

SAGEBRUSH HEADLIGHT

Vol. 33, No. 1
118th Ed.

THE NEVADA STATE RAILROAD MUSEUM
An Agency of the Division of Museums & History
Nevada Department of Tourism & Cultural Affairs

Spring 2012

Restoration of the *Glenbrook*

By Lara Mather, Curator of Education



The Glenbrook ca. June 1882. NSRM Archives

Beginning in 2004, a four part series on the *Glenbrook* appeared in the *Sagebrush Headlight*. The articles gave a brief history of the *Glenbrook* and recounted in detail the first attempt at the locomotive's restoration.

New *Sagebrush Headlight* readers can find the articles on the NSRM website at www.museums.nevadaculture.org. Follow the links to "Newsletters." The articles were published in Fall 2004, Winter 2004, Spring 2005 and Winter 2006.

The Carson & Tahoe Lumber & Fluming Company purchased the *Glenbrook* from the Baldwin Locomotive Works in 1875. Known as *Glenbrook* until 1890 when it was re-designated No. 2, the locomotive hauled cut lumber and cordwood from sawmills in Glenbrook to Spooner Summit.

In 1899 the *Glenbrook* was sold to the Lake Tahoe Railway & Transportation Company, owned by the Bliss Family. In 1900 the locomotive was re-designated No. 1, and began hauling passengers between Truckee and Lake Tahoe, California. The *Glenbrook* ran until 1926 when it was retired and placed in storage in Tahoe City. In 1937 the locomotive was sold for spare parts to the Nevada County Narrow Gauge Railroad and stored in Grass Valley, California. In 1942—like many things made of steel, during World War II—the *Glenbrook* was sold for scrap.

In 1943 Miss Hope Bliss, daughter of Duane L. Bliss, part-owner of the Carson & Tahoe Lumber & Fluming Company, purchased the *Glenbrook* and donated it to the Nevada State Museum. Repainted black and red and placed at the back of the Nevada State Museum, the *Glenbrook* soon became a popular attraction. In August of 1948, the locomotive was moved to fenced display at the front of the Museum. It became one of Carson City's most photographed artifacts.

In 1981 Short Line Enterprises was hired to undertake restoration projects at the Nevada State Railroad Museum. In 1982, after the *Glenbrook* was moved to covered storage at the Nevada State Railroad Museum, the first stage of restoration began. Restoration stopped in 1989, when it was discovered that the brand new boiler costing \$36,500 was the wrong size: an expensive error that could not easily be corrected.

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**NEVADA STATE
RAILROAD MUSEUM**

2180 South Carson St.
Carson City, NV 89701
775-687-6953

www.NevadaCulture.org/museums

Open 8:30 to 4:30 Fridays through
Mondays except Dec. 25 and Jan.1
Admission: \$6. Children under 18, and
members of the Friends of the Nevada
State Railroad Museum, admitted FREE



The museum is an agency of the
State of Nevada

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Tourism & Cultural Affairs

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The Nevada State Railroad Museum
publishes the **Sagebrush Headlight**
newsletter each quarter. The Friends
of the Nevada State Railroad Museum
distribute it as a membership benefit.

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NEVADA STATE RAILROAD MUSEUM
Spring and Summer Events

National Train Day—Saturday, May 12—McKeen motorcar

Memorial Day Weekend

Saturday, May 26—Monday, May 28—Steam Train

Sunday, June 17—McKeen motorcar

Fourth of July Weekend

Saturday, June 30 through Tuesday, July 3—Steam Train

Wednesday, July 4—McKeen motorcar

Monday, July 2 through Wednesday, July 4, 2012

Inyo operating for display

Labor Day Weekend

Saturday, September 1—Monday, September 3—Steam Train

**Special Ticketing and Extended Hours for Memorial Day,
Fourth of July and Labor Day weekends:**

Jacobsen Interpretive Center 8:00 AM to 6:00PM

Annex & Outdoor Exhibits 8:30 AM to 4:30 PM

Train Rides 10:00 AM to 4:00 PM

All-inclusive ticketing (Museum admission and unlimited rides)
can be purchased at the museum admissions desk
or the Wabuska Depot.



This photo is of the remains of the V&T bridge at the north end
of Washoe Valley. The bridge was destroyed during the Washoe
Drive Fire that burned 3,200 acres January of this year.

NSRM photo by John Walker

New Publication Schedule

The *Sagebrush Headlight* will be published three
times a year: April, August and November.

FNSRM President's Message

Well, here it is the middle of winter, but feels more like spring. It is the slowest time around the museum, but that gives everyone a chance to “catch their breath” and get caught up on some of those “hanging” tasks that were left unfinished because of busy time schedules.

First, I want to take this opportunity to welcome Lara Mather back to the museum as the new Curator of Education. So next time you visit the museum be sure to visit with her and make her feel welcome. She is truly a welcome addition to the staff.

This is the first opportunity since the completion of the schedule for 2011 to present an update on how successful the operating season was. It started off with a “bang” on Memorial Day and just got better throughout the year, ending with the most successful Santa Train weekends ever. The total visitation count was up to near record levels during the major weekend activities. The *Friends*, through the Promotions and Publicity Committee, created different themes for each of the major weekends and then carried them out. This approach proved to be very successful. This coming year the museum staff has decided to make changes in themes, so there will be some interesting surprises. Please keep informed and answer requests for assistance in supporting the activities.

I unfortunately have a saddened request for filling the position of Elections Registrar for the *Friends* Board of Directors. Nancy Humphries has filled that position for many years and always did an outstanding job; however, she has now resigned and left the position available. So, if you are interested in it or know of someone who would be interested in it, please contact me at your earliest convenience. Nancy has stated that she will be most happy to assist the new person in performing the duties. In fact, please contact me for a brief job description of the required duties and I will be most happy to forward it onto anyone interested. Timing is of the utmost importance, since solicitations for possible candidates start in June.

Since the deadline is near for getting this in, I must go for now, but please answer as many requests for volunteering as possible, and I will be seeing you around.

—Ronald J. Allen

Spotlight on Cristol Greer

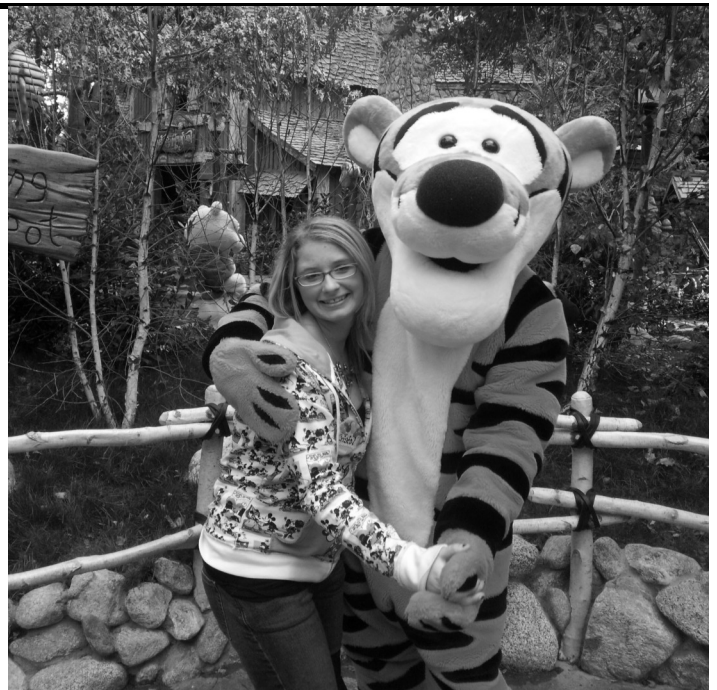
Born in Canada, Cristol moved to Carson City eight years ago from Seattle, Washington. She started coming to the museum when she was 14.

At 16 she started volunteering as a car attendant on the steam train. Cristol recently began volunteering in the museum store and helps with the off-site handcar events.

For her high school senior project she focused on women on the railroad. After she graduates from Carson High School this spring, Cristol will attend Western Nevada College for her core classes.

She will then transfer to the University of Nevada, Reno, where she will complete her education in clinical psychology and early childhood education.

—Christopher Thompson



August 2012 Sagebrush Headlight items are due Monday, July 1.

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More-pressing projects, including the McKeen motorcar, took precedence and the restoration of the *Glenbrook* was shelved.

In 2010 the Nevada Division of Museums and History applied for and was awarded a grant from the E.L. Wiegand Foundation. The foundation is a public-benefit, nonprofit corporation based in Reno. With the McKeen car restored and funds in hand, restoration of the *Glenbrook* resumed in December of 2010.

The restoration team began by cataloging and assessing all parts. Assessment led to four categories: parts to be reused, parts to be repaired, parts to be reproduced, and parts that needed to be replaced because they did not fit the period of restoration. The boiler and firebox were moved to the restoration shop. Their cleaning was the first task to be completed.

As is required by most grants, the restoration team has documented all work done on the *Glenbrook*. Restoration Supervisor Chris de Witt provides quarterly reports that track the progress. During the first quarter, the defective crown-bar was reinstalled with new hardware. The backhead-brace anchors and patch bolts in the door ring were repaired. It was determined that installation of a liner under the boiler wrapper sheet would be prudent. When this boiler was manufactured there was no standardized boiler code to dictate safe and reasonable practice for construction. In 1911 a boiler code was initiated. It grandfathered-in any boiler built earlier.

Although this boiler didn't fail catastrophically, its design is below today's accepted standard of construction. The Museum is in a unique position to make this modification. It will allow easier certification of the boiler when complete, provide for a safer boiler, and increase the life of the artifact significantly - without adversely affecting its appearance or original fabric.

Material to make a liner was sent out to be rolled. A sample of the original wrapper (which dates from 1875) was removed and sent to a testing laboratory for analysis of chemical composition and tensile strength. The results, which were very good, allow for repairs.

A new steam-dome lid was fabricated, heat treated, and sent out for machining. Safety and blowdown valves were ordered. Angle iron was rolled and delivered for the pilot staves. A pilot sword was burnt out and delivered and a hand-hole cover was purchased for inclusion in the barrel of the boiler to facilitate annual inspections as required by code. This innovative application of modern technology will not jeopardize the integrity and fabric of the artifact. The steam dome was set up for repair of the dome-stud holes. The ashpan studs were re-worked and dome studs were machined. Drawings of original backhead valves and fittings were sent out with requests for pattern-making and casting quotations.

During the second quarter of restoration, the Nevada state boiler inspector was invited to the shop to witness the project as work progressed. When the locomotive is completed the museum must obtain a permit for its operation.



Restoration Specialist Mort Dolan, drilling 2" diameter holes in the rear tube sheet for the new boiler tubes. January 2012



The rods have been fitted with new brasses and bolts. January 2012

The inspector was invited now so that he could follow the progress and offer technical advice as needs arise, facilitating the final permitting process.

The fit-up of the liner allowed the restoration team to begin the hot-riveting process. The steam dome and liner were riveted together. Following completion of the riveting of the wrapper, liner, and dome, the sling stays were re-fitted to accommodate the addition of the liner, allowing the installation to be completed. The mudring rivets at the sides were driven-up and the firebox-door rivets were repaired. Steam-dome studs were machined and installed in the dome.

A decision was made to replace all boiler staybolts in locations that will be inside the frame of the locomotive when the boiler is reinstalled. Though the staybolts appear to be within specifications, they are original to the locomotive's construction and access to them would be impossible later without the removal of the boiler from the frame. After staybolt holes were repaired and re-tapped, material for staybolts was purchased, cut to length, heat treated, and machined. Work to renew the threads in the washout and blowdown holes was also completed. Dye-penetrant inspection of the throat sheet revealed a defect that the team was able to weld-repair.



Restoration Specialist Rick Stiver fabricates the new pilot. February 2012

The caulking edges were chipped and ground. The original front tube-sheet was sandblasted and inspected for signs of delamination. It appears to be in very good condition. Although it will require some minor attention prior to installation, it is very serviceable. The smokebox was brought into the shop and set on the cylinder saddle preparatory to laying out the boiler courses. Flaggering of the rear tube-sheet was started and is progressing on schedule.

The *Glenbrook* frame was moved into the shop, cleaned and inspected. A new cab floor milled from ash wood was installed. This will facilitate installation of the Johnson bar, which in turn will facilitate timing of the engine. The piston rods are well worn and show signs of corrosion. They will be replaced.

Because of the limited operation of locomotives at the Nevada State Railroad Museum and subsequent prolonged inactivity, corrosion of certain components is always an issue. To prevent the corrosion of new piston rods, hard-chromed rods will be installed. The material for the new rods was purchased and sent out for machining. The pistons were disassembled and their old rods removed so that the pistons could be cleaned. They await the fitting of the new rods. The valve-linkage components were collected, inventoried, cleaned and inspected, and new pins were machined.

For the third quarter, work on the firebox continued, machine work to apply the new piston rods was underway, and the crossheads were repaired in the shop. Work on building a timing engine, critical to facilitating the valve setting on the steam cylinders, was progressing.



The original stack sits below its replacement.
January 2012

Raw castings for the air pump were delivered to Burns Engineering for machining, and fabrication of a new smokestack was started.

It was anticipated that approximately forty percent of the original fabric and parts can be reused on the new stack. Patterns for castings of cab hardware were completed with remaining pattern work in this area underway. All finished patterns were shipped out for production quotes.

The most recent quarter of restoration saw delivery of a new crosshead reamer which was used to clean crosshead wrist-pin holes. New crosshead wrist pins were turned, heat-treated, and ground. Crosshead wedges were machined and case-hardened. The engine timing was finished and in place, the engine and frame having been jacked up to facilitate installation. Fabrication of the new pilot, including fabrication of the pilot beam, initial fitting-up of the staves and center member (sword) began.

The stack screen assembly has been completed and the stack funnel has been fitted-up and awaits riveting. The inner stack is riveted and ready for installation, the cleanout casting has been received from the foundry and ground for fitting. The funnel base has been flanged and riveted. New valve rods have been machined. Wrist-pin brasses have been cast and are ready for machining. Drawings of the locomotive cab have been sent out for construction pricing.

Materials have been ordered with an eight-week lead time. Drawings for the following have been completed and sent to vendors for pricing: smokebox ring, smokebox door, three-way Westinghouse airbrake cock, starting valve, firebox-door ring, freeze valve, injector check-valve, crosshead pump-cock, half-inch boiler stop-check, rod cups, and cab gong. The tender has been moved into the shop to prepare it for painting. A quotation for painting has been received and the tank is being prepared. Paint details are being recorded and archived.

Compared to other projects completed by the restoration team, the *Glenbrook* has been a fairly easy endeavor. However, two main challenges remain. First, we do not have a correct injector, which delivers water to the boiler. The restoration team will need to build an 1870s injector from scratch. Second, the original boiler jacket was made of Russia iron, a type of sheet iron produced in Russia during the 19th and early 20th centuries. Although its composition can be determined by chemical analysis, little is known about the process that produced this corrosion resistant material.



Volunteer Kevin Owens prepares the steam dome for riveting. November 2011

The *Glenbrook* restoration to be completed in December 2014 will not be to a specific historical appearance, in order to create a spectacular, fully functioning locomotive that is also safe to operate. Great care has been taken to document every aspect of the restoration so that future generations will know what is original, replicated, replaced or modified.



A mock-up of a rear cab-wall helps with joint design and layout. February 2012

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The Museum Store is proud to announce that we are now stocking the wonderful White River Productions line of railroad books.

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Crest of the Continent: (Conway) Item #870006. \$79.95

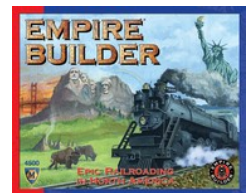
The Colorado Rockies have been home to some of the most dramatic railroad operations in America. *Crest of the Continent* illustrates the Denver & Rio Grande Western as it traversed its home territory in Colorado and Utah. The early chapters of this volume follow the line south out of Denver along some of the original narrow-gauge alignment to Pueblo, Trinidad, and the San Luis Valley. Later chapters examine the rails as they wind through the Royal Gorge, over Tennessee Pass, on to Aspen and ultimately Grand Junction. These 176 pages are a celebration of the glory days of color photography along that most interesting of mountain railroads — the Rio Grande.

The Western Pacific: (Meeker) Item #8700012. \$79.95

In the world of railroading, the Western Pacific was a late bloomer. From the outset, the upstart WP was fighting for its survival, competing against the mighty Southern Pacific which had been firmly entrenched in California, Nevada, and Utah 40 years prior to the arrival of the WP. Opened for operation in 1909, for 73 years, the WP remained a fiercely independent carrier surviving in the shadow of the much larger SP. The WP was divided into seven operating divisions. Each division had individual character, unique operating challenges, and distinct scenic elements providing variety at every corner of the railroad. In addition, the WP also operated two wholly-owned subsidiaries; the Sacramento Northern and the Tidewater Southern. All seven of WP's subdivisions, as well as subsidiaries SN and TS, are documented in the 256 pages of *The Western Pacific*. This spectacular book is lavishly illustrated with 410 full color photographs and 11 detailed maps.

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