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

Summer 2013

Down by the Station, Early in the Morning

What it takes to awaken a sleeping dragon

By Bill Kohler

NSRM Volunteer Locomotive Engineer

Photos by the author or as noted

When the alarm sounds at 4:30AM, the fuzzy brain takes awhile to comprehend why it's being disturbed. Finally the electrical impulses are properly directed, reality focuses, and the body responds. It's an operating day at the museum. After a shower and coffee it's on to the job at hand. By 6AM the crew is ready at the museum annex.

No. 25 requires much more than an alarm to wake up. First we move the locomotive outside: there are no provisions for dissipating smoke indoors. Lighting off must be done in the cold, rain, snow or whatever other treats Mother Nature has in store.

The shop switch engine (the dinky) is coupled to no. 25. A walk-around insures that nothing will obstruct the locomotive's passage out of the building. The Johnson Bar (reverse lever) is placed in the direction of movement, the cylinder cocks opened to allow condensation to drain from the cylinders, the tender brake released, and the safety chain removed from the driving wheels. The dinky takes the locomotive outside. With the tender clear of the walkway it stops, the tender brake is set, the safety chain placed, and the Johnson Bar centered. The hostlers start getting the locomotive ready. The museum's assigned engineer and fireman, assisted by other volunteers, perform this job. In regular railroad service hostlers were employed to serve this function exclusively.

Step one in preparing the locomotive is to check the fuel level in the tender and water levels in the tender and boiler. The boiler must have water before a fire is lit in the firebox. Fuel is checked with a dipstick, and its level recorded in the logbook. Water level in the tender is checked visually. Water in the boiler is checked with the water-glass and the try cocks that feed directly from the boiler at different levels. Next the hostler removes the cover from the smokestack and ensures the atmosphere valve is open. This valve on the steam dome, next to the whistle and safety valves (*top left in photo above*), allows boiler pressure to equalize with atmospheric pressure - more about that later. The smokestack cover is stowed in the cab. The hostler opens the main manifold valve, in the cab at the top of the boiler, so steam can feed various appliances on the locomotive. If there's no steam in the boiler, compressed air is used to atomize the fuel so it will ignite in the firebox. If this weren't done the fuel would dribble out of the burner and puddle on the bottom of the firebox.



No. 25 being readied, with Bill Kohler in the fireman's seat.
NSRM Photo

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NEVADA STATE RAILROAD MUSEUM

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

www.NevadaCulture.org/museums

Open 9:00 to 5:00

Thursdays through Mondays
except Thanksgiving

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

Brian Sandoval, Governor

**Nevada Department of
Tourism & Cultural Affairs**

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Nevada State Railroad Museum

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and Editor *Sagebrush Headlight*

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distribute it as a membership benefit.

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Address *Friends* correspondence to:

Friends of NSRM

PO Box 1330

Carson City, NV 89702

2013 Summer/Fall Operations

TC&GB Ry. **Edwards Motor Car no. 401** will operate
every **Saturday & Sunday** through **September 29**,
departing from Wabuska Depot, 10:00AM till 4:00PM,
except when the Steam Train or McKeen Car is operating.

Edwards Car Fares: \$4; Children 4-11, \$2

McKeen Car/Steam Train Fares: \$8; Children 4-11, \$4
FNSRM Members ride half-fare with Membership Card.
Combination Admission/Train Tickets for special events

Independence Day Weekend

Wednesday, July 4 through Sunday July 7: Steam Train

Labor Day Weekend

August 31, September 1 & 2: Steam Train

Nevada Day Holiday

Saturday, October 26: McKeen Car

The next 2013 *Sagebrush Headlight* will be published in
November. Deadline for submissions: **October 14.**



Riders and crew on the 12:15 PM McKeen car trip of May 27 got
more than they bargained for. After three times around the loop
it was time to head back to Wabuska depot. Car no. 22 had
other ideas, however. When the drive wheels reached switch 8 it
couldn't decide which way to go and ended up splitting the
difference, bringing the trip to an abrupt halt.

A quick evaluation and an explanation to passengers allowed a
safe and orderly evacuation of the car and short stroll back to
the station with no complaints from patrons. After all, how often
can anyone say they were involved in a derailment? Passengers
exiting the car were directed past the offending drive wheel so
they could see what the problem was.

After the passengers were clear, we went to work under direction
of NSRM Curator of History Wendell Huffman. About 2½ hours
later the car was back on the rails: a good ending to an
unexpected problem. Chris de Witt, the museum's Restoration
Supervisor, likens derailment to a flat tire; but the skills needed
to fix it are a bit different.

— *Bill Kohler, Conductor*

FNSRM President's Message

June is here and well underway. The next big weekend is the 4th of July. Let's hope that it is a big crowd drawer. However, the Inyo will not be running during that celebration. We will have the regular steam train operations and the McKeen car will be out on exhibit. There will be some special displays for the public to enjoy.

A very special event is planned for that time though. We will be celebrating the 100th Anniversary of Locomotive # 27. We will have tours of it and a special cancelled cache available. This is the 3rd in the series of spotlighting the equipment displayed at the Museum. The cache will be for sale all four days. However, the special cancellation will be on the 4th during a special ceremony.

During the June meeting of the Board of Directors of the **Friends**, it was decided to postpone the Capital Campaign for Locomotive # 8 after meeting with our Accountant/Auditor and a few potential large donors. They advised that due to the current conditions that we should wait for a year or so until conditions improve. Therefore, we will not be launching that campaign at this time. We will continue some exploratory research during that time, so that we will be ready to launch it when the time is right.

Here is hoping that we see you this summer. Please visit the museum and be sure to say hello to the volunteers. After all, it is those dedicated folks that keep everything running smooth. See you soon.

Yours truly,
Ronald J. Allen,
President

CALL FOR CANDIDATES

Help support the Friends and the Nevada State Railroad Museum!

The 2013 elections for the Board of Trustees of the Friends of the Nevada State Railroad Museum are upcoming. Supporting the Museum and the Friends volunteer activities is vital to the life of our museum. Get involved by serving on the Board of Trustees. Each year 3 of the 9 Trustee positions are open for election. A term is for 3 years, with board meetings held 6 times per year. We invite you to submit a short resume for candidacy for the Board elections. Include your name, mailing address, phone number and e-mail address. Please include information about your interest in railroading, any NSRM volunteer participation, and why you would like to serve as a trustee.

This will be the only notice of Resume Invitations sent this year. Please act promptly.

Send resumes to:

David Brambley; Registrar Friends of the NSRM
2016 State Lane
Big Bear City, CA 92314

Or e-mail resumes to **VTRRLoco18@aol.com**

All resumes must be received by the Registrar no later than Saturday, August 31, 2013.

Thank you for your support of the NSRM and the Friends.

— David Brambley, Registrar, Friends of NSRM

The State Legislature has restored Museum staff to full-time, allowing NSRM to be open to the public **Thursday through Monday** starting **July 4**. Other State museum schedules also expanded. The Nevada Historical Society is open Tuesday through Saturday, and the Nevada State Museum—Carson City is open daily except Monday. The East Ely Railroad Depot Museum was authorized a second employee and is to be open daily.

Continued from Page 1

If the fuel could burn in that condition it wouldn't be efficient enough to boil water in the boiler in a timely manner. The air provides an artificial draft, using the blower nozzle located in the smokebox directly beneath the stack. A hose fed by an auxiliary air compressor is used for this method. Before lighting the fire a drip pan is placed under the firebox to collect fuel leakage. The firebox is inspected for foreign objects or signs of boiler leakage. If all is okay, and air is supplied to the locomotive, the hostler assures that fuel valves from the tender to the burner are properly set. A solvent-soaked rag is lit and tossed into the firebox to ignite the fuel to be released. The hostler opens the firebox damper, opens the blower valve in the cab to create a draft through the boiler tubes, shuts the firebox door and opens the atomizing valve, controlling the flow of oil with the firing valve.

In a few seconds the fuel ignites and the hostler adjusts the atomizer/blower combination to the proper air/fuel mixture and intensity of the fire. If the locomotive is cold, a very low fire is best. To avoid undue stress on the boiler, the mass of metal needs to expand gradually as it heats up. From the time the fire is lit until the water is boiling is about two hours; half that, if the locomotive is still warm from the day before. After a stable spot-fire is established, the focus shifts to oiling around.

Steam locomotives need fuel, water and lubrication in order to operate properly. Without liberally applied oil, the many tons of moving parts would overheat from friction and soon fail. Two types of oil are used: machine oil for areas not subjected to high temperatures and steam oil where things are likely to get hot. Steam oil is formulated to avoid breaking down and forming carbon when exposed to high temperatures. It's more expensive than machine oil and is used only where needed. There are dozens of points to lubricate. Knowing where they are and the type and amount of oil to use comes with training and experience. Everything from driving wheels to the bell needs attention, and not only when the day begins. At station stops throughout the day the crew will add oil and check bearing temperatures to insure proper lubrication.

The air pump, which supplies compressed air for the brake system, requires lubrication on both its air side and steam side. A small reservoir on the

pump supplies the air side. A hydrostatic lubricator located in the cab oils the steam side of the air pump (and the locomotive's steam chest) and does so with no moving parts. It condenses steam to water that displaces oil in a reservoir on the lubricator. The displaced oil is fed where it's needed by adjusting individual valves. Pressure must build up in the boiler before the lubricator will operate and oil will flow to the lubrication points. The lubricator reservoir can be filled before steam is generated. The dynamo, a steam-driven electric generator, also needs lubrication. Its steam-turbine side takes steam oil; the generator uses machine oil.

While lubricating, the hostler also looks for loose or broken parts, tools left on the locomotive from previous repairs, or anything else to attend to. The fire is monitored to insure proper combustion.

When the boiler water begins to boil, condensed steam escapes the atmosphere valve on top of the steam dome. After a few minutes to purge air from the boiler, the valve is closed. Once the steam gauge in the cab shows 15psi (pounds per square inch) of pressure the air hose is removed. Then the locomotive blower and atomizer can be fed with steam from the boiler, increasing the efficiency of the fire. Besides heating the oil, the expansion properties of steam atomize the fuel more effectively than compressed air does. After switching from air to steam, the fire must be monitored more closely. As steam pressure builds in the boiler the atomizing and blower valves need to be adjusted.

With pressure in the boiler and steam feeding the hydrostatic lubricator, the injectors can be opened to warm up and be ready for operation. The injectors feed water from the tender to the boiler to replace water that has been converted to steam and used by the blower, atomizer, air pump, dynamo and cylinders. There is an injector on either side of the cab. The most important job of the engine crew is to insure proper water level in the boiler. Not doing so can result in boiler damage, or even catastrophic failure.

The injector may be the most mysterious and intriguing appliance on the locomotive. It manages to pump water into the boiler with no moving parts other than valves, and it does so by using steam

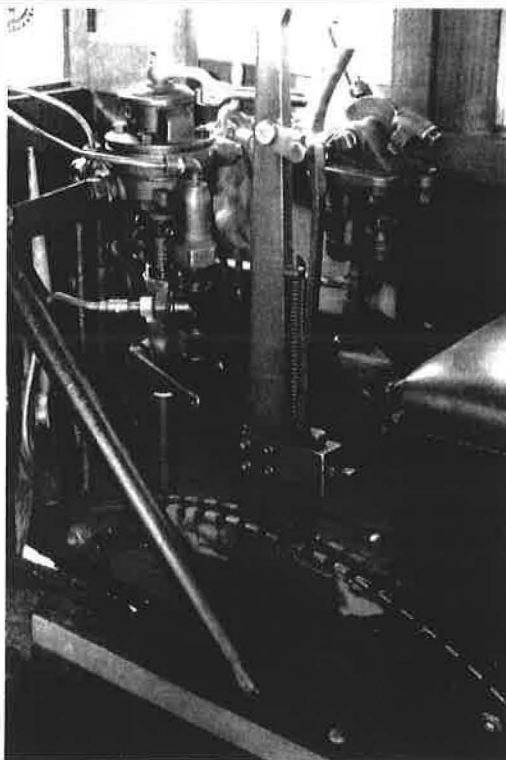


With atomizer (in left hand) and firing valve (rt.) Volunteer Kevin Owens regulates fuel-oil flow.



Hydrostatic Lubricator

from the boiler. You Think "150psi can't push water into a boiler that has 150psi. If the pressure differential is zero, nothing will happen." The secret is something called the latent heat of vaporization. When water is heated to boiling, additional heat must be added for that water to become steam at the same temperature. When steam from the boiler mixes with cool water from the tender the steam condenses, and the heat added to convert boiler water to steam is recovered. Heat imparts kinetic energy to the feed water, in the form of velocity. This energy opens a check valve on the boiler, and in flows the feedwater. Simple, right?



Johnson Bar. Note toothed quadrant.
Russ Tanner Photo

About an hour after steam starts showing at the atmosphere valve, the locomotive is nearing its operating pressure of 150psi. Pressure in the boiler is allowed to build until a safety valve opens on the steam dome. The safety valves are set to relieve the boiler of excess pressure and are monitored to verify that they're working. The time and pressure at which they open are logged. An injector is started to feed cool water into the boiler to drop the pressure and allow the safety valve to reseal. The fire is adjusted accordingly.

With the boiler at operating pressure it's time to start the air pump. First the hydrostatic lubricator is set to feed oil to the pump. The steam valve is opened enough to allow the pump to cycle slowly and heat up. There are drain valves on the pump's steam cylinder to allow removal of condensate until the pump warms up. When the drain valves show dry steam they're closed, and the pump's speed increases. Pressure of 90psi is needed to release the air brakes. The pump will operate until it fills the reservoir to correct pressure. Then it cycles off until pressure in the system drops. When pressure is established the engineer cycles both the locomotive brake and the train brake to insure they function properly.

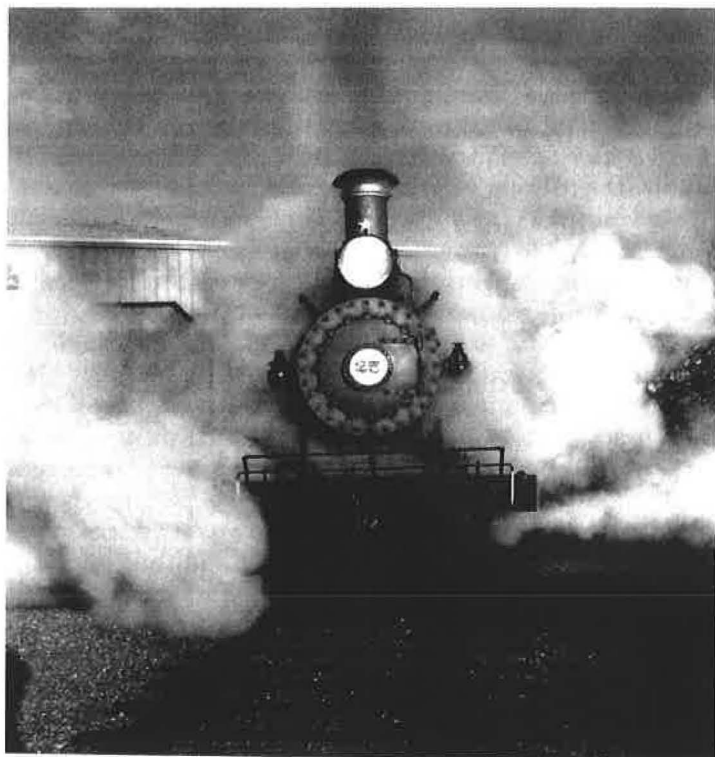
The oil cans are refilled and returned to the cab so lubricants will be available later. The sand dome is checked, as is the sand box at the front of the tender. Sand from the dome aids in traction. The supply on the tender is used as needed to sand the

flues. The draft of the locomotive at speed will carry sand poured into the firebox through the boiler tubes, scouring off built-up soot. Dirty tubes lead to poor heat transfer and high fuel consumption.

Before departure the engineer applies the brakes, makes sure the cylinder cocks are open and sets the Johnson Bar to one end of the quadrant. He cracks the throttle to heat up the cylinders and to blow condensate from the steam lines; then repeats the process with the Johnson Bar at the other end of the quadrant. The dynamo is started and the headlight and backup light checked. The dinky is moved away, the turntable lined up, the tender brake released and the safety chain lifted. A walk-around is made and the conductor signals to proceed. With two toots of the whistle

and a ringing bell, the locomotive moves onto the turntable.

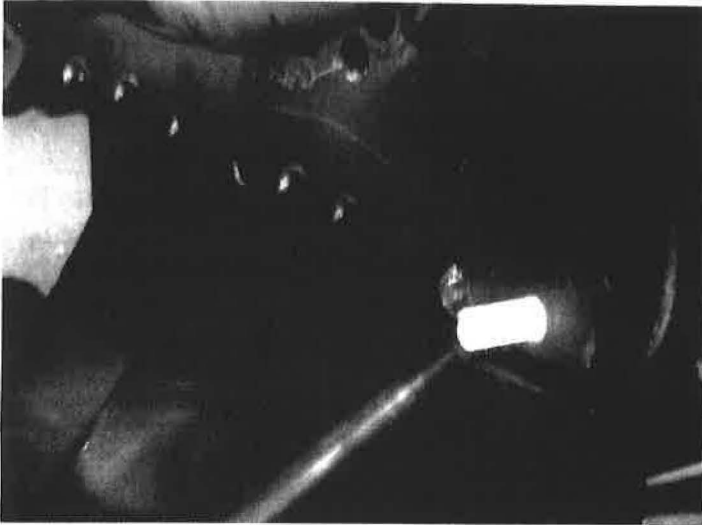
If all has gone well, it's taken about three hours to awaken the dragon and send her on her way. If you'd like to see the activities firsthand, show up at 6AM on an operating day. You may get put to work!



Recent activity in the NSRM restoration shop has included the continuing work on the *Glenbrook*, maintenance on No. 25, track work, and other duties.

In this report, Railroad Restoration Supervisor Chris de Witt outlines work that's been accomplished, is ongoing, or is to be addressed in the near future. Besides de Witt, shop personnel include Railroad Restoration Specialists Rick Stiver and Mort Dolan.

The riveting of the *Glenbrook* boiler has been completed with the driving of approximately 750 rivets. Following the completion of riveting the edges



of the plates were caulked. The braces were fitted with new wedges and pins and installed. The front tube sheet, which had been removed to facilitate riveting, was reinstalled. The dry pipe has been installed and boiler plugs have been made and applied. The *Glenbrook* is now ready for tubing as Mort has finished reaming the tube sheets. Following tubing, the boiler will be hydrostatically tested.

The cab, being fabricated by Custom Manufacturing in Sparks, Nevada, is nearing completion. Regular inspections are being made by the shop staff and the work is found to be quite satisfactory. The process of timing the engine has been completed. The installation of the balance of the running gear is pending. Ancillary components have been restored or reproduced as warranted. The ash pan has seen extensive repair. Two of the four grate sections have been fabricated and two have been repaired.

New castings for the smoke box front and door have been received. They will be sent out for machining shortly. The new fire box door and ring castings have arrived and are being fitted at this time.

A myriad of smaller castings have been delivered and are in various stages of machining.

Locomotive no. 25 was determined to have defective tubes by the boiler inspector during the 2012 spring inspection. He allowed us to operate on the tubes during the summer of 2012 with the caveat that we replace them prior to the 2013 operating season. To that end no. 25 has a new set of tubes and is currently under hydrostatic testing.

The piston and valve-rod packings have long been problematic for many years. During the winter the piston rods were removed from the pistons. The rods were then sent out for hard-chroming. Electronic Chrome and Grinding, Inc., of Santa Fe Springs, California, graciously donated several thousands of dollars in service to grind, plate, and re-grind the piston rods. The rods have been fitted with new mechanical packings machined from Teflon-filled bronze. The valve rods were replaced with hard-chromed hydraulic piston-rod stock. They too received new mechanical packings.

Before the boiler is lagged and jacketed we will invite the boiler inspector to witness the safety valves and perform an external inspection while under steam.

Rick and Mort replaced the wood timbers in three of the railroad crossings. The timbers are re-sawn turntable timbers that were removed when the turntable was rebuilt. They have also laid the majority of the third rail which allows for the operation of the *Glenbrook* when finished and for the operation of any narrow gauge equipment that visits NSRM. Work remaining in the dual-gauging of the railroad is the switch work, which Rick will undertake this next winter.

The Edwards motor car has been out of service for repairs. On April 14, at the end of annual motorcar training, the car's drive system suffered a catastrophic failure of the hydraulic motor, the component that turns the wheels. A new motor was ordered from the manufacturer. Following a lengthy wait for delivery, installation of the new component required less than a day's work. The motor car returned to service June 15, having missed three school visits and four weekends of scheduled operation.

—Christopher C. de Witt

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NEVADA STATE RAILROAD MUSEUM

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**McKEEN MOTOR CAR # 70 (VIRGINIA &
TRUCKEE RAILWAY MOTOR CAR # 22)**

Carson City, Nevada

**Designated a
NATIONAL HISTORIC LANDMARK**

**By the Secretary of the Interior on
October 16, 2012**

Under the Authority of the Historic Sites Act of 1935,
This site has been found to possess exceptional significance in
illustrating or commemorating the history of the United States for the
benefit and inspiration of the American people.



Chief, National Historic Landmarks Program
National Park Service