



No. 146, July/August 2016

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**STEAM<sup>IN</sup>THE GARDEN**

# Steam-powered **WINDUP**

Joe Rothwell modifies a Marx 'Commodore Vanderbilt,' adding steam pistons, burner and boiler



- **Portlandia: Staver Locomotive's spring steamup**
- **Adding two wheels and a bunker to 'Dora,' Part II**
- **Rob Lenicheck's Accucraft C-16 coal conversion, Part II**
- **Bill Allen builds an Algerian streamlined Garratt, Part III**

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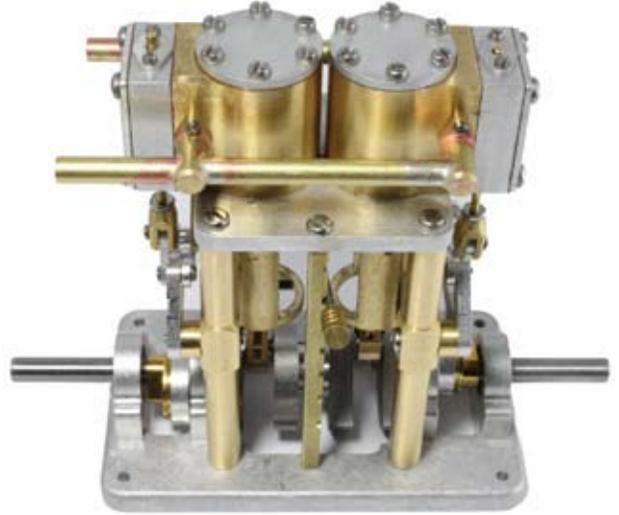
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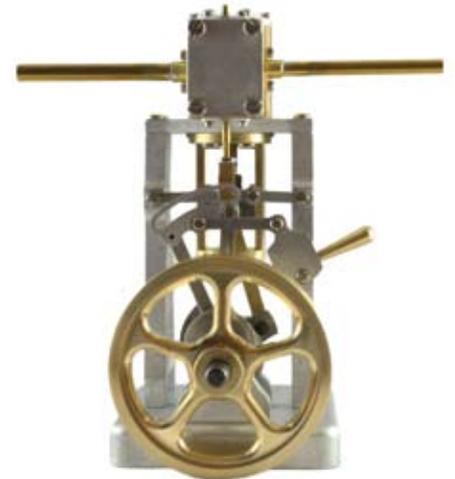
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## Australia NSWGR C38

A 1:32-scale, butane-fired 12-wheeler

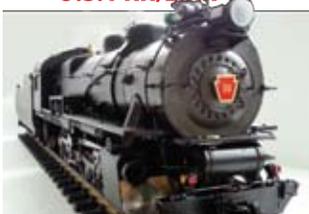
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The Australia New South Wales Government Railways C38 was designed in 1938 to haul express trains and to eliminate the need for double-heading. Built between 1943 and 1949, C38s were the only locomotive in the NSWGR to use the Pacific 4-6-2 wheel ar-

angement. The model will be streamlined in green livery, have a ceramic burner, axle pump, see-through fire box door, bypass valve, tender pump, water gauge, whistle and reversing lever. Gauge One (45mm), 1:32-scale, butane fired.

### U.S. PRR/LIRR G5



1:32-scale, Gauge 1 (45mm)  
ceramic burner

### U.S. CASEY JONES No. 382



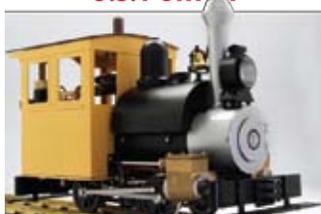
1:32-scale, Gauge 1 (45mm)  
ceramic burner

### U.S. FALK



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butane fired

### U.S. PORTER



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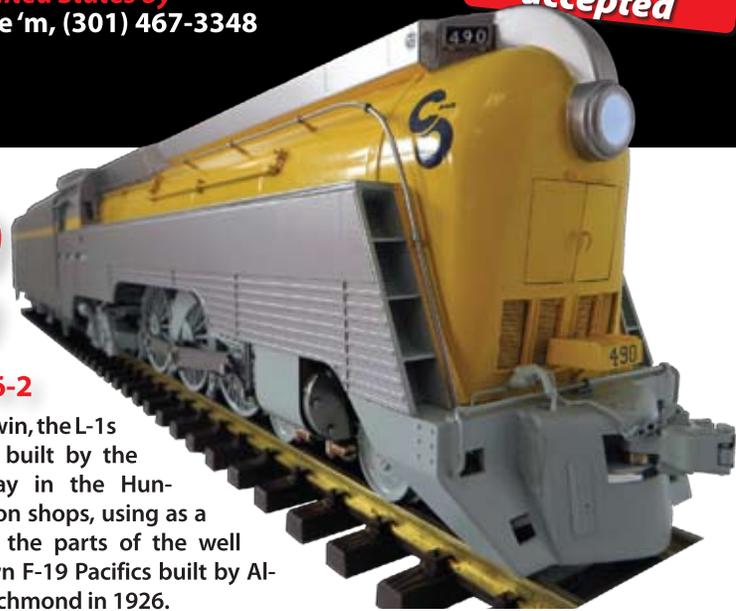


## C&O Hudson 490

**Streamlined 1:32-scale, butane-fired 4-6-2**

One of the most interesting Chesapeake & Ohio locomotives is the Class L-1 Hudson, the only streamlined conventional steam engine owned by the C&O. It has been compared both favorably and unfavorably to other examples of streamlining, but there is no argument that it is unique in the C&O experience. The second group of Hudson locomotives on the C&O was Class L-1 of 1947, following the Class L-2 of 1941/42 and preceding the Class L-2a of 1948. Unlike the L-2 and L-2a, which were built by

Baldwin, the L-1s were built by the railway in the Huntington shops, using as a basis the parts of the well known F-19 Pacifics built by Alco-Richmond in 1926.



### German BR64 295

The model will be 1:32 scale, Gauge One (45mm), butane fired with a ceramic burner, bypass valve, Walschaert valve gear, hand pump, axle pump, working whistle. Limited to 60 sets worldwide, with 35 sets now sold, meaning just 25 are left!



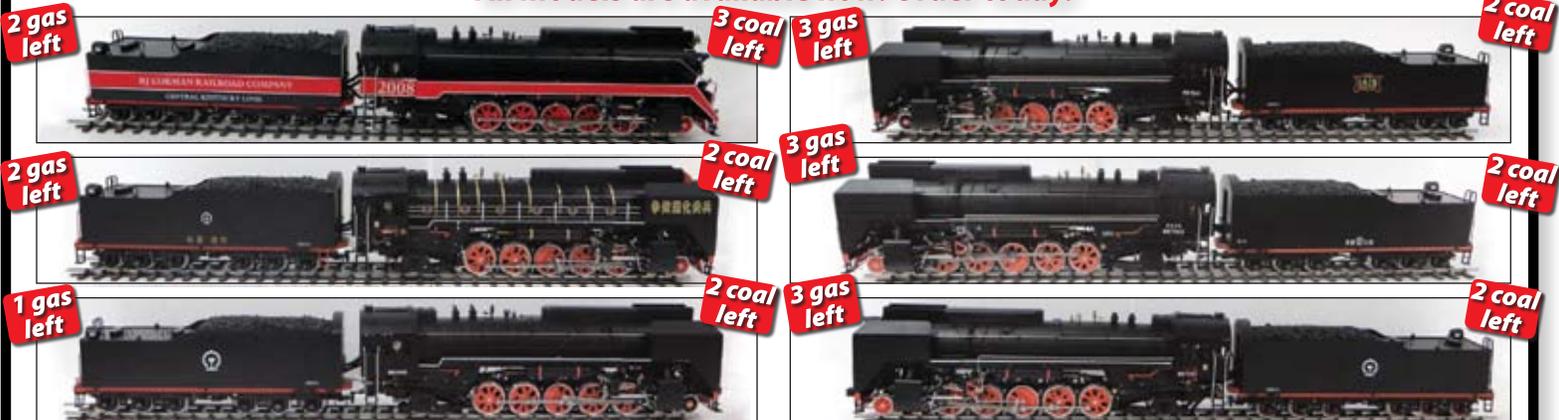
### GERMAN BR41 — TWO VERSIONS



Big deflector (upper) or small deflector (lower). 2-8-2 locomotive, 1:32-scale, Gauge 1 (45mm), butane fired, ceramic burner. With R/C or R/C-ready. Walschaert valve gear; fully sprung axles, sprung buffers. 29½-inches long, 5½-inches tall, 3¾-inches wide (750mm x 142mm x 97mm). British pressure gauge, water gauge, working whistle.

## China's 'Big Boy' — live steam model 'QianJin'

Limited to 50 sets released worldwide — 35 sets gas fired, 15 sets coal fired  
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The 1:32-scale models come in both gas- and coal-fired versions and the butane locomotive uses a ceramic burner. The boiler holds 22 ounces (650ml) of water

and the engine runs for 70 minutes. Available numbers include 2008/7040, 6800, 6988, 7081, 7143 and 7207. Comes with a working whistle and headlight.

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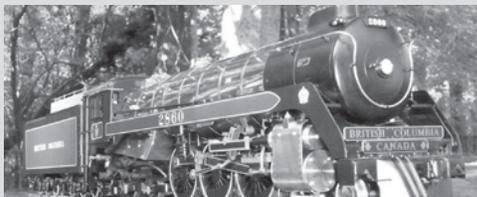


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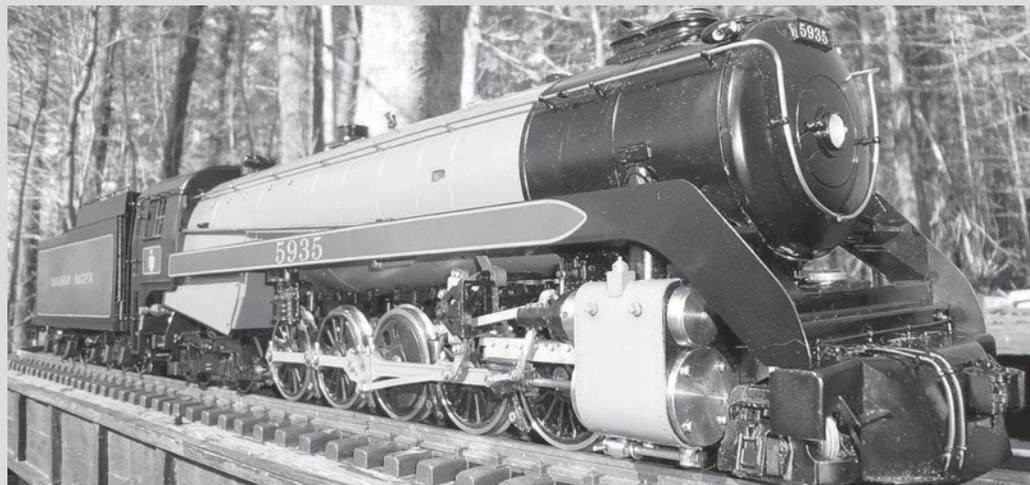
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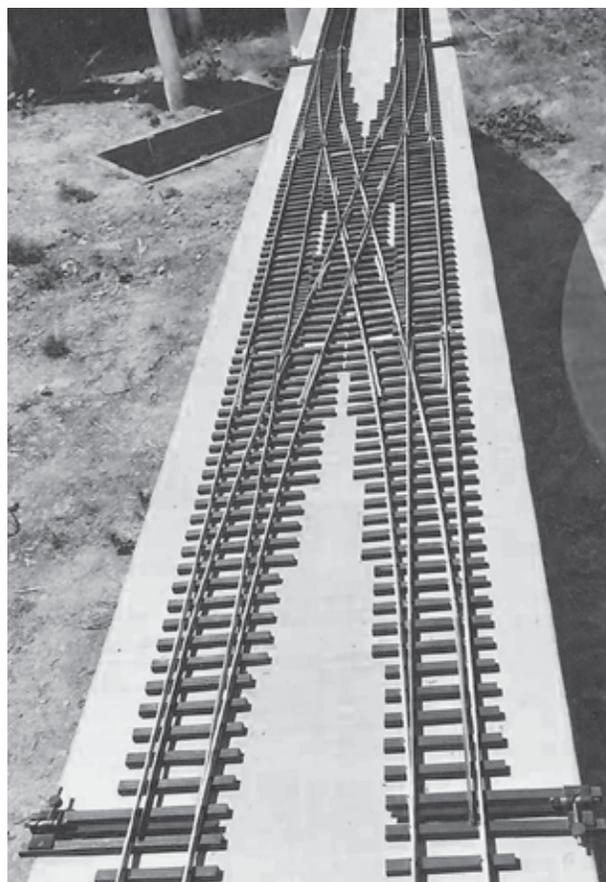
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# STEAM IN THE GARDEN

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

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**Latest waybill.** Wuhu Bowande picks a Hudson; Roundhouse goes East; Isle of Man 2-4-0T in 1:20.3; In memoriam: Ron Hunter, Toyoki Inoe; New radio-control transmitters; Small-scale live steam at conferences.



**Steam-powered windup.** New burners, boilers and pistons turn Marx's 'Commodore Vanderbilts' into real 0-gauge steamers. **By Joe Rothwell.**

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**'Dora' wheelie.** Adding two wheels (and enlarging the bunker) gives Accucraft's engine new character. Part II of three. **By Marc Horovitz.**

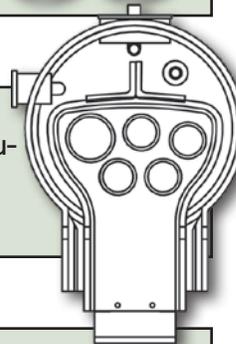


**Streamlined Garratt.** Building a 1:32-scale engine from Algerian/French prototype. Part III of three. **By Bill Allen.**

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**Coal conversion.** Changing an Accucraft C-16 from butane to solid fuel. Part II of six. **By Rob Lenicheck.**



**Portlandia.** Running, funning at April's spring steamup at Staver Locomotive. **By Rick Parker.**

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**Cover:** Joe Rothwell's second-generation 'Commodore Vanderbilt,' a Marx conversion in 0-gauge live steam. **Photo by Joe Rothwell.**

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**Yellow belly:** *Wuhu Bowande's latest is a C&O Hudson with a yellow-and-silver livery.*



## LATEST WAYBILL

### Wuhu Bowande picks a Hudson

**C**hinese small-scale live steam manufacturer Wuhu Brand Arts & Crafts Co. Ltd., said last spring it would be bringing out a Chesapeake & Ohio Class L-1 Hudson, No. 490, as its next American-profile 1:32-scale locomotive.

The 4-6-4 engine, in a yellow and silver livery, will feature all brass and stainless-steel construction, with a ceramic butane burner, a silver-soldered copper boiler, fully functional Stephenson valve gear, sprung axles on both the locomotive and tender,

hand and axle pumps, a water gauge, a pressure gauge and workable whistle and lights.

The model will have a minimum radius of three meters (nine feet, 10<sup>1</sup>/<sub>8</sub> inches) and will come in at 39<sup>7</sup>/<sub>8</sub>-inches long, by 4<sup>1</sup>/<sub>4</sub>-inches wide, by six inches tall (1012mm by 106.5mm by 152.4mm), with a boiler pressure of 60 psi.

Chesapeake & Ohio began converting five of its Class F-19 Pacifics to a streamlined design in 1946, doing the work at its Huntington Shops. Only No. 490 remains today, on display at the B&O Museum in Baltimore.

According to the museum, the railroad — primarily a coal hauler — wanted to “upgrade” its passenger service after World War II and in addition to the streamline conversions of the F-19s, also developed experimental steam-turbine electric locomotives,

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which had the same streamline cowl and livery as the converted locomotives.

No. 490's specifications include a weight of 388,700 pounds, drivers with 74-inch diameters, cylinders at 27-inches by 28-inches and a tractive effort of 49,200 pounds.

The yellow-and-silver Hudsons, known as "yellow bellies" among C&O staff, ran passenger service on the Chesapeake & Ohio through 1953. No. 490 was mothballed until 1968, when it was transferred to the museum.

The retail price for Wuhu Bowande's live-steam model of No. 490 had not been set at press time; it will be available through the manufacturer at <http://www.bowandeusa.com> or through its U.S. dealer, Stoke 'M and Smoke 'M, on the Web at <http://www.livesteamg1us.com/> or by phone at (301) 467-3348.

### Roundhouse goes East

**L**ocomotives from two eastern-hemisphere countries have been chosen as the next models at Roundhouse Engineering Co. Ltd., of Donchaster, England, with a steam engine from Australia and a diesel-electric from India.

An 0-6-2 built in 1952 for the Millaquin Sugar Co. Pty. Ltd., in Queensland by the Bundaberg Foundry Engineers Ltd. (under license from John Fowler &

**Darjeeling:**  
*Roundhouse  
battery-  
powered  
switch engine  
from India.*



Co. of Leeds, England) will be the basis for an engine Roundhouse is calling "Bundaberg."

The locomotive was later moved to the excursion Ballyhooley Steam Railway of Port Douglas, Queensland, and is now known as "Speedy."

Roundhouse says the locomotive will have two double-acting slide valve cylinders, operated by simplified Walschaert-type valve gear. The engine will have an "exhaust enhancer," glazed cab windows, gas firing and will be 12<sup>5</sup>/<sub>8</sub>-inches long by 4<sup>7</sup>/<sub>8</sub> wide by 6<sup>1</sup>/<sub>2</sub>-inches tall (322mm by 123mm by 165mm) and will weigh in at nine pounds (4.1Kg).

Standard controls include steam and gas regulators, safety valve, pressure gauge, displacement lubricator, reversing gear, water gauge and a "water top-up valve." Full radio control is optionally available to operate both the steam regulator and reverser.

The company says the engine will be available

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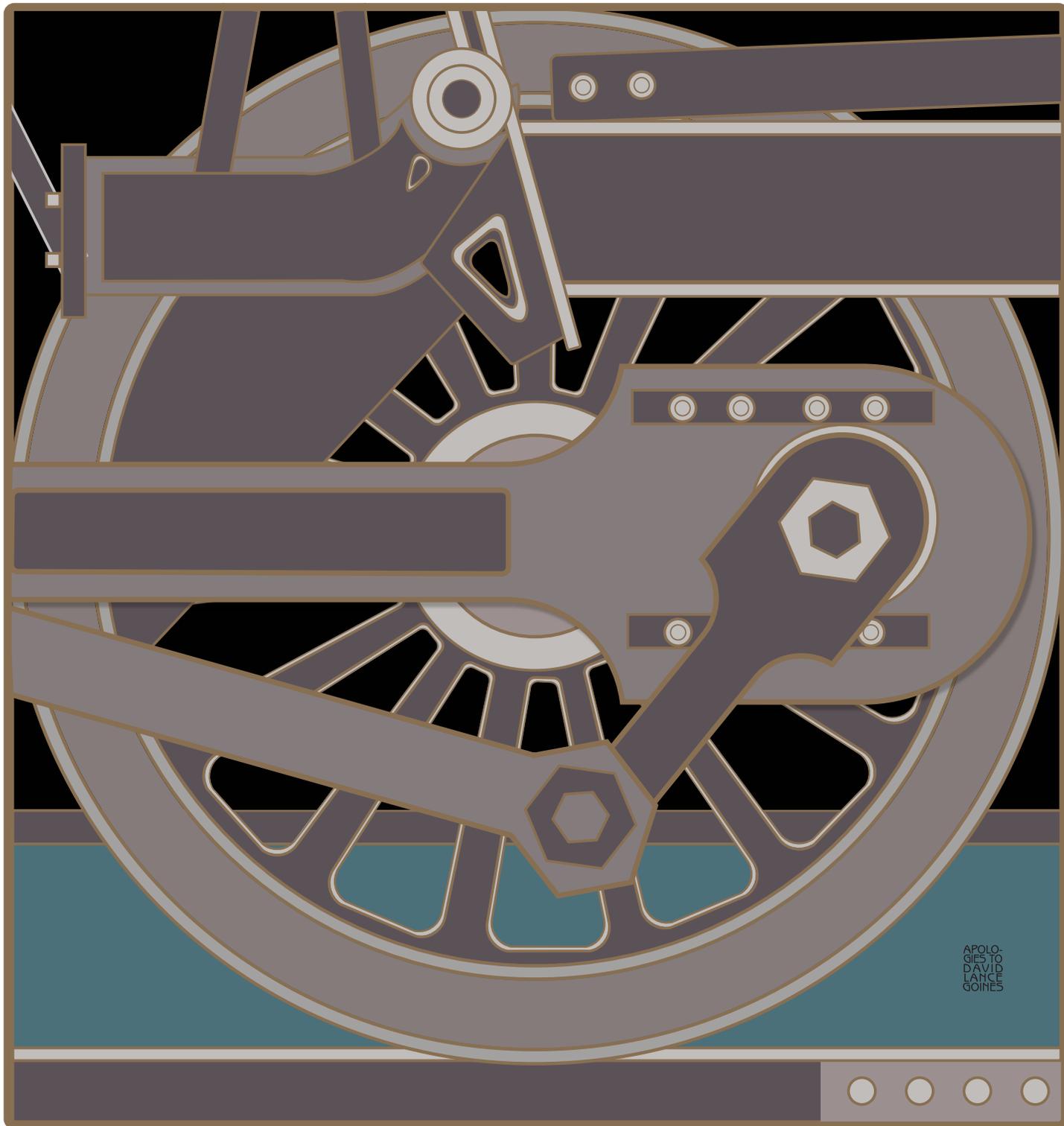
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# 2016 NATIONAL SUMMER STEAMUP

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'Bundaberg': Roundhouse Engineering's model of an Australian o-6-2 sugar-mill Fowler locomotive.

in any standard Roundhouse color and can also be optionally made with a standard Fowler smoke stack or black frames. The "Bundaberg" can be ordered either as a 32mm-gauge or 45mm-gauge engine.

Roundhouse also said last spring it was creating an electric model of the Darjeeling Himalayan Railway No. 602, a two-axle, air-braked unit that weighs in at around 17½ metric tons.

The o-4-0 model has 10 nickel-metal hydride batteries, insulated wheels and full radio control (with optional sound control as well).

The diesel model will weigh in at 7¾ pounds and will measure 12½-inches long, 4¾-inches wide and

5¾-inches tall (309mm by 110mm by 145mm).

Roundhouse said "Bundaberg" will have a suggested retail price of about \$1900 (£1315) and \$2099 (£1454) with radio control, while the Darjeeling diesel will retail for about \$1413 (£979) and with a sound unit \$1534 (£1063). Roundhouse is on the Web at <http://roundhouse-eng.com/> and it's North American distributor is The Train Department of Hazlet, N.J., on the Web at <http://www.thetraindepartment.com/> or by phone at (732) 770-9625.

### Isle of Man 2-4-0T in 1:20.3 scale

**A**ccucraft UK announced last spring it would soon deliver yet another small-scale live steam locomotive based on a popular Isle of Man engine, "Mona."

The 45mm gauge, 1:20.3-scale engine will be gas fired and have a center-flue boiler operating at 60psi, simulated Stephenson link valve gear, piston-type reverser with a lever in the cab, and will include a safety valve, pressure gauge, water-level check valve and water gauge. Controls in the cab include a steam regulator, gas regulator, lubricator under-floor drain valve and under-floor water level check valve.

"Mona" will be 14½-inches long by 4¼-inches wide by 6⅛-inches tall (360mm by 108mm by 156mm) and

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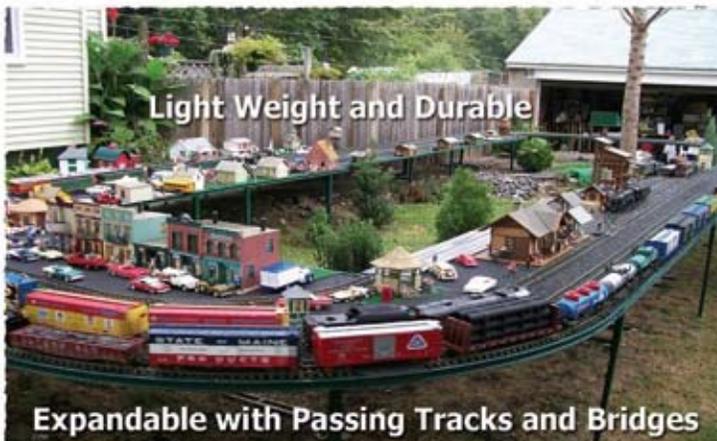
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**'Mona':** Accucraft UK has commissioned a 1:20.3-scale live-steam version of the Isle of Man 2-4-0T.

weigh in at 9½ pounds (4.3kg). Minimum operating radius will be 39-inches (one meter). The locomotive will come in two liveries, Ailsa green and Indian red, and will be available in electric as well as live steam.

Accucraft UK says that “Mona’s” prototype — No. 5 — was delivered in 1874 for the Manx Port Erin line. The company said in its announcement that “Mona,” “has idiosyncrasies that distinguish her, such as a chimney numeral in a slightly different style to the other locomotives.”

The British dealer also said “Mona,” “Carried brass ‘5’ numerals on the side tanks above the name plates, though the one on the driver’s side was removed later.”

After service on the Peel Line until 1970, “Mona” had trouble raising steam and was mothballed. The locomotive was purchased by a private party in 1978 but remained on site through until 1998.

Because of “asbestos present in the locomotive’s lagging it was hermetically sealed in 2009” and is not operational or on display.

“Mona” will have a suggested retail price of \$2235 (£1550) for the live steam model and \$1910 (£1325)

for the electric version. Accucraft UK is on the Web at <https://www.accucraft.uk.com> or by phone at 011-44-1432-1981-241380. “Mona” can be ordered through other Accucraft dealers as well; a list is available at <http://accucraft.com/company/AT-dealers.htm>.

### In memoriam: Ron Hunter, Toyoki Inoe

**D**riving forces behind two firms that provide small-scale live steamers with products and services died earlier this year, with Toyoki Inoe passing at age 68 in late February, and Ron Hunter dying at age 58 in early March.

Inoe was with Aster Hobby Co. Inc. of Yokohama, Japan, for almost 35 years, most as the company’s general sales manager. Fluent in English, Inoe appointed and managed the second generation of Aster dealers, including Aster Hobby USA LLC, owned by Hans Huywler of Campobello, S.C.

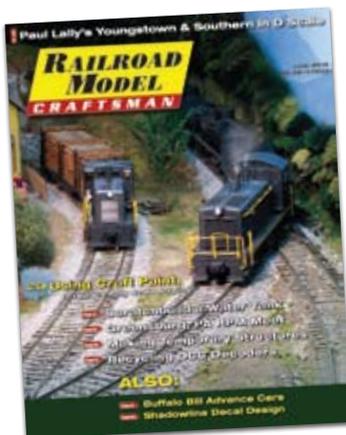
At the International Small Scale Steamup of 2000, Hans said, “Toyoki expressed interest in a green livery Southern Mikado I had kit-bashed from a newly released Aster USRA Mikado kit. The resulting discussions helped us form a closer relationship, which eventually spawned the production of the Aster Southern Railway Mikado 4501.”

Hans’ business was appointed the North American distributor for Aster in 2002 and Hans and Inoe worked together for the next nine years.

“Toyoki was a committed liaison and interpreter between all overseas Aster distributors and the design department of Aster Japan,” said Hans. “He managed the spare parts and overseas service department with great dedication and also proved to be an excellent host and sightseeing guide to any foreign visitor to the Aster factory in Yokohama.”

Ill health began to affect Inoe in 2005, and though

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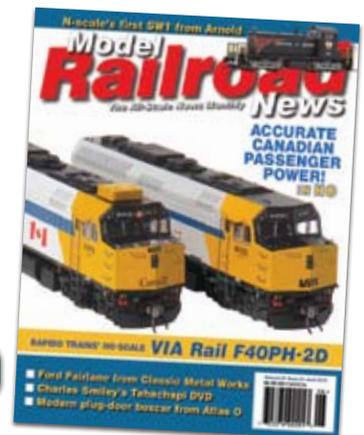
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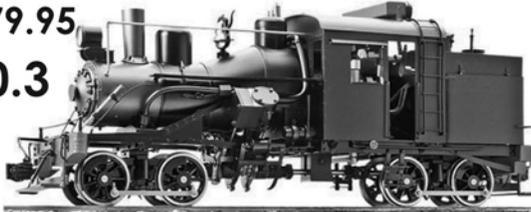
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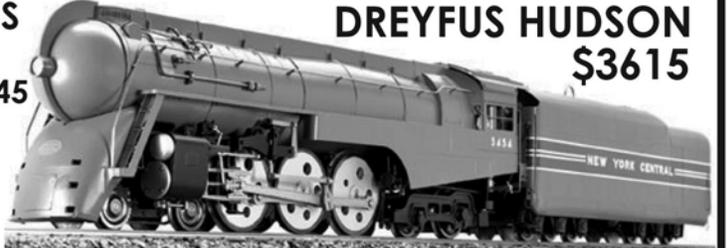
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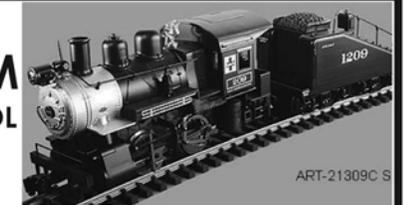
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**Aster leader:** *Toyoki Inoe, general sales manager of the locomotive manufacturer, worked at the Japanese company for more than 34 years.*

he was able to work for another six years, he had to cut back on travelling. For the last five years, Inoe had lived in a nursing home in Gifu Prefecture, near relatives. His only niece informed Aster in April of Inoe's February death.

Hunter was the master craftsman behind Hunter Railway Systems Inc., originally of Rancho Cordova, Calif., and in the last 18 months, of Las Vegas, Nev.

Hunter had been a Sacramento-area contractor and handyman in 2006 when he began building his trademark helix large-scale train systems, which allow an engine and consist to move from one level to another in a small amount of space without

exceeding the grade allowable by the engine.

The helices attracted attention and soon he was building them for model railroaders nationwide. A full-fledged business was soon launched, branching out into trestles, display-shelf systems, elevated railways with custom bridges and steamup tables.

The business' marketing and sales were handled by Ron's wife, Jamie, whom he married in 2002. They decided in 2014 to move the business to Las Vegas, where they planned a full-service train store that offered not only Ron's helices and bench work, but also model-train products, parts and service.

"Ron was an entrepreneur with passion, vision, and integrity; a strong work ethic was reflected in his products and the relationships with customers and peers," said Jamie.

Ron Hunter was suddenly taken ill in early March and died in the hospital. He is survived by Jamie, his mother and step-father, two sisters and a brother, and multiple nieces and nephews.

### New radio-control transmitters

**S**mall-scale live steam accessory maker Remote Control Systems of Casino, Australia, said last spring it had switched suppliers for the transmit module used in its TX-1, TX-7 and TX-9 2.4 Ghz DSMX hand pieces.

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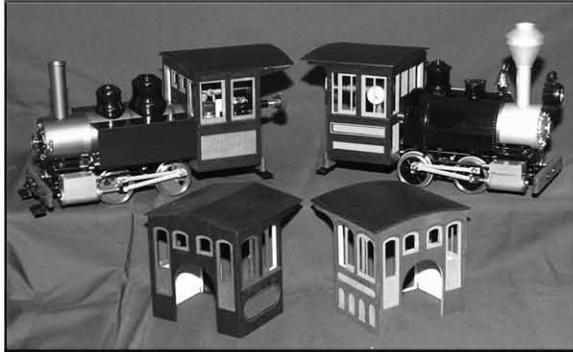
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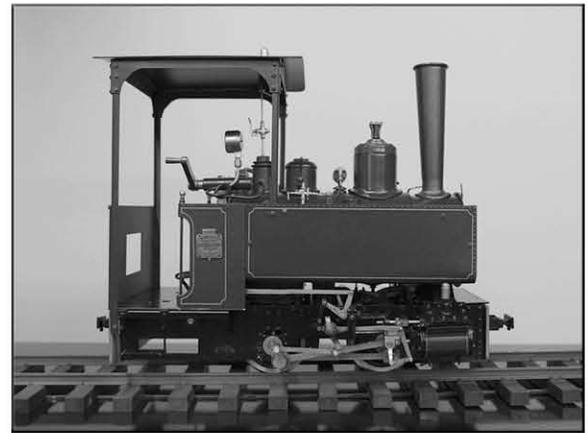
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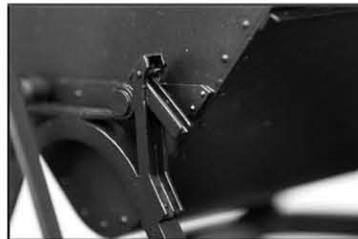


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“As soon as the forthcoming DSMX transmitter modules are tested and are OK, I will get on with a replacement auto-bind loco receiver for live steam,” said Tony Walsham, proprietor of Remote Control Systems. “This will be programmable from the transmitter for default servo direction and end point adjustments for at least two-times channels.”

The previous technology used, DSM2, allocates only two channels for the transmitter and receiver to exchange information; if one channel becomes saturated (via interference) or otherwise unusable, the second channel takes over. The new DSMX technology channel-hops the entire spectrum of the 2.4 Ghz based on random channels the transmitter and receiver negotiate at startup.

The existing DSM2 equipment will work with the new DSMX equipment, Walsham said. He said the company expects the new DSMX hand pieces to be available in early summer 2016.

Australia’s Radio Control Systems is a 26-year-old firm that builds its product line by hand. It is available on the Web at <http://www.rcs-rc.com/> or by phone at 01 (614) 2902 9083.

### Small-scale live steam at conferences

**B**oth the National Model Railroad Association and the National Garden Railway Convention

will have small-scale live steam components, organizers said. The NMRA annual convention and train show, to be held July 3-10, in Indianapolis, will play host to the portable steam layout of the Owens Valley Live Steamers. The layout will be in the Indianapolis Convention Center, organizers said, and live steamers attending the event can bring Gauge One live-steam trains and operate them.

OVLS’s Charles Mote will be bringing the layout and manage its use; he’s available at [csmote@mindspring.org](mailto:csmote@mindspring.org). The convention itself is at <http://www.nmra2016.org>.

The garden railway event will be held in Santa Clara, Calif., July 4-10. In addition to an extensive number of small-scale live steam backyard layouts that will be available for touring and the Bay Area Garden Railway Society’s portable layout in the dealer hall, the group said it plans an extensive number of clinics devoted to live steam.

Scheduled sessions include scratch building for live steam by Bill Allen, radio-control installation by Steve Heselton and live-steam firing methods by Steve Shyvers. Also on tap to provide a session will be “Starting in Steam” co-author Scott McDonald.

The 32nd National Garden Railway Convention, sponsored by the Bay Area Garden Railway Society, is on the Web at <http://www.ngrc2016.org>.

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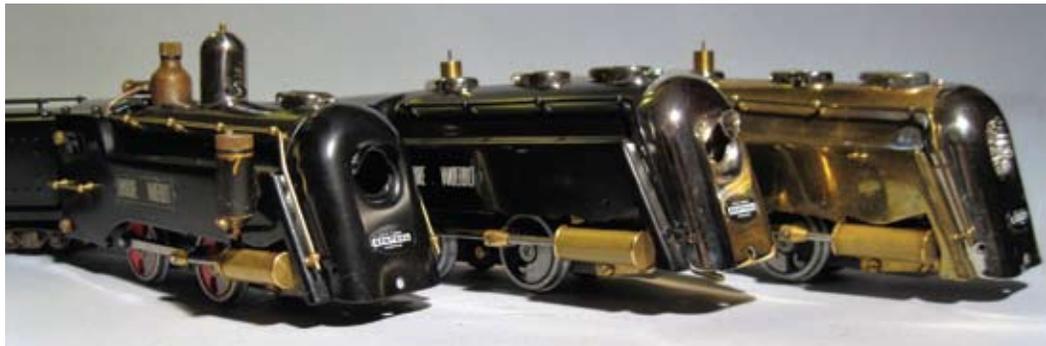
Text and photos by Joe Rothwell

**M**arx Toys' "Commodore Vanderbilt" engine is about as charming as a piece of stamped steel can be. Whether electric or wind-up, with lots of play wear or shiny new in the box, it's easy to become rather fond of this little gem.

There are a few varieties of Marx's "Commodore Vanderbilt" ("CV"), but the nickel-plate-front "CV" and close cousin, the "Mercury" engine, are two interesting examples. All are well made and hard to wear out, and "CVs" are still reasonable on eBay with the exception of really nice or rare examples. For me, an o-gauge live steam "CV" engine would be about as close to model Nirvana as you'll get and still ply earthly rails.

Inspiration came after I read Carl Berg's article in *Steam in the Garden*, "The Commodore Vanderherget Belchfire Limited" (July/August 2008, No. 100). He writes, "Anyone approaching the Marx 'Commodore' body shell with an idea of putting a steam-powered chassis under it is properly cautioned." The rest of the article is a pleasant narration on how some of the major obstacles were overcome along with photos. The pictures show something that transcended the sum of its parts; something rare ... it was rolling art.

In that article, Carl also mentions another "CV" steam engine published a decade earlier, "Marx



**Fleet:** Author's collection of three modified Marx 'Commodore Vanderbilt' toys he changed from mechanical to live-steam operation.

Commodore Vanderbilt," by Charlie Mynhier (see *Steam in the Garden*, July/August 1998, No. 46). Charlie made everything – it looks just like a Marx "CV," but it's not! A fine plan drawing and a photo accompany the text. Both these projects are a *tour de force* in imagination and execution. So, standing on these two sturdy shoulders, I began my project.

The "CV" shell is ideal for the conversion, being a roomy two-piece, heavy-gauge stamped steel affair – it can handle the high temperatures. Engines with more fragile and heat-sensitive construction like pressure-cast models are not as well suited. It's hard to find an engine without a bunch of castings making up the shell in o-gauge. Brass engines are more suitable, but are usually expensive, though basket cases show up on eBay all the time and will be more reasonable. Another interesting candidate is Lionel's 259E; all stamped



**Donation:** Stripped down Mamod for parts.



**'Cricket':** Boiler test fitted to Mamod chassis.



**Surgery:** One 'CV' shell provides roof for the other.



**Shell game:** Boiler on chassis with 'CV' body on top.

steel, on par with European stamped engines of the era, but it has that classic American look.

I started referring to the conversion as the "CV Challenge." Two were done (maybe more out there) and I was seriously considering making No. Three. While I was soap-boxing the "CV" Challenge at the 2012 National Summer Steamup in Sacramento, the late Northern California steamer Tom King said he had a boiler at home that might fill the bill.

The deal was, he would send it to me when he got back home and in return, I should put together a wind-up engine with a consist of three or four cars (I always bring my wind-up locos to the steamups) and send that back to him. A "sight-unseen" deal. True to his word, a tiny Berkeley "Cricket" boiler showed up in the mail a couple of weeks after the steamup ended. This was the catalyst, the final spark for the project. I sent his wind-up train set out right before Christmas.

Since there are no rules in this challenge, I wanted the boiler under the shell, and the fuel tank would end up wherever. After dismantling an old, but still healthy, British Mamod engine down to the chassis, I did a trial fit between the Mamod chassis, the "Cricket" boiler and the "CV" shell ... "therein lies serendipity." The steam dome and the filler plug on top of the "Cricket" boiler were not in the same positions as the teardrop fairings on top of the Marx shell, so a compromise was made. However, the smoke box exhaust hole on the boiler matched the "CV" shell exhaust port perfectly and the boiler back head couldn't have landed in a better spot inside the cab.

Another problem though, was the throttle valve's location on the steam dome, outside of the shell. This required cutting off the roof and a second "CV" shell giving up its roof. The shells used for this project were incomplete wrecks bought on eBay. Look for ones that have been repainted really badly, so they're cheap and not collectable. Sometimes a group of three or four "CV" engines are auctioned off in one lot and a good deal can be had, yielding an abundance of parts.

Some boiler bands were rolled to keep the boiler tight to the chassis without causing too much heat-sink loss. The frame robs little heat because the boiler sits on the sharp edges of the two frame rails. The "CV" shell itself is a huge potential heat-sink if allowed to touch the boiler anywhere. It would impair temperature build up and most likely would be a deal breaker. Prevention comes from the eight handrail stanchion nuts inside the shell that are acting as standoffs, creating an air gap all around.

The dead-leg lubricator needed little work and just about mounts in the same position as on the Mamod. A copper pipe was bent for a main steam line and soldered onto the throttle end and plugged into the dead-leg lubricator/switch block at the forward end.

The test steamups were conducted on a pair of

## Marx and Vanderbilt

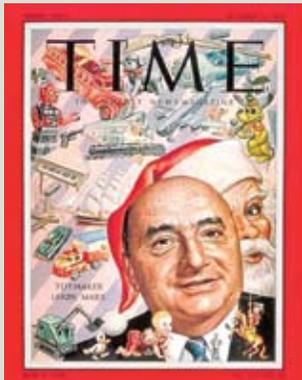
If you were a child in the 1940s-1950s, you probably had a toy from Louis Marx & Co., the New York City maker of lithographed tinsplate, plastic and wood items for children.

In 1955 (two weeks before Christmas), Louis Marx graced the cover of Time magazine. The 4000-word article on Marx and his business claimed he was responsible for 10 percent of all the toys sold in the country that year, with a gross of \$50 million and a net of \$5 million (or \$444.3 million and \$44.4 million in today's money).

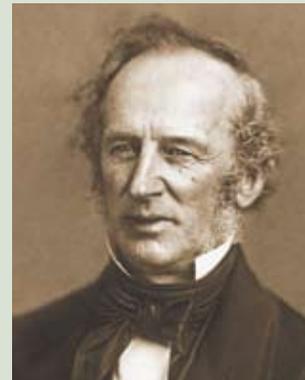
The firm at the time had six U.S. factories with 8000 workers, plus subsidiaries in the United Kingdom and Canada, and relationships with toy makers worldwide.

Called the "Toy King," Marx was said to have spent only \$312 on advertising in 1955, but reportedly gave away "a million toys a year" to "the children of cops and waiters and charwomen, boys and girls in orphanages and other institutions."

Historian James Pekarek — who in addition to being a Marx and "Commodore Vanderbilt" expert is also a large-scale live steamer (12-inch-gauge) — writes in his 2015 book, "The Marx Mechanical 'Commodore Vanderbilt,' 1935-1948," that Marx made the "CV" as either a clockwork or electric engine starting in 1935 and many of the parts in



**Toy trains, real trains:** Left, Louis Marx, 'Toymaker,' on Time magazine cover. Right, Cornelius Vanderbilt, 'Commodore,' from circa 1852.



the first versions were based on technology from Joy Line, which Marx acquired in 1934.

The toys were marketed through 1948, writes Pekarek, and because few records were kept by Marx, he coined the adage, "Never say never with Marx." Pekarek believes that double-dome body mechanical "CVs" are pre-war, while single-dome body mechanical "CVs" with plated drivers and motor-side plates are probably post-war.

"Without a doubt," writes Pekarek, "there are oddities out there." He says that chrome-plated "CVs" "do show up from time to time." But he and other experts believe that while some may be Marx prototypes, "others have been stripped and plated by previous owners."

Both Marx and Lionel Trains made toys from the "Commodore Vanderbilt" locomotive, which was developed in 1934 by the New York Central's Carl Kantola, who added the streamlined shroud to NYC's No. 5344, a J1E Class 4-6-4.

The locomotive was named after Cornelius Vanderbilt, the builder of the New York Central. (As a 16-year-old ferry boat captain, Vanderbilt was given the nickname "Commodore" by his competitors in recognition of his energy and eagerness; the name stuck the rest of his 82 years.) After a tour of the NYC's system, the company chose the locomotive to pull its signature train, the "20th Century Limited."

The "Limited," ran 960 miles from New York City to Chicago, and with the "Commodore Vanderbilt," made the trek in 16½ hours.

According to contemporary reporting, the shroud decreased air resistance by about 30 percent when operating at 70 to 90 mph. The shroud also enclosed the piping and cylinders, helping to limit heat loss.

Nonetheless, NYC came up with another streamlined shroud for J3 Class 4-6-4s and in 1939, took the Kantola shroud off the "CV," so it would match the J3s.

— dmc

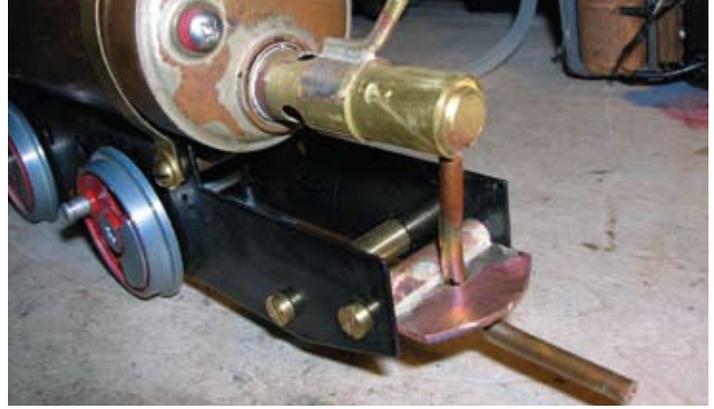
wood blocks, using the bare boiler without the "CV" shell. The chassis demonstrated great power, much better than the stock boiler set-up. The "CV" shell was attached next, but the nose piece was left off, leaving the smoke box open. Still the tests went better than hoped. I was using a poker-style burner made from concentric rings of K&S brass tubing which used a No. 5 jet for butane delivery. It roared in its flue, a blue dragon tongue licking out the front.

The engine ran better with each steamup. Instead of hot water, this set-up was making steam! For the final test, the front nose piece was installed, enclosing the smoke box. Then the engine was put in the configuration it would be in for an actual track run, but still on the stand. Now things began to unravel.

The test was going fine and when steam was reached, a funny odor was followed by a couple of wisps of pale smoke. Instead of shutting things



**Attachments:** Bands to hold boiler on chassis.



**Burner:** Gas pipe from jet, headed toward tender.



**More burner:** Brass parts for the butane system.



**'Cricket':** Boiler test fitted to Mamod chassis.

down, I went full steam ahead, and cracked open the valve. This caused the right cylinder/piston to fall off and hit the workbench.

After things cooled off, I found out that the blue flame wasn't just coming out the top, but wherever there was an exit, because of the nose piece enclosing the smoke box. The next biggest exit hole was near the right cylinder, so the heat softened the solder there and when I applied steam pressure, off it came. Rats!

With nothing to lose, a repair was attempted and within 30 minutes, things were going back together again. (It was months later, when installing a piston upgrade kit, that I found a rubber O-ring on top of the old piston rod had carbonized and likely leaked steam. You couldn't tell this when the engine ran, though; it always had good power.)

This heat problem was overcome with a one-half-inch copper elbow on the end of the flue. It channels most of the heat right out the smokestack hole. I experimented with shorter pokers, but the steam seemed to suffer, so the dragon tongue stays in for now. Also, an "extra" smoke box door was put on the front end of the boiler, shielding the nickel-plate nose piece from any excessive heat. Now a shark fin shaped blue flame exits the stack, which brings all kinds of comments during operations.

The butane tank ended up in a pre-war Lionel whistle tender, and piped gas over to the burner. Perhaps the weakest part of the engine on all levels, this could use a re-design. It works, though, so the engine still uses this fuel system. The tender is using

Marx trucks instead of the Lionel trucks. The Marx trucks have a lower profile, which makes a lower, less top-heavy tender, and they also have the proper coupler already attached for a consist of Marx New York Central heavyweight coaches.

The nose piece, dome, side rods and tear-drop fairings were sent off to get nickel-plated while the shell and tender were getting powder-coated a semi-gloss standard black. Some ladders and handrails were put on the tender, too. The nickel-plated dome encloses the filler plug/whistle combo.

The cab was cavernous and was in need of some attention. I didn't initially plan for a detailed cab, but once started, I couldn't wait to get home from work to fiddle around with the engine. A floor for the cab was fashioned out of brass, as was the fire wall.

Commercial brass o-gauge detail parts make up the back head. Copper wire and tubing were soldered on to simulate piping. Going online and studying steam engine back heads helped with the layout. This part was fun, maybe even therapeutic ... the engine was done so the pressure was off and I could enjoy this last bit of design. Not wanting things to end, I took my time, savoring the minutes. Nirvana achieved.

I debuted the engine at the 2013 Summer Steamup on the Pacific Coast Live Steamers' track. It's the largest indoor dual-gauge track that I've seen, so it's the Mecca of 0-gauge runners, live steam and windup. We appreciate the effort of the organizers in bringing this layout every year to the event.

Tom was there to see the maiden run and afterward, walked over and informed me quietly with a smile, that the engine did 14 laps. And added that the engine was "well balanced." I believe he was satisfied with the fate of his little "Cricket" boiler.

Now that it's been running a couple of years, I feel that the powder-coated shell was worth the cost as it still looks new and is heat and stain resistant. Altogether, you'll find yourself forgiving the bulbous nature of this "streamliner" and have an irresistible urge to pick it up. The engine got the ultimate compliment at the Summer Steamup when it was repeatedly picked up during the event in my absence, even though the rules forbid this. Who could blame them – I'm under the same spell.

How many times have you finished a project and said if you could do it over, what would you change? And then you go on to the next project, leaving unrealized potential. This time I was compelled to take what I learned and capitalize on a fully self-contained steam powered "CV," with the stock Marx "CV" appearance still somewhat intact. No protrusions, elegant streamlining dominating the look as originally intended by Marx. Detailing the back head is something I was looking forward to. It goes in last, like a reward.

Brand new parts were ordered for two chassis' from Dream Steam in the United Kingdom, which included the frames, wheels, dead-leg oilers, cylinders, side rods, spacers and switch blocks. The copper oil lines had to be replaced on the dead legs because the opening of the tube was about the size of a pinhole. The flanges on some of the wheels were poorly turned, but should be adequate. The cylinders



**Scratch:** Components for the second version of the steam 'CV.'



**Comparison:** 'Cricket' back head, left; Justin boiler back head, right.

are a work of art. Everything else was satisfactory.

A drawing of the boiler and butane tank were sketched up and evolved as the design came into focus. A talk with Las Vegas steamer Bob Sorenson led to the elimination of the steam dome by placing the throttle valve at top-center of the back head, streamlining the boiler top. The exhaust port, filler port and safety valve are to be positioned at the stock "CV" teardrop locations, a no-brainer.

The butane tank will fit under the cab between the rails and the valve will end up right behind the



**'CV' v1:** Engine with gas tender and consist in the Sacramento backyard of the author's younger brother.



**'CV' v2:** Shell rests on second-generation chassis.

burner. I sent the final boiler and butane tank drawings to boiler maker Justin Koch. Two boilers and two butane tanks were made to perfection; they fit the shell and chassis like a glove. The exhaust port, filler plug and safety valve all fit in the three stock teardrop fairing locations, preserving the Marx "CV" look. Another design change was the dead-leg lubricator which now fits under the nose piece, screwed to the smoke box door, further streamlining the engine.

A drawing of the burner and jet holder was also sketched. The design uses K&S brass tubing with a solid-brass collar and jet holder. The brass tubing for the Venturi and poker can be lengthened or shortened through trial and error. The jet holder and collar for the burner were turned by hobbyist Rich Klopp of Redwood City, Calif. We met at the 2014 Summer Steamup where Rich ran a tiny 0-gauge jewel he scratch built from plans. He even drilled the jet on his little engine! Rich also turned two exquisite safeties for the two "CVs" along with a special adjusting tool. These items add legitimacy to the finished look, like gems in their settings.

Two more inexpensive Lionel whistle tenders were procured from eBay. Since they were getting repainted, I looked for ratty ones, keeping the cost down. They don't have to carry a fuel tank with the new design, so they were a bit easier to finish. One engine and tender was sent to get powder-coated black and the other engine and tender was plated brass.

The brass set is an experiment. As the years go by, it should get darker and streaked with weathering. I may speed this up chemically somewhat or just leave it alone. Also, the steel body will rust at thin spots in the brass plating with time, adding more weathering. Either way, it should look fantastic down the road.

Some other design changes were on the main steam line. I found some micro 90-degree cast bronze fittings that were drilled and threaded for one-eighth-inch pipe. I drilled out the threads and soft soldered the pipes instead, opting for ease of construction and maintenance down the road. They look great and add to the overall appearance of the engine. The exhaust pipe is routed back towards the butane tank, diffused steam warming the tank.

The steam valve and butane valve were bought from DJB Model Engineering, another British firm. The Brits seem to understand small-scale steam needs, judging from the amount of gear used from the United Kingdom in this project. A tip of the hat in their direction is due.

The back head was upgraded, getting a pair of seats and some dial gauges along with the usual items from the first engine. Both engines fired up fine and needed little tweaking, though they weren't without a few hiccups, of course. The connection between the burner and tank could use some more thought. Also, the burner could profit from a wire mesh wrap upgrade featured last year in this very magazine (see *Steam in the Garden*, September/October 2015, No. 141).

I couldn't be happier with the results of time, effort and money spent in this project. Keeping the design simple has made the project fun and rewarding.

The potential of the "CV" shell has barely been scratched. The Marx "Mercury" is up for grabs and a better name would be hard to find. Building a model without a set of directions may seem daunting to some, but the flip side is that you are not constrained and your imagination is completely freed up. If the model works, the satisfaction is tremendous. If not, you probably learned more from that experience than if it did ... a win/win situation.

I would like to thank everyone who contributed to this project, and look forward to see if someone else will take up the gauntlet and make us smile.

Adding two wheels gives Accucraft's engine new character

# 'DORA' wheelie

Text, illustrations and photos by Marc Horovitz

**I**n this second installment of converting Accucraft's "Dora" to an 0-4-2T, we'll finish building the trailing truck and discuss possibilities for the new sheet-metal bunker.

First, let's do the axle. Chuck up a piece of 3/16-inch drill rod in your three-jaw chuck, face off the end if need be, then part off a piece 2.075-inches long. It's important to get the length accurate, as that will determine wheel spacing. If you have a 3/16-inch collet, use that for the rest of this part. If not, and you know that your three-jaw is accurate, you can use that. If that's no good, use your four-jaw chuck and center the part properly.

Shoulders will need to be turned on both ends of the axle. I like to use a parting tool for this sort of thing (**Photo 43**). **Figure 7** will give you the dimensions. The finished axle should look like **Photo 44**.

The wheels are made of seven-eighths-inch-diameter stock, if you have it. I didn't, so started with one-inch stock. Mild steel is probably the best



**Bunker:** Completed 'Dora' on author's Denver layout.

material to use. Again, I didn't have any, so used brass. Chuck up a piece in your three-jaw, three-to four-inches long, with an inch or so sticking out. If you're starting with one-inch stock, turn down three-quarters of an inch or so to 0.875-inch (**Photo 45**).

Face off the end, then center drill it (**Photo 46**). Drill No. 31 by three-quarters-inch deep, then ream the hole with a one-eighth-inch reamer

(**Photo 47**). Turn the tread down to 0.750-inches, 0.188-inches wide (**Photo 48**). At this point the wheel has a flat face. You can leave it thus if you like. If you want to give it a little bling, add a recess to the surface. This can be anything you like — I used a round-nose tool (**Photo 49**). Just make sure you note your lathe settings so that you can duplicate your work on the other wheel.

Set your parting tool so that the thickness of the wheel is 0.250-inches and start to part it off (**Photo 50**). Go in one-quarter-inch or so. Then, with a file, carefully shape the flange (**Photo 51**). It should be



Photo 43



Photo 44



Photo 45

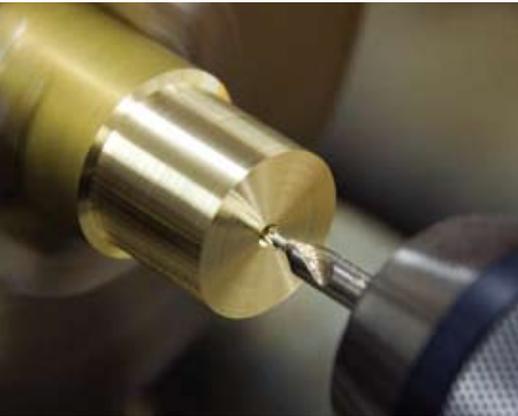


Photo 46



Photo 47



Photo 48



Photo 49

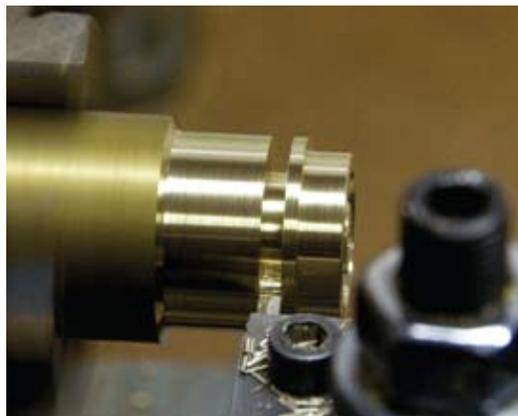


Photo 50

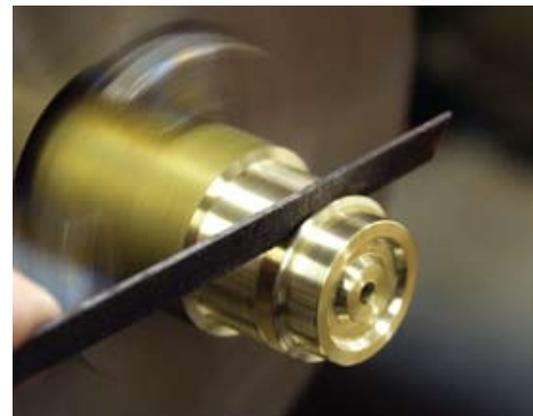


Photo 51

tapered on the tread side and can be flatter on the back side, with the edge rounded over, as per **Figure 8**. When you've got the flange the way you like it, finish parting off the wheel. Clean up any burrs. Now do it all over again. The finished wheels should look like **Photo 52**. Set them aside for now.

The swing arm should be made from 1/16-inch brass plate. Darken the metal and lay out the pattern as per **Figure 9** (also see **Photo 53**). Center pop and drill the 3/16-inch hole (**Photo 54**). Start small and work up to it.

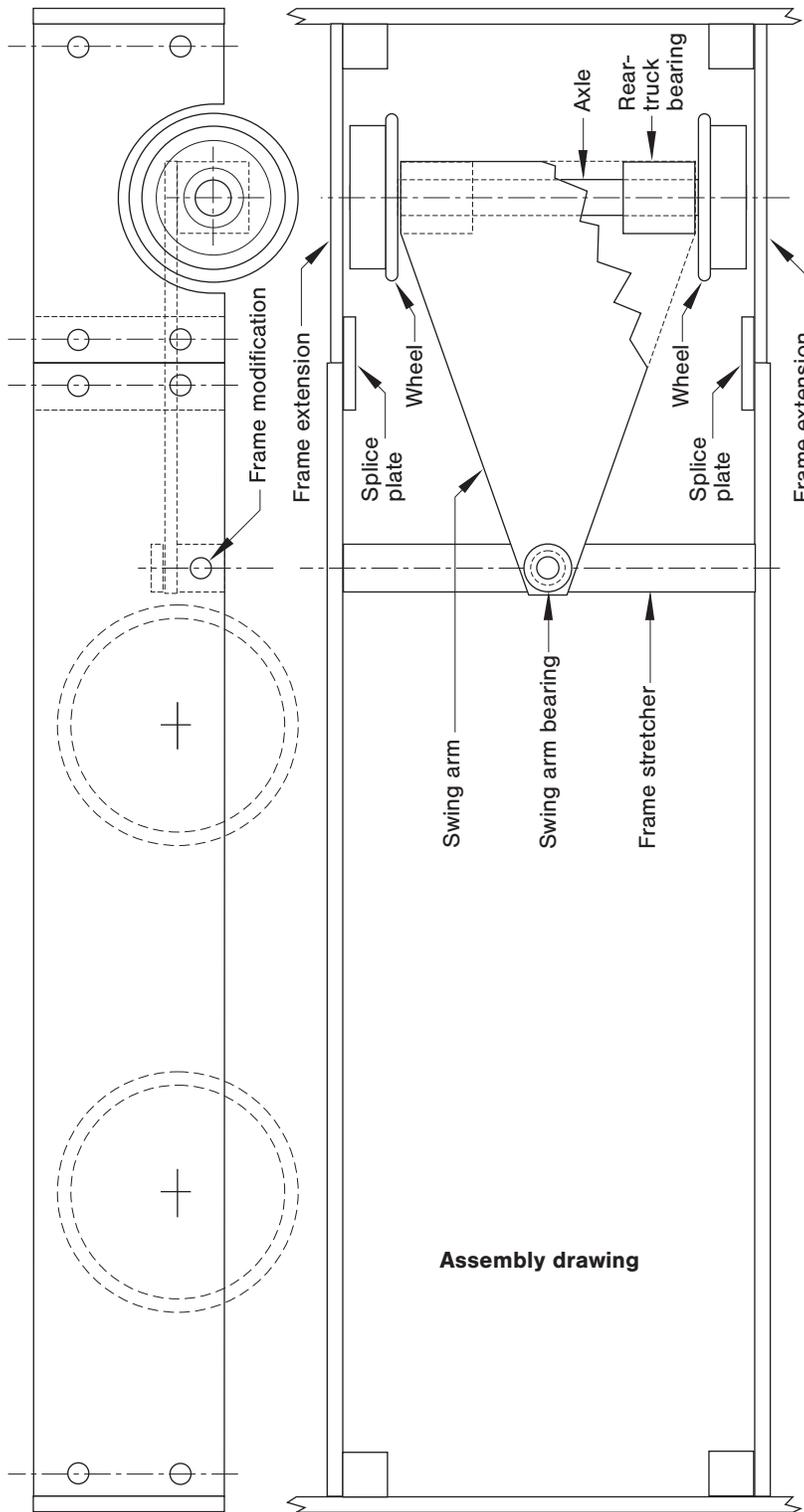


Photo 52

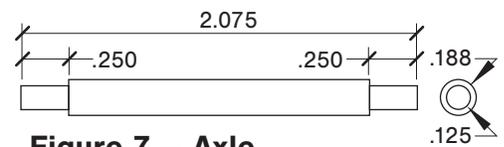
Make sure you clamp your work to the table.

To cut the piece out, you could use a stomp shear, a jeweler's saw, or a hacksaw. I decided to use a hacksaw. Clamp the work in your vise with the cut line parallel to but slightly below the top of the jaws. Then, using the jaws as a guide for the saw blade, make the cut (**Photo 55**). Do the same for all of the cuts. The rough-cut piece can be seen in **Photo 56**. Clean up

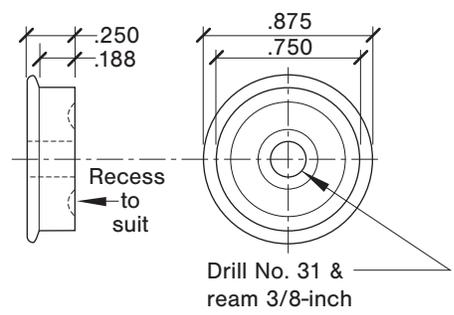
the cut edges with a flat file. The finished (cleaned up) piece is in **Photo 57**.



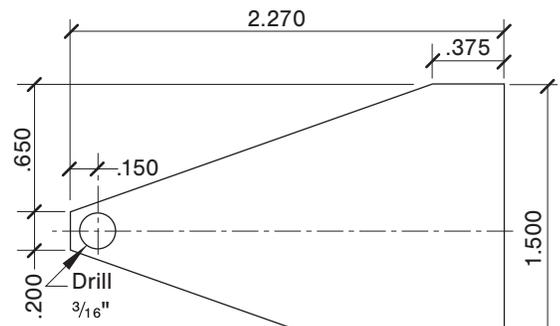
Assembly drawing



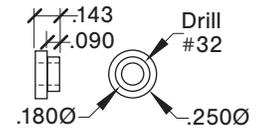
**Figure 7 – Axle**  
Make from 3/16-inch drill rod



**Figure 8 – Wheel x2**  
Make from brass or steel



**Figure 9 – Swing arm**  
Make from 1/16-inch brass



**Figure 10 – Swing arm bearing**  
Make from brass

The bearings will be soft-soldered to the swing plate. To do this, grip a piece of something square in the vise and clamp the swing plate to it, with the wide end sticking out into space, as in **Photo 58**. Slip a length of 3/16-inch drill rod (not the axle) through the bearings. Put a little flux on the swing plate in the places where the bearings will sit, then put the bearings into position. Hold the bearings to the swing plate by lightly clamping the 3/16-inch rod, as per **Photo 59**.

*Important:* The bearings need to overhang the side edges of the swing plate the tiniest amount, but

the distance measured over the outside edges of the bearings must be a little less than 1.575-inch (**Photo 60**). (You'll notice that, in the photo, the pieces have shifted slightly. They were properly positioned before soldering.) Put a small chip of solder near the joint of each bearing and apply the torch to the opposite side (**Photo 61**). When the solder flows, allow things to cool, then clean it up. The finished truck assembly is seen in **Photo 62**.

Now's the time to paint the wheels and truck assembly. Clean up the parts, slip a one-eighth-inch

– Continued on Page 30

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1:32 Scale, 45 mm Gauge  
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Photo 53



Photo 54

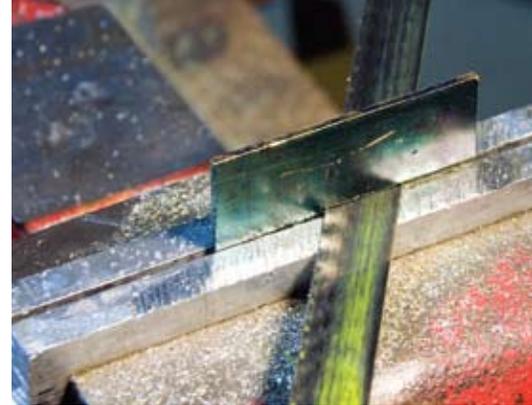


Photo 55



Photo 56



Photo 57



Photo 58

— Continued from Page 27

rod into the wheels to keep the paint out, and put bits of tape over the bearing holes for the same reason. Prime and paint. The painted parts are in **Photo 63**.

The wheels are held on the axles with a cement like Loctite RC/609 retaining compound. Put a tiny drop into the hole on one wheel — not on the axle — then place the wheel on the axle (**Photo 64**). Wipe off any that got on the outside of the wheel. When this has set up, put the axle through the bearings, then repeat the process with the other wheel, taking extreme care to keep the adhesive away from the bearings. When that has set up, put a drop of oil in each of the bearings and give the axle a spin. It should rotate smoothly and freely. The finished truck is in **Photo 65**.

Here's something to think about: After painting the wheels, you may want to skim the paint off the treads and outsides of the flanges. Here's a way to do it more easily. Before assembling the truck, chuck up the axle, either in a collet or in your three-jaw and, with a tiny center drill, center drill both ends (**Photo 66**). After the truck is

assembled, you can grip the wheel set in your three-jaw by the tread of one wheel, while supporting the other end with a live center in your tail stock. With the lathe set on a slow speed, you can use a piece of sheet metal with a sharp edge to scrape off the paint (**Photo 67**). Reverse the wheel set to do the other wheel.

All that remains is to make the swing-arm bearing. This is a simple turning job. Chuck up a piece of one-quarter-inch round stock, brass or steel, in your three jaw. Turn the end down 0.090-inch by 0.180-inch diameter, as per **Figure 10** (see **Photo 68**). Center drill and drill the end No. 32 by a quarter-inch or so deep. Then part it off 0.143-inch from the end. Clean up any burrs. The part should look like **Photo 69**.

Insert the bearing into the hole in the top side swing arm (the axle bearings are on the bottom side). It should be a fairly sloppy fit. Using a 4-40 by 3/8-inch screw (any sort will do), screw the swing arm to the frame stretcher (**Photo 70**). That's it — you're done with this part of the project (**Photo 71**).

Now that you've fin-

### Giving 'Dora' more wheels

**A** new wheel arrangement gives the stock Accucraft "Dora" a significant change in character. Marc Horovitz added a new rear truck and a larger bunker to make her a 0-4-2T.

- **Part I:** Disassembling the engine, modifying the frame and starting the trailing truck.

- **Part II:** Finishing the trailing truck build and begin sheet metal work on the new bunker.

- **Part III:** Completing the bunker and finishing the project.



Photo 59



Photo 60



Photo 61

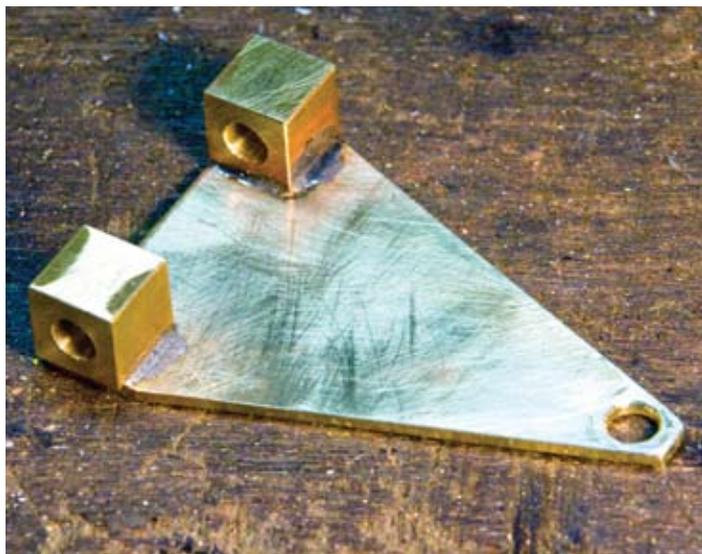


Photo 62



Photo 63

ished modifying the frame and building and installing the new trailing truck, you'll need to build a new bunker to complete the project. Since this is a free-lance locomotive, there's no prototype to follow. Thus, the possibilities are endless when it comes to what you can do for a bunker. For instance, it can hold coal or oil, it can have square corners or round, it can be any height that will still allow access to the throttle, it can have rivets or not; it's entirely up to you.

What I'll describe in the next issue is the bunker I made for my "Dora." I liked the proportions and I deliberately left off the rivets, as I didn't think they'd be in keeping with the rest of the locomotive. I went with round corners, as I felt they added a little character to the engine, and I opted for coal firing so I could put a coal rail on top of the bunker. You're free to do as you please — use your imagination. The steps described here may give you some insights as to technique. Before we get started (in the next issue), here are some thoughts on sheet metal.

### Brief notes on working with sheet metal

When working with sheet metal, unless we have precision presses and dies to stamp out our parts, most of our work will be done with hand tools. Unlike



Photo 64

working with a lathe or milling machine, achieving precision with sheet metal to a thousandth of an inch is not only more difficult, it is usually unnecessary. The finished parts should fit together well and look good. If they're off a few thousandths one way or the other, who's to know (or care)? It just doesn't matter.

Having said that, the dimensions for the sheet-metal parts are given to three decimal places. When



Photo 65



Photo 66



Photo 67



Photo 68



Photo 69

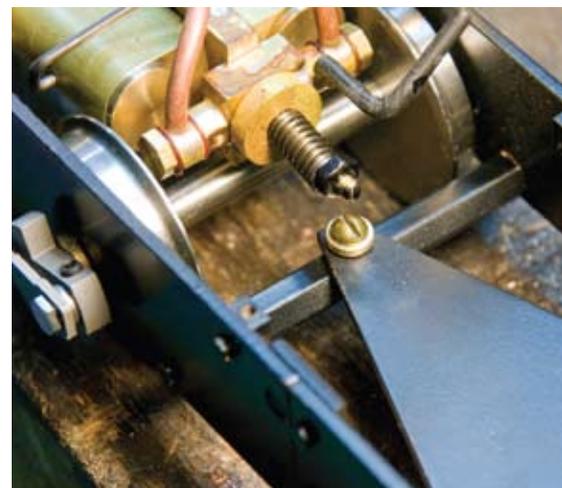


Photo 70

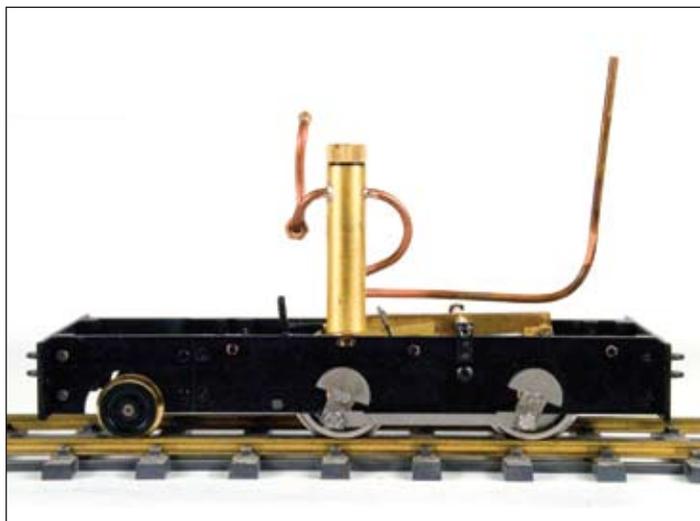


Photo 71

working with sheet metal, this is just a target — getting close counts for a lot. Personally, I like to try to work to three decimal places with my sheet metal. Even though I often miss the mark a little, I think it improves my work overall.

What's important is to do the best work you can. If you muff a part, don't be afraid to do it over. A wise friend of mine (and a superb machinist and metal worker) says, "Anything worth doing is worth doing twice." If you've not done a lot of sheet-metal work,

you'll learn as you go. I've tried to explain things as clearly as I can. If you have questions, please don't hesitate to contact me through the editor.

There are various ways of cutting sheet metal. The cleanest is with a shear, but many hobbyists don't have one. Snips are good but you need to learn how to make the cut without deforming the metal. A jeweler's saw can also be used. If you take this course, cut slightly outside the line, then smooth to the line with a file.

A Stanley-type knife can even be used for straight cuts if the metal is thin enough. You'll need to go over the cut several times, until you can bend the metal along the cut, back and forth until it breaks. This is not the best method, however.

Bending sheet metal into sharp angles is best done with a bending brake. However, you may not have one available. A good substitute, for smaller pieces anyway, is a good vise with smooth, straight jaws. You can even build a vise extender. Plans for one are available free at <http://tinplategirl.com/2011/09/12/026-vise-extenders/>

Drilling small holes in sheet metal is about the same as drilling through thicker stock. However, when you get into larger holes, a step drill or a punch is recommended.

In the final installment, we'll build the new bunker out of brass and install it on the engine.

Building a 1:32-scale engine from Algerian/French prototype

# Streamlined GARRATT

Text and photos by Bill Allen

**W**hen I saw my first photo of the Streamlined Garratt, I thought the bunkers were tubular shaped with running boards attached to the sides. (To avoid confusion, I am referring to that end of the bunker where the headlights are as the front for both bunkers.) Upon further research, I found that it is constructed more like the following:

The chassis have frame risers which support a flat floor that bends down at the front. A half tube (actually a little more than half) goes on top of that, and at the bend downwards a transitional piece was welded on for the streamlined front.

I started with the frame risers. Using my scale drawing I cut some 0.032-inch brass sheet to the profile and soldered some mounting strips to the top. Slots and holes were made to accommodate the valve linkage (**Photo 68**).

I then made a template out of card stock to use for my floor (**Photo 69**). I had a

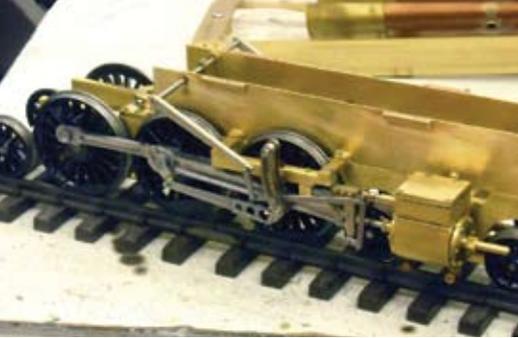


roll of thick gasket material that worked great for the half-tube. I taped strips of card stock on the front to get an idea of the curvature and length (**Photo 70**).

The templates gave me the exact size I needed to cut my pieces. I wanted these to be substantial, so I used 0.050-inch sheeting, which needs to be annealed for bending. The rear bunker on the prototype had a huge hatch, covered with six doors, which I was afraid would affect the rolling out of the piece after cutting the openings, as the area with the opening would bend at a different rate.

Cutting the hatch detail out after bending would be difficult. So I decided to emboss the detail on the flat sheet in the mill (**Photo 71**) and cut along the lines after the rolling. The line across the bunker was done with a jeweler's saw but it wouldn't work for the horizontal one which was done with a slitting saw in the mill (**Photo 72**).

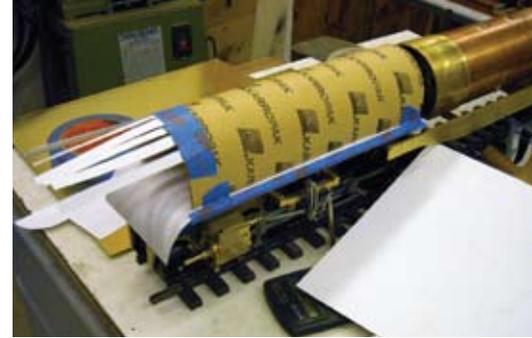
The floor plate was annealed and bent over a pipe in the vise. Headlight holes were cut and 3/32-inch brass



**Photo 68:** Frame risers.



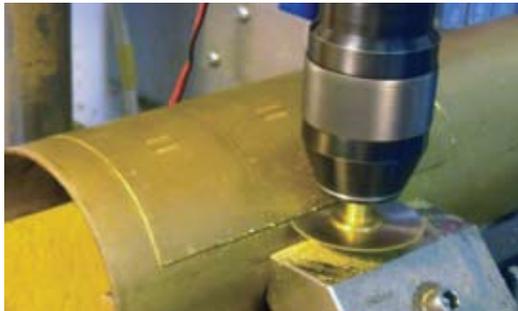
**Photo 69:** Card stock mock up of bunker floor.



**Photo 70:** Bunker mock up.



**Photo 71:** Hatch etchings and hand holes were mill cut.



**Photo 72:** Slitting saw cuts out hatch covers.



**Photo 73:** Floor is mounted to frame risers.

tube soldered to the bottom for the hinge (**Photo 73**).

The headlights were turned on the lathe and then the curvature to match the floor was done on the one-inch belt sander. The lights are wide angle, warm white LEDs with a potentiometer in the forward bunker to adjust brightness for indoor or outdoor running (**Photo 74**).

The annealed 0.050-inch brass sheets were bent to the half tube shape on a roller. The multi-curved bunker fronts were formed from 0.050-inch copper sheet, which bends easier than brass, over a wood former. Several annealings were necessary, as the material work hardens during the bending. The working door on the rear bunker was embossed and cut later similar to the hatches.

The fronts were then silver-soldered to the half tubes. The seams were pretty good and about 80 percent of the seam was just sanded and primed. Adhesive and auto-body fillers such as JB Weld and Bondo were used to fill the small crevasses that were left (**Photo 75**).

### Rear bunker

The rear bunker was the most challenging. The hatch described above provides access to the

hand pump and fuel tank, but because of the curvature of the bunker, the hatch sides came nearly halfway down (**Photo 76**).

This meant that with sloshing of the water, the water capacity would be very low. Because of this, I needed to have risers inside the bunker that would allow me to raise the water level. The problem was that I needed to attach them after the fuel tank was put in and they needed to be easily removable in case I ever needed to remove the tank.

I decided to make them out of 0.032 sheet brass, curve them to match the inside bunker curvature and attach them with industrial-strength glue (E6000), which is strong and waterproof but can be removed.

Because there is a door in the front of the bunker and the lubricator is behind it (**Photo 77**), I had to install a waterproof divider behind the lubricator, which was soldered to the half tube and then the whole assembly was soldered to the floor. I used 1/32-inch Stay Brite Solder and laid strips all of the way around the inside of the bunker. I then heated it from the outside.

If you haven't used Stay Brite Solder, you

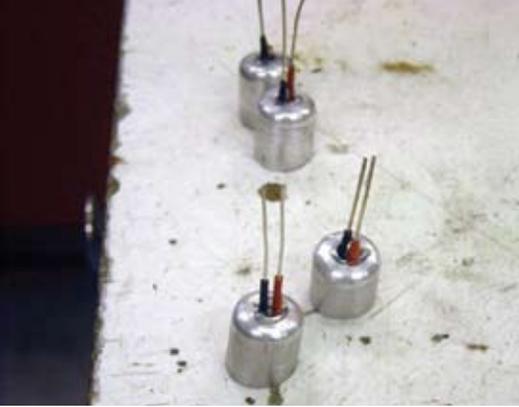
### Streamlined Garratt

**S**teamer Bill Allen prefers unique locomotives and sometimes to get the ones he wants, he must build them. The Algerian Double Pacific Garratt — a streamlined 4-6-2+2-6-4 articulated engine built by Franco-Belge in the late 1930s for the French railroad PLM and discarded during World War II — is one of his more recent projects. This three-part series includes:

- **Part I:** Chassis — Building the two Pacific style frames, cylinders, valves, wheels, axle pump and Cossart linkage.

- **Part II:** Boiler — Making the boiler and smoke box, ceramic burner, cab, accessories and plate work.

- **Part III:** Bunkers — Construction of the bunker, hand pump, fuel tank, headlights, tubing and wiring.



**Photo 74:** LED headlights.



**Photo 75:** Bunkers in progress.



**Photo 76:** Hand pump and fuel tank with bunker hatch off.



**Photo 77:** Lubricator at the front of the bunker.

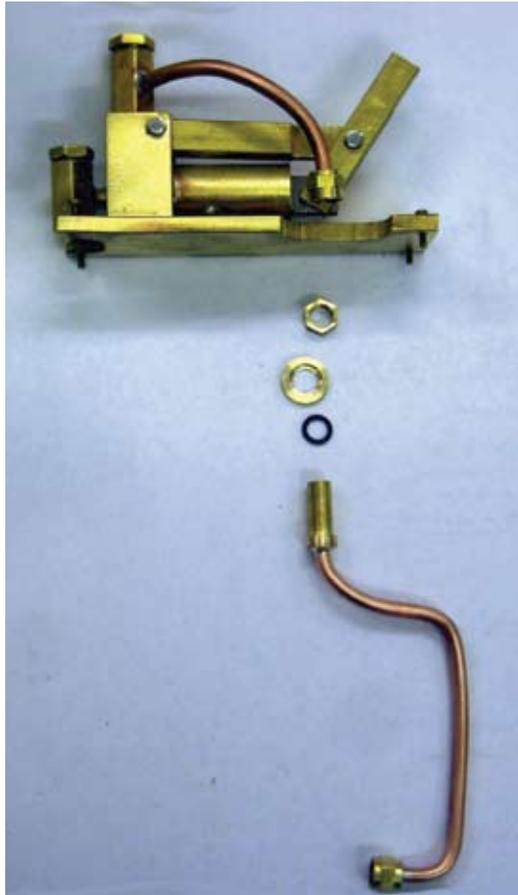
should try some — it is amazing how well it flows. Make sure you use the company's flux too.

The hand pump and axle pump are in series so that the hand pump can clear any air pockets from the axle pump that can cause it not to work.

The hand pump needs to have a sturdy mounting. As the floor is made from 1/16-inch plate, it is thick enough to hold screws. It was drilled and tapped to receive the four 0-80 mounting screws. Sealant (RTV) was used around the holes and on the bolt threads. The line from the hand pump to the axle pump goes through the floor using an O-ring seal shown in **Photo 78**. The offset in the line is to go around an axle.

The fuel tank is a half-tube design — the valve is in the front of the bunker and the knob is disguised as a water-filler hatch. The gas-filler valve is in the rear of the tank and accessible through the hatch doors (**Photo 79**).

There are grab rails on both sides running along the entire



**Photo 78:** Hand-pump components include O-ring seal.

length of the locomotive and on the cab. Because I needed to make many stanchions, I decided to come up with a way to mass produce them. I ground a lathe cutting tool with a rotary tool (Dremel) clamped in the vise and a small cutoff wheel. I made a reverse profile to the stanchion.

In the lathe, I used the tool to form the shape, slide the one-eighth-inch brass rod out, cut the shape, slide and repeat (**Photo 80**). The length was then turned around and the threads were cut on the base. The stanchion was cut off with a jeweler's saw (**Photo 81**).

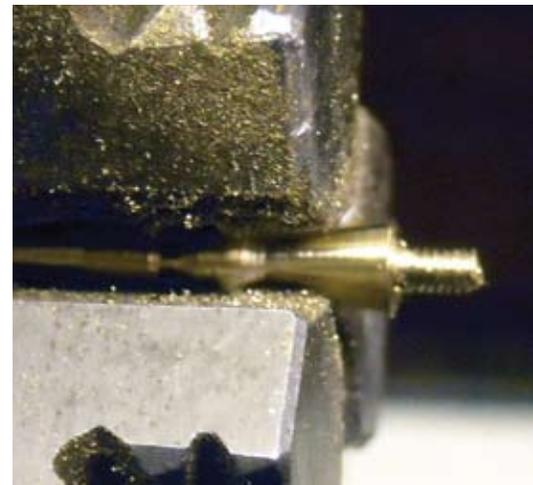
A one-eighth-inch cavity was cut in



**Photo 79:** Hand pump and fuel tank inside bunker.



**Photo 80:** One-eighth-inch brass rod cut to make stanchions.



**Photo 81:** Stanchions are threaded on the lathe.



**Photo 82:** Rear bunker with gas valve, hand rails, ladders.



**Photo 84:** Front view of bunker floor.



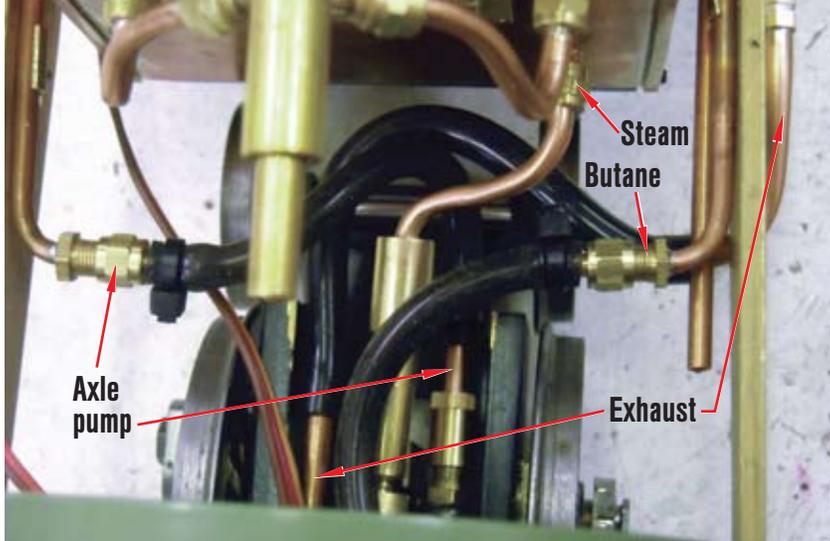
**Photo 87:** Whistle valve, servo shown above.

a scrap piece of brass with a ball end mill (a drill bit would work too). This piece was glued with cyanoacrylate (Super Glue) to the mill vise and was used to clamp the ball end of the stanchion for drilling the 1/16-inch hole for the stainless grab rail (**Photo 82**).

The ladders were made by cutting the rails out of 1/16-inch brass plate and drilling the 0.050-inch holes for the rungs through both rails at a time. The rungs were cut to length and then, on the lathe, the ends were turned down to 0.050 inches. The parts now interlocked for easy soldering.

The tubes and wires that go from the rear bunker to the boiler frame at the articulation point are: Steam supply tube, exhaust tube, feed water tube, fuel tube, reverse servo wires and headlight wires.

The steam line is superheated so it needs



**Photo 83:** Rear bunker fittings under the cab floor.



**Photo 85:** Bunker tilted up shows, top to bottom – battery pack, RC receiver, lubricator, potentiometer, power switch.



**Photo 86:** Throttle servo is mounted on cab floor.

a mechanical connection (dog bone). The exhaust is relatively pressure free, so a silicone tube without clamps is sufficient. It passes through the articulation point and then is connected to a larger tube, that runs along the outside of the boiler frame to the smoke box, as in the prototype. The other tubes are semi-soft silicone tubing clamped to brass connectors (**Photo 83**).

## Front bunker

Differing from the rear, where the rear floor and half-tube are soldered together to form a water tight unit, the front half-tube on the front bunker is hinged at the buffer, and the floor houses electrical equipment and access to the front lubricator (**Photos 84 and 85**).

The radio control operates the throttle (**Photo 86**), whistles (**Photo 87**) and two reverse servos. The receiver and battery pack are in the front of the bunker. There is a electrical box in the rear of the bunker that holds resistors for the LED headlights as well as a potentiometer which adjusts the headlight brightness. The power switch is housed here also. The lubricator is in the center.

The ceramic burner is lit through the smoke box door. Tilting the bunker makes this an easy process. Many of the Garratts had tilting front bunkers to accommodate tube cleaning.

Without plans or drawings, this was a difficult project, but it turned out well and there now exists a 1:32-scale, streamlined Double Pacific Garratt.

## Changing an Accucraft C-16 from butane to solid fuel

# COAL conversion

Text, photos and illustrations by Rob Lenicheck

**O**K, building a coal boiler is not for the faint of heart. But the rewards, in my opinion, far outweigh the “risks.” After all, what’s there to lose except for a few fingers, some singed hair and a bit of copper?

All kidding aside, if you’re into the “dark side” of the hobby, building your own coal boiler is quite rewarding. And if you have the desire to do this, don’t get discouraged by the complexity of the steps to follow in the next few pages. As they say, “How do you climb Mount Everest? One step at a time.”

In this installment, we will begin the building of the boiler. The design itself is pretty traditional but draws input from a multiplicity of reliable sources:

Torry Krutzke of Pikes Peak Locomotive Works, live-steam author Kozo Hiraoka and the K.N. Harris book “Model Boilers and Boilermaking” (Model Aeronautical Press, 1967).

One of the biggest design challenges of building a coal boiler for the C-16 is the fire box. Not only does it have to be long and skinny but it has to straddle the last set of driving wheels.

In addition, coal boilers in our small scale like

to have fire-box depths which have been maximized to help keep the coal burning.

Let’s start by looking at the overall design of the boiler. Referring to **Figure 12**, “Boiler overview,” you will notice that the fire box depth is 1.188-inches between the top of the grate position and the bottom of the flues, a decent amount which still allows for fitting the grate over the last axle. The inside of the fire-box walls hang down 0.200-inches below to help accomplish this.

The steam manifold fitting is at the rear of the boiler but the steam is delivered to it through a dry pipe running from under the steam dome location of the locomotive. The reason for this is that there

is too much turbulence directly over the fire box to deliver a consistent supply of steam. The check valve is located in the cab and the fitting for the valve has a pipe leading off the back of it which delivers the cold water from the axle pump away from the fire box.

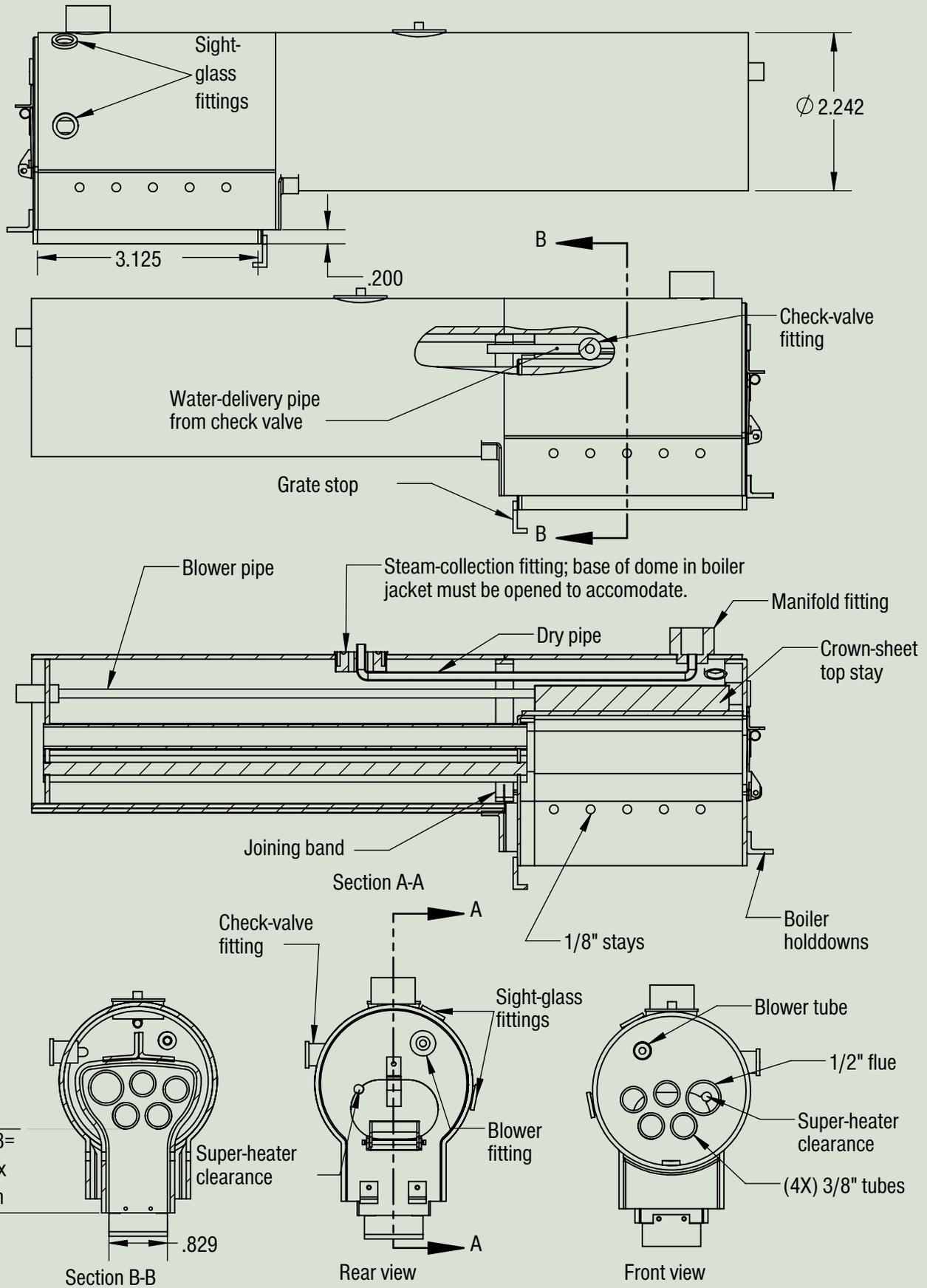
As my previous “experiments” have proven, air draft from below the grate, through the coal and on through the tubes is critical. The Harris

## Coal conversion of a C-16

**R**ob Lenicheck’s Accucraft C-16 ran very nicely once he got it “peaked and tweaked” to his satisfaction. So nicely, in fact, that it grew boring. What to do? Rob, a committed coal-burner, decided that he would convert the engine to “the dark side.” Here’s how he did it:

- **Part I:** Designing the valve gear, disassembly, modifying the frame.
- **Part II:** Starting the boiler.
- **Part III:** Finishing the boiler, pressure-testing.
- **Part IV:** Smoke box, ash pan and grate.
- **Part V:** Steam manifold, fittings, blast pipe.
- **Part VI:** Axle pump & bypass plumbing, water glass, wrapping it up.

# Figure 12: Boiler overview



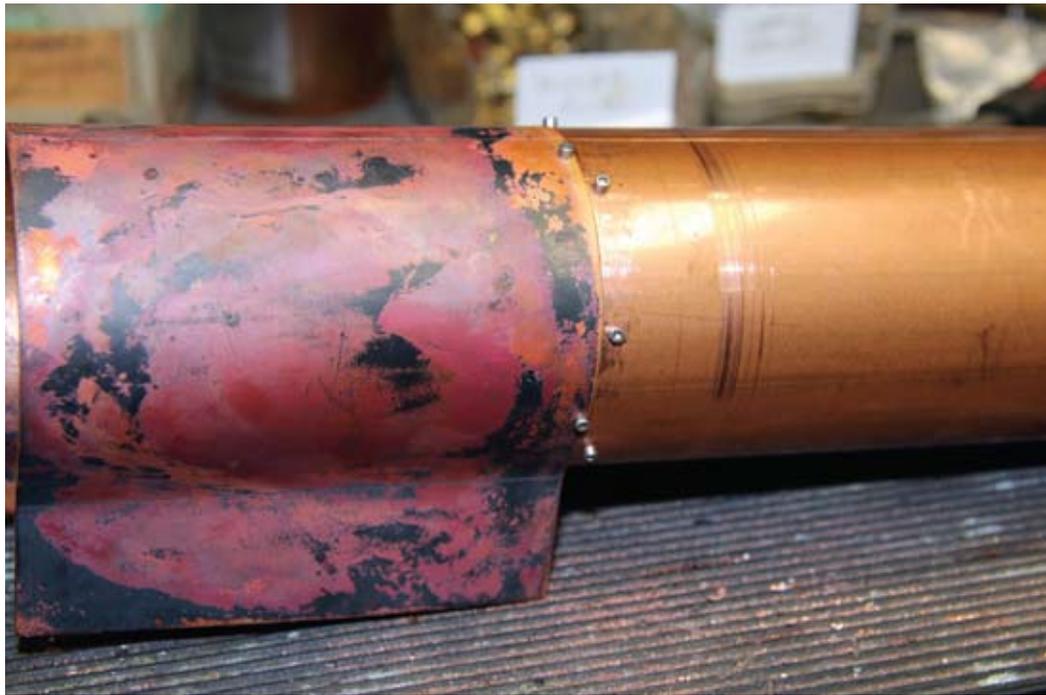
book states that the flue area to grate area should be 1:6 to 1:7. (I conveniently ignored this design suggestion on my first two C-16 boiler attempts.)

This criteria drove the design, which maximizes the diameter of the boiler because of the need for the comparatively large number of flues, but yet is still able to fit into the old Accucraft boiler shell. Thus came the rather odd 2.242-inches boiler diameter, which is what the boiler shell smoke box adapter ring measured on my engine. Since copper pipe producers have not seen fit to make pipe to this exacting diameter we must “roll our own,” but this isn’t particularly hard. The entire boiler is made from 1/16-inch (0.063-inches) copper plate.

If you don’t have one already and you’re serious about building the boiler it’s time to purchase your Seivert torch and silver solder. A Google search finds that Best Materials Discount Warehouse (<http://www.bestmaterials.com/default.aspx>) has all the Seivert heads, handles and parts you’ll need. Recommended are the following (although you need to make your personal choices here) : No. 3488 PRO 88 Dual-Valve Torch Handle, No. 3509 7 Inch Neck Tube, Disposable Propane Cylinder to POL Adaptor with Shut Off Valve, Propane-hose-HP-10C, and the heads 2941, 2942, and 2943 (with perhaps some of the smaller heads for smaller projects).

The J.W. Harris Co (<http://www.harrisproductsgroup.com/>) makes fine products for silver soldering, although they call it “silver brazing” in their literature. Their silver soldering alloys contain no Cadmium, which is a toxic substance and should be avoided. “Safety-Silv 56” works really well on all materials except aluminum (even stainless steel). I use their “Stay-Silv Black Flux” which is designed to be used in high and prolonged heat conditions. Sometimes these Harris products can be obtained at a discount rate on eBay.

When you perform silver soldering you will need



*Photo 7*



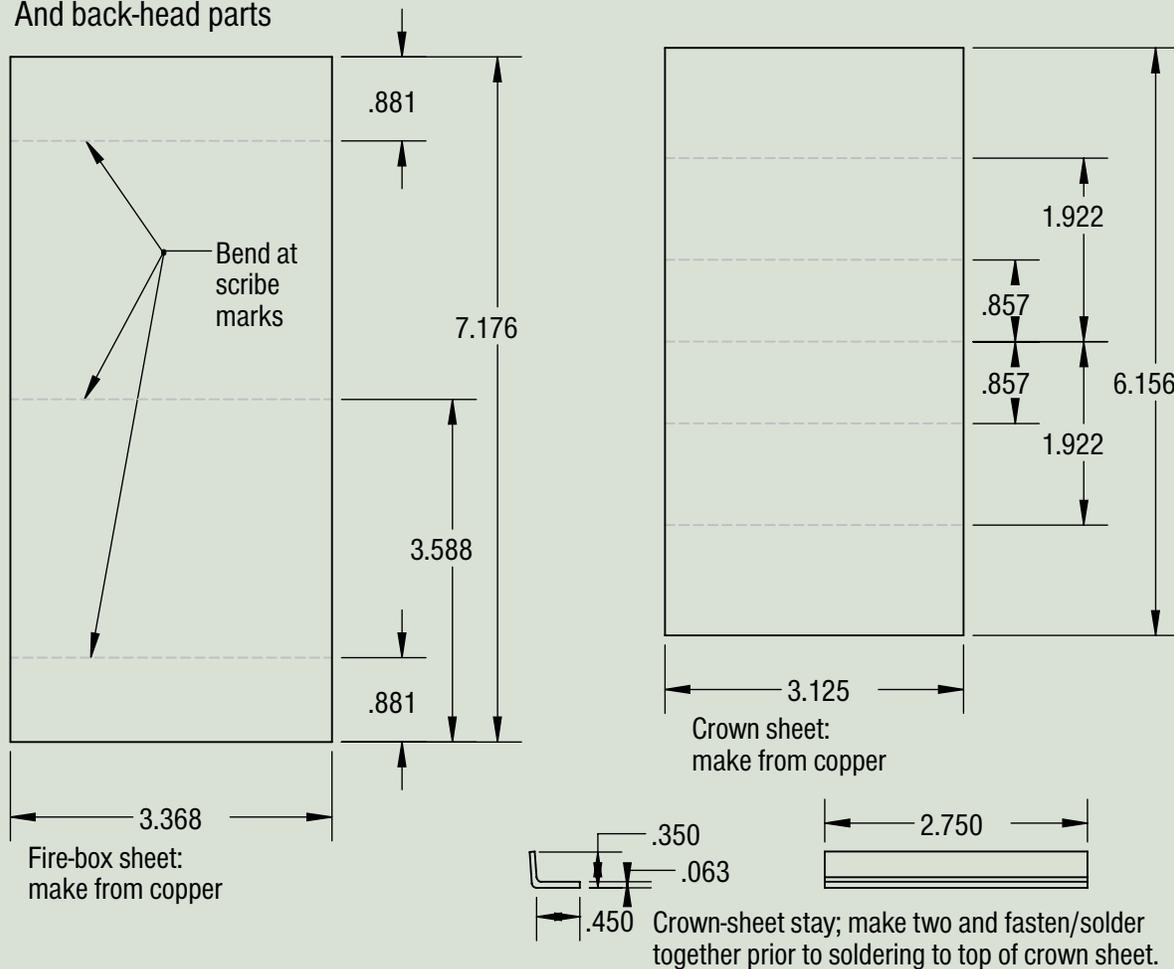
*Photo 8*

to chemically clean the parts prior to the next soldering step. Otherwise the solder will not flow. I use phosphoric acid sold as “Metal Etch” at Home Depot. This works very quickly but it does effect the sheen of the silver joints. Some guys I know use citric acid. This takes a bit longer but it is less caustic.

One more item you will need: fire bricks. These are used to support and insulate the pieces you intend to solder together so you don’t burn down your workshop. McMaster-Carr sells them for about \$10 each.

## Figure 13: Boiler-sheet blanks

And back-head parts



I would get about six to eight to support your work.

Here are the first steps for making the boiler:

**1.** Get started by making the barrel. Cut a sheet of your 1/16-inch copper to 6.7-inches by 7.043-inches. The 6.7-inches is the length; the 7.043-inches makes up the diameter. The sides need to be cut fairly precisely but using Kozo's techniques, little deviations can be fixed. If you have never formed copper before you're in for a treat: once copper is annealed it is very pliable, at least until it work hardens. Anneal the plate by using your new Seivert torch to heat the copper to cherry red and then let it cool. You'll find that the surface may form a black scale which brushes off – this is perfectly normal and will not hurt the copper.

**2.** Using Kozo's bending technique, put the last one-quarter-inch or so in a bench vise and bend the end of the diameter. This allows for a smooth joint at the seam. Bend the rest of the barrel by simply hand-bending the sheet over a 1½-inch to two-inch

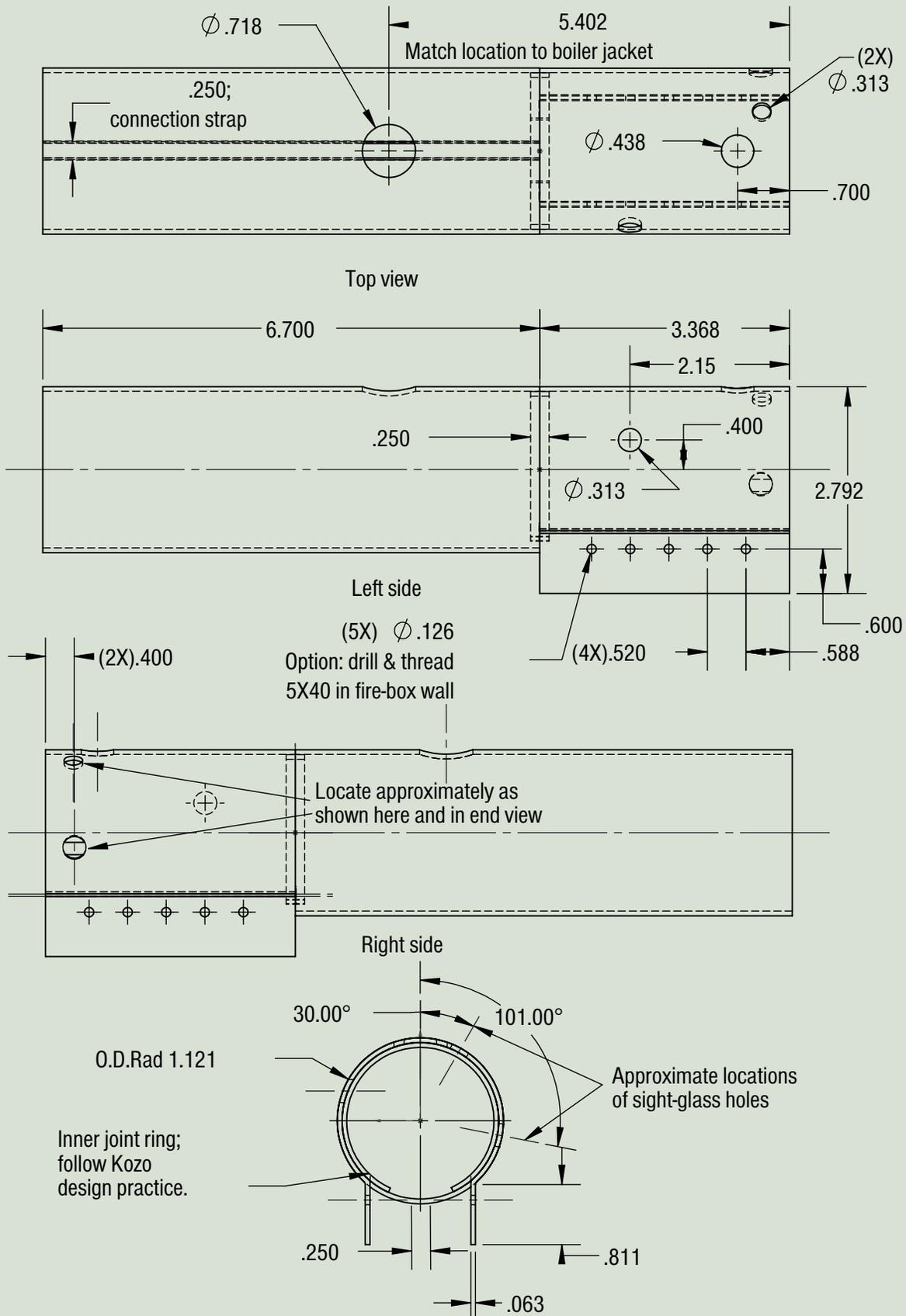
pipe. The goal is to get the two sides together so that they touch each other without any added pressure. Now cut the 0.25-inch- to 0.375-inch-wide strip which will be soldered to the seam to seal it, again using Kozo as an example.

**3.** Having tried and failed several times at making boilers, I have learned that using mechanical fasteners during various stages of the construction greatly improves the probability of success. Mechanical fasteners can be things like copper rivets or stainless screws. Stainless-steel screws, 00-80, work quite well at holding things together prior to soldering and ensure that there will be minimal movement of the joint during successive heatings. Brass or carbon steel screws *cannot* be used for this.

**4.** So, before you solder the seam strip in place, hold it together with your choice of fasteners. At this point it is best to scribe a line from one end to the other along the top of the boiler. This will help with alignment and fitting in subsequent steps.

# Figure 14: Boiler shell

Make from 1/16" copper



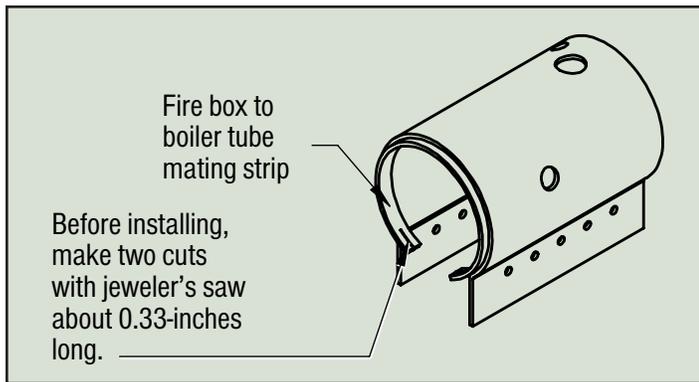


Figure 15

**5.** Another important process step: *Always let the assembly cool naturally rather than dousing it immediately in cold water.* While this is effective, I have found it also can put uneven stress on the previous joints and can help pull them apart.

**6.** The next step is to make the outside fire box sheet which attaches to the back of the boiler tube over the fire box. Referring to the outline of the part on **Figure 13**, “Boiler sheet blanks,” after you cut the copper to size make three scribe marks as shown. These are the marks which will guide your bending. Since you cannot bend the lower sides after the boiler diameter is shaped, bend the lower fire box sides first, again using Kozo’s method. The length of the sides have been made 0.050-inches longer in case your bends are slightly off. The resulting diameter should exactly match that of the boiler tube. See **Figure 14**.

**7.** To mate the two pieces together cut and anneal a piece of one-quarter-inch wide copper strip which is 5.4-inches long. Scribe a line at the halfway point on the strip. Before bending it make two 0.33-inch cuts with a jeweler’s saw at the ends. These will split the strip and allow you to bend part of it down around the throat plate to help the sealing during soldering. (More on this later.) See **Figure 15** for the fire-box sheet detail. Now bend it to match the internal diameter of the boiler tube.

**Photos 7 and 8** show the boiler tube and fire box sheet prior to soldering. Notice the scribe line and the 0-80 stainless steel fasteners. You want to drill and tap the screws prior to soldering. It’s best to solder the boiler tube to the mating strip separately, doing it first.

**8.** Referring to **Figure 16**, “Boiler fittings,” fabricate the steam collection fitting and the steam manifold fitting. *These must be made from bronze.* (Brass contains zinc which will leach out of the brass under heat and eventually cause the boiler to fail.) It’s real-

ly nice to have a rotary table for the mill to do the steam collection fitting. Or you could buy a beer for a friend who has one. Also, make up the clack valve fitting and the two water glass fittings. (The clack valve fitting threads must match your clack threads.)

I have found it very helpful to make the needed holes for boiler fittings to be a light press fit. That way they stay in place while you position and solder them in. If you drill out the holes needed for these fittings before you make them then you can exactly match the size hole you have. The two hole locations for the water glass are not particularly important – a general proximity to the print is sufficient. Note: Postpone drilling the fire-box stay holes until later.

**9.** An important thing to check before drilling the hole in the boiler shell for the steam collection fitting: making sure that the fitting is located precisely within the steam dome of the boiler jacket. In order to do that you first must remove the steam dome base from the boiler jacket and bore it out to approximately 0.85-inches diameter or larger.

Once you’ve done that, reattach the dome base and then slip the boiler into the jacket so that the front of the boiler tube goes into the ring at the front of the jacket about one-quarter-inch or so. (If the boiler doesn’t fit into the ring, it may need to be opened up. Knock the ring out from within the jacket with a piece of dowel and bore it out on the lathe until the boiler fits.) Place the jacket/boiler assembly onto the frame, letting the back of the fire-box sheet clear the back of the frame by about one-half-inch. With a black marker, mark the diameter of the steam dome base on the boiler. This is where you need to place the steam-collection fitting.

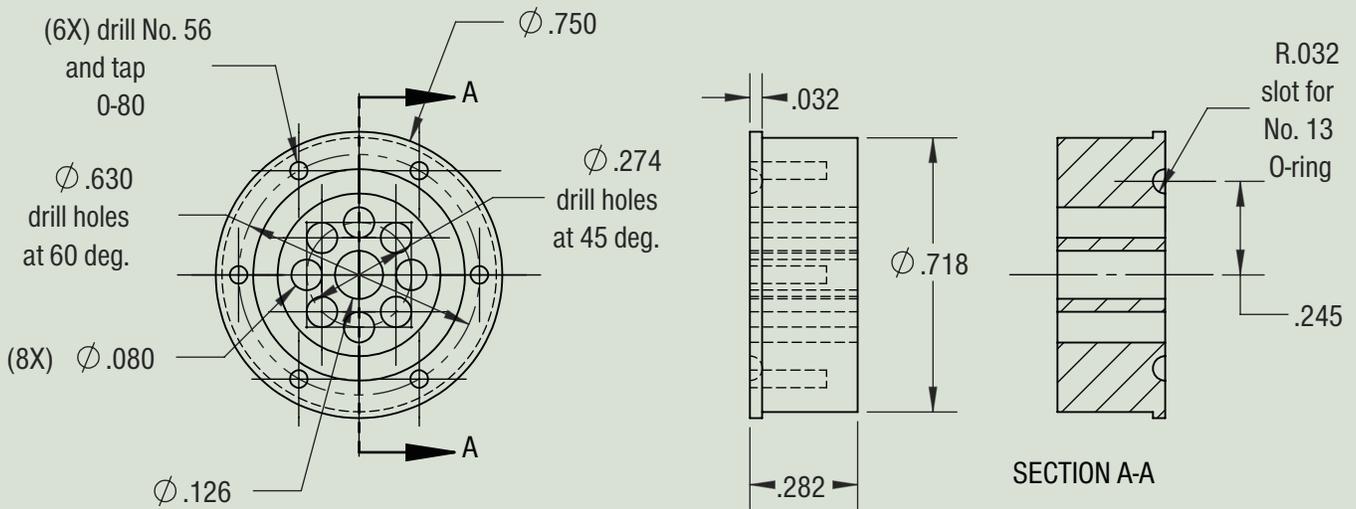
**10.** The one-eighth-inch-diameter dry pipe, which connects the steam manifold to the steam-collection fitting, needs to be soldered into the steam manifold fitting before it’s soldered into the fire box sheet. Also, try to get the bend of the pipe as close into the fitting as possible, even putting a radius at the corner of the fitting where it emerges. The reason for this is because there needs to be clearance between the dry pipe and the crown sheet top stay. Solder the steam manifold fitting into place first, making sure the dry pipe runs into the hole in the collection fitting. The dry pipe does not need to be soldered into that fitting – a slip fit will keep it in place.

Be sure to bend and solder in place a four-inch piece of one-eighth-inch copper tube into the back of the check valve fitting before you solder it into the boiler. (Refer back to **Figure 12**.)

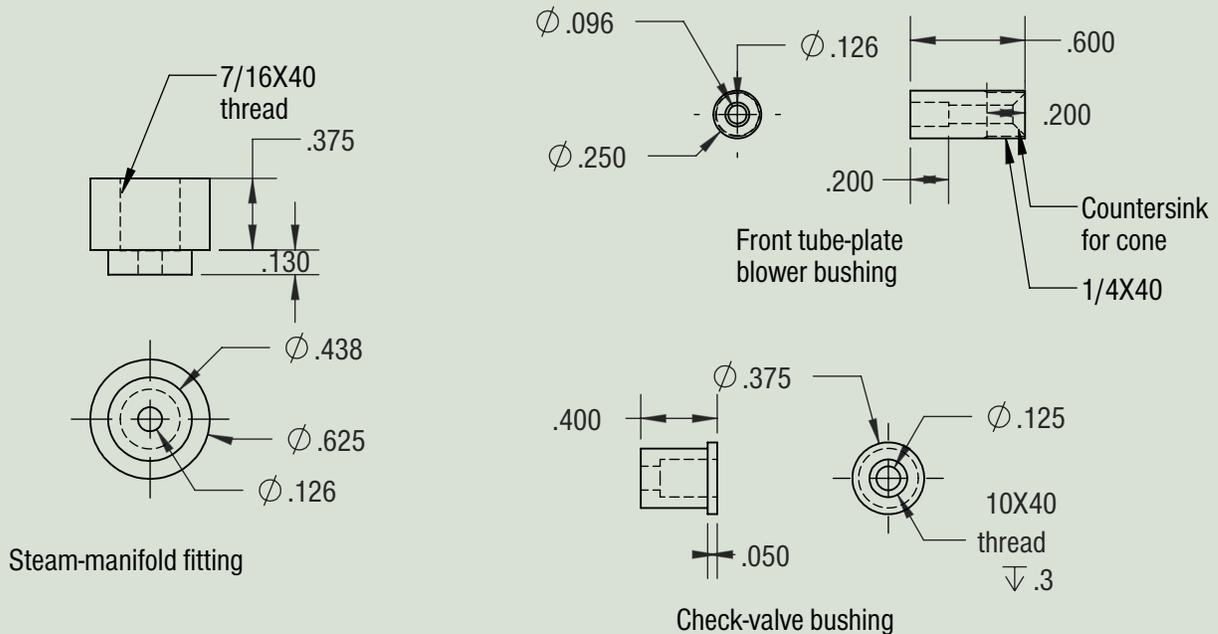
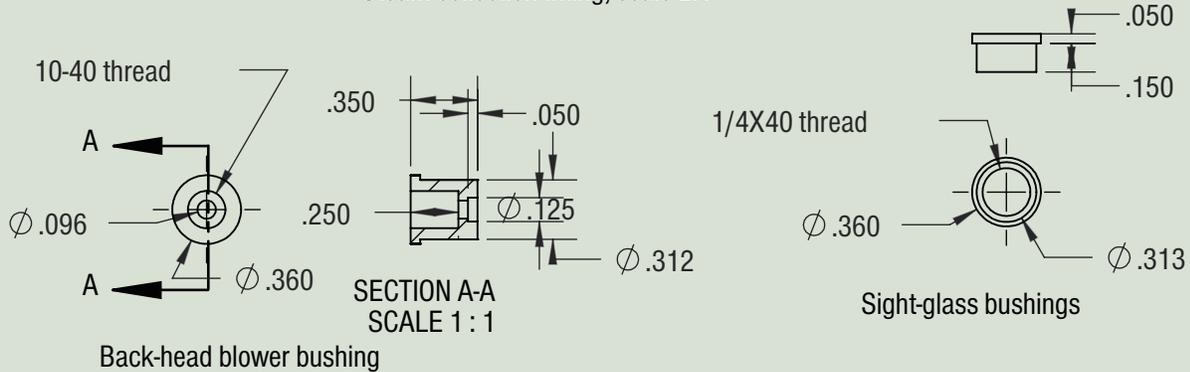
In the next installment we’ll start the real fun – making the flanged parts.

# Figure 16: Boiler fittings

Make from bronze



Steam-collection fitting, scale 2:1



Running, funning at Staver Locomotive's spring steamup

# Portlandia

Photos by Rick Parker



**Proprietor:** *Larry Staver watches a D&RG 2-8-0 navigate a bridge.*



**Narrow-gauge junction:** *Sidings for 1:20.3-scale equipment.*

**W**hile totally unlike the cable-TV series “Portlandia,” Staver Locomotive does share the same setting: Oregon’s Rose City.

Larry Staver’s unique establishment — a 45mm-gauge live steam layout in a refurbished industrial building in the Forest Park/Northwestern District of the city — provides not only a space for operating trains, but also a venue for non-profit fund-raising events as well as a substantial back shop.

The latest iteration of the twice-yearly steamup, held last April 21-24, played host to more than three-dozen steamers and their friends and family.

Larry is constantly adding to and adapting the layout, which ranges both inside and outside the industrial building.

This spring, as in the past, Larry was the consummate host, providing a continental breakfast, as well as coffee and soft drinks each day. A few of Oregon’s finest brews were also offered to guests every afternoon. Saturday evening started off with margaritas and chips and salsa and then finished off with a dinner of enchiladas with traditional sides.

A fine time was had by all.

— dmc



**Advice:** *Jim Gabelich watches over Steve Shyvers.*



**Light oil:** *Bill Wilbanks uses lamp to see adding oil.*



**Pop off:** *Kevin Schindler watches his engine steam.*



**4449:** *A model of the symbol of Staver Locomotive — and Portland's own restored steamer — outside.*



**Little red engine:** Ron Bacon gets a steamer running.



**Turntable:** Michael Williams pushing his engine.

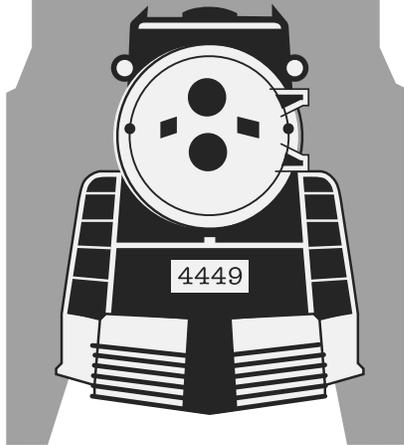


**Big Boy:** Chuck Morton tends to a U.P. X4024.



**East and West Coast steamers in attendance:** Left to right, standing: Neil Simpson of British Columbia, Ryan Bednarik of New Jersey, Paul Hagglund and Harlan Chinn of Washington, Paul Lator of Georgia and Peter Comley of Washington. Sitting: Nick Fisher of Washington.

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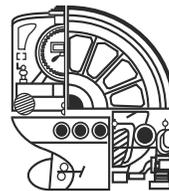
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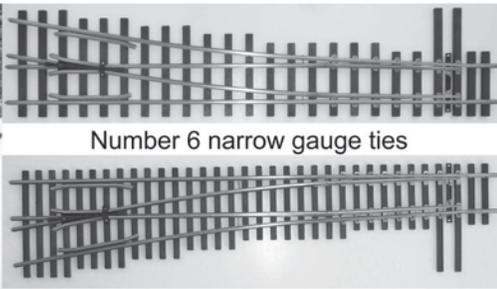
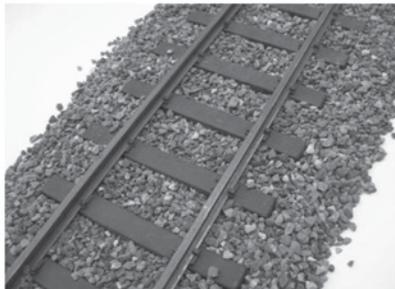
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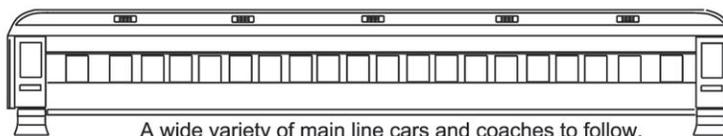
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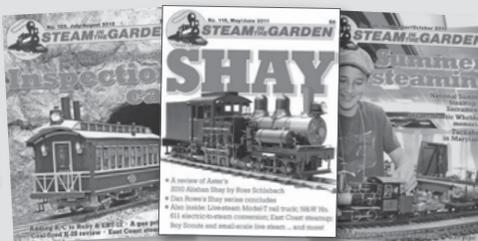
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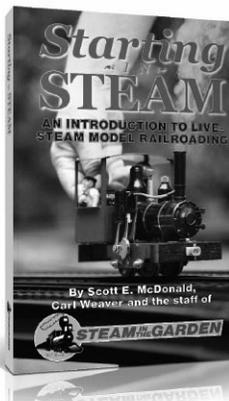
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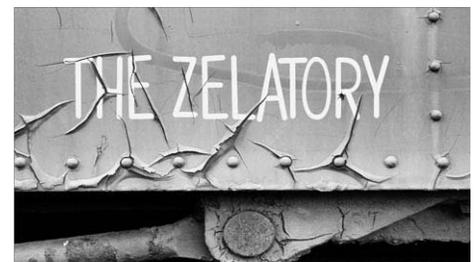
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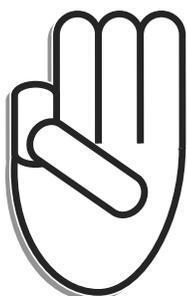
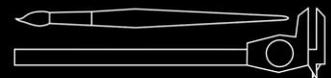


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**July 3-10, 2016** — National Model Railway Association Convention, Indianapolis. In addition to traditional clinics, workshops, modeling contest and layout tours, the Owens Valley Live Steamers will have its portable small-scale layout available. Live-steam info: Charles Mote, [csmote@mindspring.com](mailto:csmote@mindspring.com). Event info: <http://www.nmra2016.org>.

**July 4-10, 2016** — National Garden Railway Convention, Santa Clara, Calif. Self-guided and motor-coach tours of area garden railroads; clinics, vendor hall, speakers, banquet, ice cream social. Steam layouts. Info: <http://ngrc2016.org>.

**July 13-17, 2016** — National Summer Steamup, Lions Gate Hotel, McClellan, Calif. Multiple layouts, more than a dozen loops, 38,000-square-foot steamup hall; open 7 a.m.-1 a.m. Clinics, dealers' room, door prizes, swap tables, Saturday night BBQ. Lions Gate room reservations: (916) 643-6222 (<http://www.lionsgatehotel.com>). Info: <http://www.summersteamup.com> or (650) 898-7878.

**Sept. 7-10, 2016** — Thirty-sixth National Narrow

Gauge Convention. Augusta, Maine. Info: <http://ngc2016.org>. Live steam layout by Owens Valley Live Steamers. Info: Charles Mote, [csmote@mindspring.com](mailto:csmote@mindspring.com) or Bruce Gathman, [shaygearhead@bell-south.net](mailto:shaygearhead@bell-south.net).

**Sept. 15-18, 2016** — Fall Steamup, Staver Locomotive, Portland, Ore. Info: <http://www.staverlocomotive.com>.

**Nov. 25, 2016** — Turkey Trot Run, invitation-only Gauge One steamup. Pennsylvania Live Steamers, Collegeville, Pa. Info: <http://www.palivesteamers.org>.

**Jan. 8-15, 2017** — International Small Scale Steamup and Arts Festival, Diamondhead Inn and Suites, Diamondhead, Miss. Diamondhead Inn & Suites: (228) 255-1300. Info: Patrick Darby, [k5pat@bellsouth.net](mailto:k5pat@bellsouth.net), (985) 867-8695; <http://www.diamondhead.org>.

**Jan. 13-15, 2017** — Cabin Fever Model Engineering Expo, Lebanon Valley Expo Center, Lebanon, Pa. Info: <http://www.cabinfeverexpo.com>.

**Feb. 10-12, 2017** — 19th Annual Presidents' Day Steamup, Electric City Trolley Station & Museum (Steamtown), Scranton, Pa. Info: Mike Moore, [mike@aikenback.net](mailto:mike@aikenback.net).

**March 25-26, 2017** — East Coast Large Scale Train Show, York Fairgrounds, York, Pa. Info: <http://www.eclsts.com> and Mike Moore, [mike@aikenback.net](mailto:mike@aikenback.net).

**April 20-23, 2017** — Spring Steamup, Staver Locomotive, Portland, Ore. Info: <http://www.staverlocomotive.com>.

### Regular steamups

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

**Southern California Steamers.** Contact Jim Gabelich for dates, places and other pertinent information. (310) 373-3096. [jfgabelich@msn.com](mailto:jfgabelich@msn.com).

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

**On the Brink Live Steamers.** Wednesday, and occasional weekend, greater Sacramento, Calif., steamups on elevated live-steam tracks at two locations, as well as special events. Info: Paul Brink, (916) 935-1559, [paulbr@aol.com](mailto:paulbr@aol.com).

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

**Michigan Small Scale Live Steamers (MSSLS).** Info: <http://www.mssls.info>.



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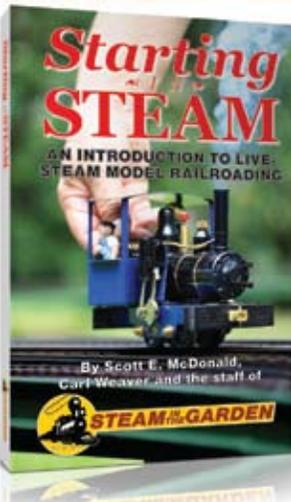
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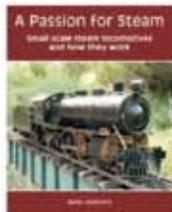
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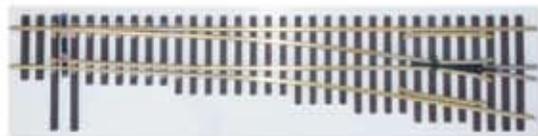


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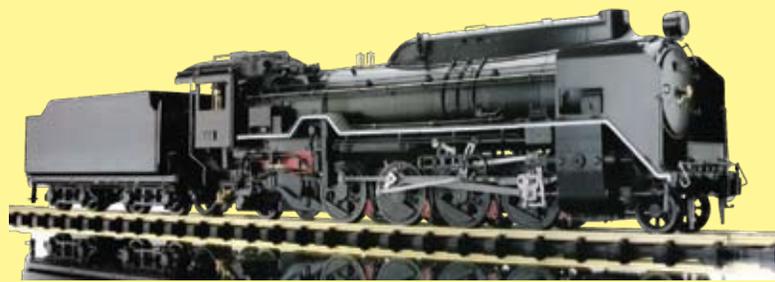
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