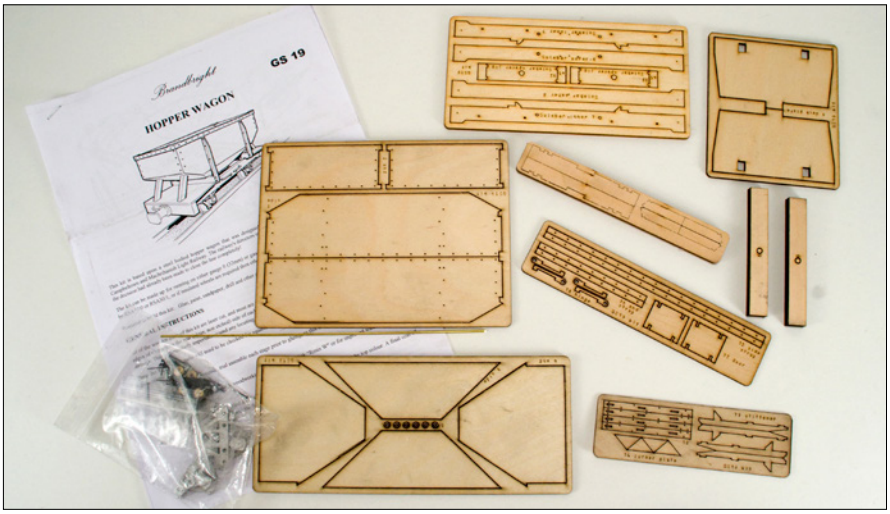
1:19 scale, gauge 0 or 1, hopper-wagon kit
Brandbright Ltd.
Unit 3, Holland Business Park
Holland Way
Blandford Forum, Dorset DT11 7TA
United Kingdom
Price £27.50 ea; £97.50/four (less wheels and couplers)
Website: *www.brandbright.co.uk*

Laser-cut wooden kit (#GS19) for a British narrow gauge, four-wheel hopper car (wagon); white-metal and other hardware supplied; instruction sheets; can be built for ga. 0 or ga. 1 track; wheels and couplers available separately; requires painting

PROS and CONS

PROS: Complete kit; relatively straightforward construction; crisp, cleanly cut wooden parts; opening hopper doors; nice-looking finished product

CONS: Some minor cleanup required where the laser didn't quite make it all the way through; instructions could have been more complete/clearer; wheels wouldn't rotate without modification



excellent suggestions on how to achieve smooth joints, which are essential to the looks of the car, as you're modeling a piece of metal rolling stock in wood.

The parts on the laser-cut sheets are held in surrounding wooden frames, or frets, by tiny tabs and will need to be cut out of them. This is easily done with an X-acto knife. The remains of the tabs will then need to be smoothed with a file or sandpaper. I found, in a few instances, that the laser cutter didn't quite penetrate the entire depth of the wooden sheet. In those instances, the edges had to be cleaned up a little—no big deal. Part names and numbers are etched into each part or the nearby fret—nice!

Assembly begins with filing or sanding angles onto the edges of a number of pieces. Guides are etched in to the parts to aid in this. Once this was done, actual assembly could begin. I immediately ran aground in this. It is important that the angled pieces be assembled properly, with the angle facing the correct way. Nothing in the instructions actually says this and it's not immediately clear in the drawings. Consequently, I assembled the parts intuitively, which turned out to be wrong, necessitating the disassembly and cleaning of all the parts I'd assembled before they could be reglued.

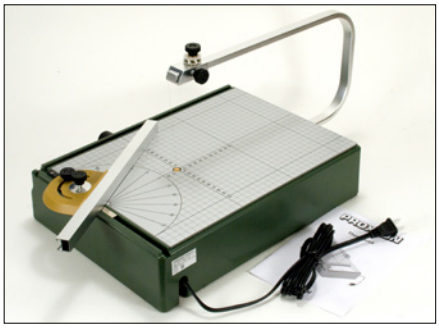
The components usually fit together well, but a fair amount of trimming and sanding was required in various parts of the kit. This was generally covered in the instructions. You are replicating a metal vehicle, and I found it almost impossible to do this convincingly without resorting to a filler material to cover and/or disguise joints, as well as sanding the surfaces to eliminate the wood grain.

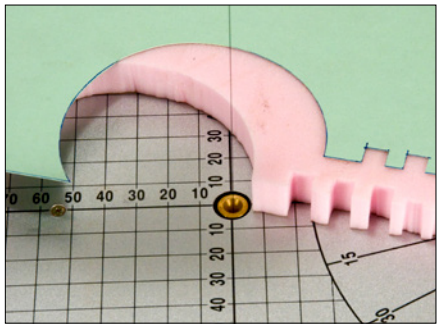
Rivets are represented by tiny, blackened straight pins. These must be trimmed to length, then inserted individually into laser-drilled holes in the wooden parts. This is not particularly difficult but it is tedious. The pins have a tendency to get away from you. This is mentioned in the instructions and precautionary measures are offered. Despite this, I still ended up losing a few and didn't have enough to complete the project as intended. It would have been nice to have had a few more spares.

The white-metal axle guard castings were quite clean and sharp, requiring only minor cleanup with an X-acto knife. However, the holes had to be drilled out to accept the supplied axle bearings. As mentioned above, wheels and couplers are not supplied with this kit. However, the company kindly supplied both wheels (#RSA139/1, uninsulated steel wheels) and center-buffer couplers (#RSA45, blackened aluminum, unsprung) so that I could finish the kit. When installing the wheels, I found that the axle guards (axle boxes) were too close together and the wheels wouldn't rotate. In assembling the kit, the solebars (beams to which the axle guards are affixed) are spaced according to a jig provided in the kit, so that spacing is predetermined. To get everything to work properly, I had to remove .015" from the face of each of the wheel bearings to provide clearance.

Having completed this kit, I'd say that the instructions could have benefitted by more assembly illustrations and text that better covered each step. The difficult parts were pretty well covered but some areas were glossed over a bit, making assembly somewhat less straightforward.

This is a difficult kit and one that I would not recommend to those with no experience in building kits of this type. However, for those who have experience and the willingness to carefully read and understand the instructions and put in the time required, the end result is an interesting, unusual, well detailed, and accurate piece of narrow-gauge rolling stock. **—M. Horovitz**





Precision foam cutter

Proxxon, the German manufacturer of high-quality miniature tools for hobbyists, has a hot-wire machine for cutting expanded polystyrene (and similar) foam. If you work with foam but have never used a hot-wire cutter before, you're in for a treat. The idea is this: you take a length of nichrome wire and stretch it on a frame. Then you run some current through it to heat it up. When it's hot enough, it will cut through expanded-styrene foam like butter, leaving a clean edge, sharp corners, and any shape you like. The foam shapes can then be used in model building or as forms for cement (or other) castings.

Proxxon's machine differs in some significant ways from other foam cutters I've seen. It is a benchtop model and, as such, has some size limitations. The effective thickness of foam that can be cut is around 5½". The throat depth is 14". Given that, the machine is too small for massive sheets or blocks of foam. However, within these size limitations, it is stellar.

The cutter is supplied broken down in a box, with a complete user's manual. Some simple assembly is required, thoroughly covered in the manual. The overarm must be put in place and the wire, which comes on a spool attached to the overarm, must be stretched, inserted into a hole in the base, and clamped into place. Be careful here, as the wire is springy and wants to unwind itself from the spool. Tension on the wire can be set by how much you spring the overarm when attaching the wire to the base. Once the cutting wire is in place and an electrical wire from the transformer is attached to the overarm under the base, the unit is pretty much ready to go.

An on/off switch supplies current to the wire. A knob next to it adjusts the heat of the wire. If the wire is too hot for the foam you are cutting, it tends to cut unevenly. If it is too cool, cutting will be very slow or not at all. A chart on the side of the machine gives you a rough guide to the temperature setting based on the thickness (in millimeters) of your foam.

The cutting wire is the thinnest I've ever seen—just under .008." It can be set vertical to the base or at an angle. The latter is accomplished by sliding the wire-spool assembly back on the overarm until the desired angle is achieved.

Printed on the table of the machine is a grid of 1cm squares and also a protractor at the front edge. Both of these can be useful in setting up auxiliary guides or just in freehand cutting. Also supplied is an angle gauge that slides in tracks, either on the front edge of the machine or on the left side. This guide can be set to any angle and it can also be locked to the base of the cutter. A 12½" aluminum fence is part of this guide. This slides in the guide and cannot be locked in place.

This is a fun machine to use. I tested the cutter with two types of foam—pink insulation foam and white polystyrene bead foam. With the wire set at precisely 90° (simple to do), I was easily able to cut thin slabs of foam of uniform thickness off a 5"-high block. You can adjust the temperature setting even as you are cutting—the response is instantaneous.

With the Thermocut's ultra-thin wire and excellent guide system, exceedingly precise work is possible. I had no difficulty in cutting as many pieces as I wanted of 1/16" x 1/16" foam "stripwood." If you are building foam structures, any amount of highly ornamental work can be done by laminating different precisely cut foam layers to form a three-dimensional whole.

One thing I like is to use paper templates to make more precise or repetitive shapes. If you use a piece of light cardstock, like a file folder, you can cut out a pattern or shape on it with an X-acto knife. Tape the template to your piece of foam, then use the wire to follow the edge of the template. The wire will not burn the paper and surprisingly detailed shapes can be achieved this way. Also, if you are using the foam as a mold into which you are casting cement, this is a great way to provide additional detail to the mold.

Proxxon's Thermocut hot-wire cutter is a robust and versatile machine. It is well thought out and designed and, within its physical parameters, is a tool that is limited only by the user's imagination. Highly recommended. **—M. Horovitz**

PROS and CONS

PROS: Extremely thin cutting wire; excellent guide system included; adjustable wire temperature for variable thicknesses and types of foam; wire can be angled for compound cuts; easy to use; easy precision cutting

CONS: Numbers on temperature-control knob a little difficult to read

VITAL STATISTICS

Hot-wire cutter
Proxxon
2555 Tate Blvd. SE
Hickory NC 28601
Price: $109.80
Website: *www.proxxon.com*

Hot-wire foam cutter (Thermocut 115/E); 115V; adjustable wire tension; adjustable wire angle; built-in protractor; built-in angle gauge with fence; adjustable wire temperature; on/off switch; user's manual. Dimensions: Base depth, 15¾"; overall depth, 20½"; base width, 11¾"; base height, 3¾"; overarm height above table, 5½"; throat depth from wire, 14"; wire diameter, .2mm (.0078")

Directory of large-scale train retailers

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BEGINNER PROJECT

Make exact rail cuts every time

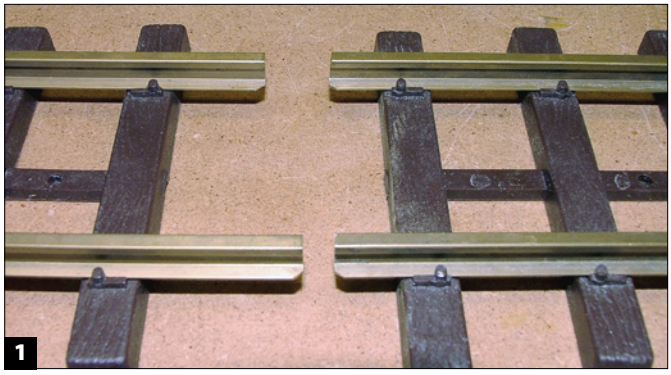
by Tom Gaps | Milwaukie, Oregon | PHOTOS BY THE AUTHOR

When I marked a rail for cutting, the cut did not always come out exactly where I wanted it (**photo 1**) because either the line I drew was not exact enough or I did not get a 90° cut with the Dremel. My solution was to use Hillmans Rail Clamps (or another brand) as guides.

I slip a Hillmans clamp onto the rail to be cut, sliding it down, away from the cut location. I then clamp the ends of the opposite rails together, with the section of rail to be cut off extending over the top of the target rail (**photo 2**). I then slide the Hillmans clamp into a position where it just touches the target rail, then clamp it in place (**photo 3**). The edge of the clamp becomes my marker for cutting.

I remove the other clamp and use a Dremel with a cutoff disc to cut the long rail right along the face of the marker clamp (**photo 4**). The face of the Hillmans clamp gives me the exact location to cut and it provides a square face that ensures a 90° cut (**photo 5**). Before removing the clamp, I use the Dremel to polish the face of the rail to match the face of the clamp. Hillmans clamps can be a little hard to slide onto the end of the rail, so I bevel the corners of the base of the rail (**photo 6**), making it easier to slide the clamp into its final location (**photo 7**). The result is rails that fit together perfectly, with no unwanted spaces between.

Have you done a garden-railway-related project that can be described in a single page? Send us 300-600 words with up to three photos and/or illustrations. E-mail *mhorovitz@gardenrailways.com* with "One-page project" in the subject line.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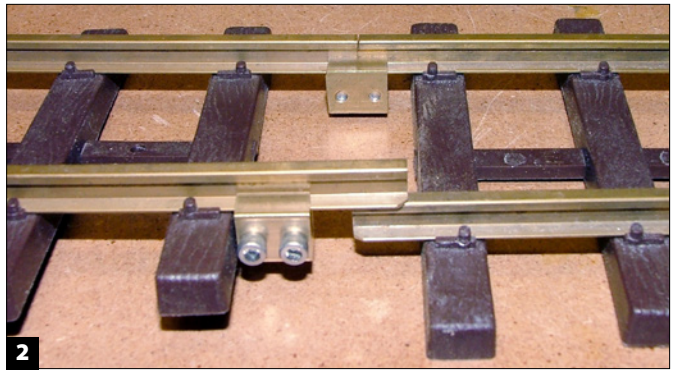
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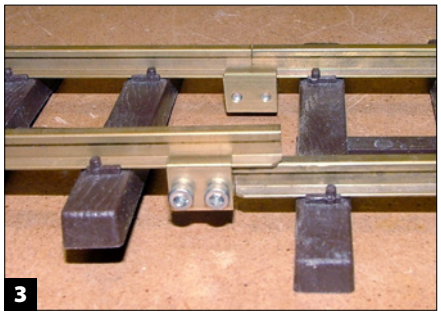
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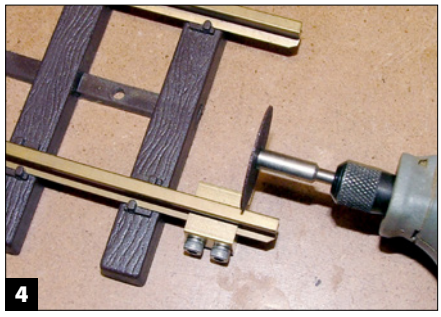
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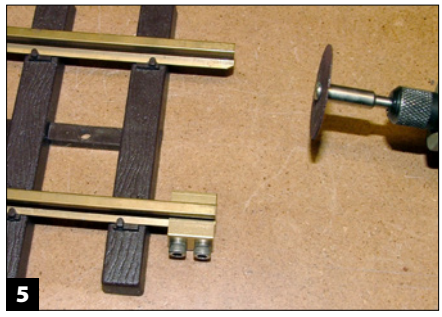
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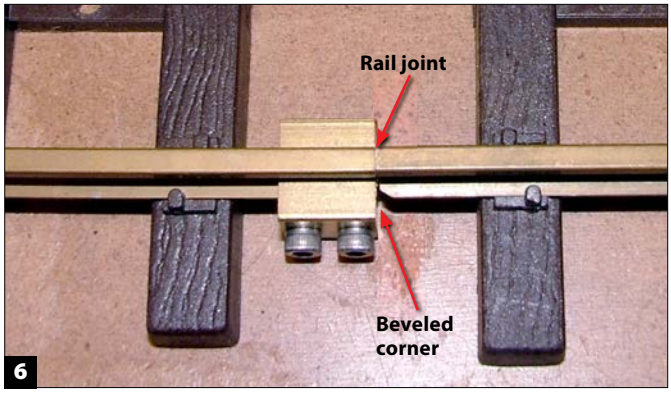

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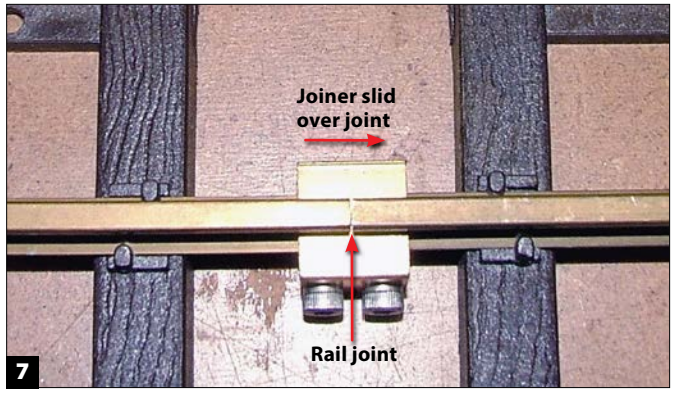

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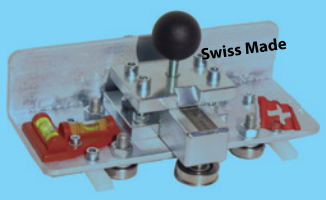

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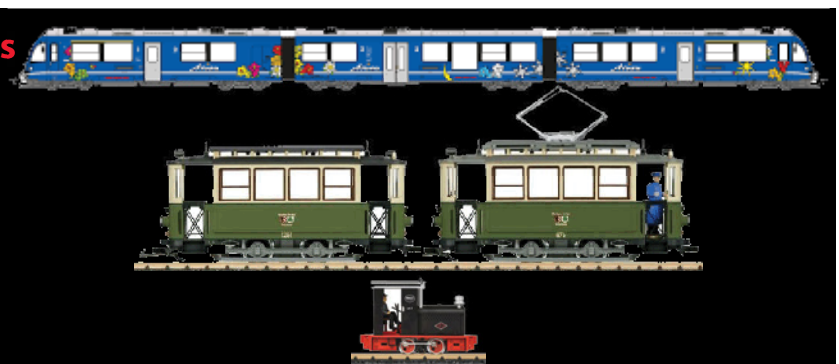

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