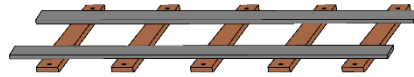


On Track



Vol. 4, Number 1, January 2025

If you are receiving this newsletter for the first time, welcome to the fold! We continue to catalog our visitor logs (some from several years past!), and your email appeared! If you wish to be taken off our list, just let us know, but we hope that you will stay with us, follow us online, and return as a visitor sometime soon. **Additional financial support will never be turned down (maintaining and operating a steam locomotive is expensive)!** Previous editions of this newsletter may be found on our [website](#). If you have comments on the newsletter, please send them to nmheritagerail@nmheritagerail.com or to your humble editor, [John Taylor](#).

FROM THE PRESIDENT:

We still need your support to help us accomplish some of the goals we have for the restoration site and the South Rail Yards. As I mentioned in last month's newsletter, we have a critical need to fund some specific projects. An inexhaustive list of projects and costs include:

- PTC hardware \$20,000!
- New driver brake shoes \$10,000
- Concrete work at the Rail Yards \$5000 for public safety
- Metal shipping container (i.e., a conex) \$6000 for on-site storage
- Dumpster service \$2400/year
- New driver brake shoes \$10,000
- ADA concrete work at the restoration site \$2000
- Quincy compressor cylinder head repairs \$2000



I'm going to start with something a bit different this month: an adventure from a recent trip.

In the spirit of international outreach, during a December family trip to England, Henry Roberts and I (along with the rest of the family), spent an awesome morning with Mr. Richard Parrott and his wife Mary. But first I should give a bit of background. The meeting was precipitated by my wife, Patti, reaching out to the Charles Burrell Museum. Taking a sentence from Wikipedia: "The Charles Burrell Museum is a museum in Thetford in Norfolk, England, dedicated to steam power and steam transport." The museum is housed in the paint shop of the former Burrell & Sons steam engine manufacturing facility that closed in 1928. Although there are no steam locomotives in their collection, they do have land locomotives, better known in the states as traction engines.

My wife, Patti, contacted them about visiting their museum, our involvement with 2926, and our interest in steam-powered equipment. Unfortunately, the museum is closed through the winter but Sheila Childerhouse, the Chair of the Charles Burrell Museum, introduced us to Mr. Parrott. Richard owns five operating Burrell traction engines. Mr. Parrott is in his 80s and has been around and working with and on steam traction engines his entire life as

part of his life on Fengate Farm in Weeting. We had coffee in their kitchen and talked about a variety of topics (apparently there are several Burrells in New Zealand and Weeting had a big rabbit industry—fur felt, meat, and pelts—and grass seed farms).

We headed outside where Richard had had his farm manager, Matt, and assistants, fire up two coal-fired traction engines for our visit: the 8-horse “Dreadnought” (1902) and the 10-horse “Century” (1877). (The Brits love naming their equipment.) We were invited to take them for a drive and we readily accepted. Henry drove the Dreadnaught about $\frac{1}{4}$ - $\frac{1}{3}$ mile down their driveway and neighborhood road and I followed in the Century while the assistants tended the fire, boiler pressure, and adjusted various valves. It was so much fun and quite an experience! (Their neighbors, who were also trying to navigate the road, took pictures while they maneuvered to squeeze by on the narrow road.) One of their neighbor friends from just down the road, Richard, dropped by and told us that he too had a Burrell but he wasn’t able to bring his down that day.



Henry ready to head out



John at the wheel while Richard (right) sees Century off



John & Henry return to Fengate Farm



Posing with Century (Richard has his back to us watching Dreadnaught)

After we finished our drive, they showed all of us the other three operational, but stored for the winter, traction engines. Also in his collection there is an Allison-Chalmers thresher and one of the Burrells was fitted with a crane attachment. Lastly, we all drove to one of their nearby fields where they have an operable Finnish, 5-ft gauge switcher tank engine that runs on a 1/2 mile of track, an inoperable 2-8-2, #1030, and an inoperable MOW steam crane. There is a huge steam up in Weeting every July with over 100 pieces of steam equipment, scale model displays, and other things for people to do. Maybe it's time to plan a trip to England?!

And now back to our regularly scheduled programming.

Capital Outlay Corner: NMHR has completed their capital outlay requests for funds that are slated for replacing another track leading into the turntable and inspecting and assessing the condition of a couple of the small, historic, stand-alone buildings for future use (i.e., the automotive shop and the washroom).

A big thank you goes out to Bill Reass, our Stadco electrician, who sleuthed and corrected the Genset communication issue. Bob DeGroft and team are now waiting to hear back on whether our 480-V wiring crimps satisfy the requirements. There are just 24 crimps remaining, but we are waiting for that confirmation before trying to wrap up. The hydraulic crimping tool continues to have a difficult time and a rebuild kit is no longer available, but we have been able to work around it so far so that we will be able to make it through the rest of the crimps.

As reported last month, we have a long list of maintenance and refurbishing to do through the winter months. The job board has been populated with the tasks listed below as well as some others on the support car and around the restoration site. There's lots for us to get done so if you haven't been around for a while for lack of work, now's your time to again lend a hand to get 2926 ready for 2025. We are still going to schedule a clean-up day at the

Rail Yards as soon as the weather isn't quite so frigid, probably in the next couple of months, so keep an eye out for an announcement

- Rebuild the fireman's side air compressor (we just started on this one)
- Remove the main boiler inlet check valve assembly and remachine the sealing surfaces
- Remove and repair the leaking injector starter valve unions
- Reset the pressure relief valves
- Make a spare copper gasket for the manway
- Repair the engineer's side mud ring studs
- Replace numerous leaking unions with new ones
- Repack the crank rod on the Worthington lubricator
- Lots of valves to lap
- Finish reconfiguring and reinstalling the piping on the blowdown
- Reconfigure the terminal blow down valve connection
- Complete the adaptation of the original speedometer wheel to use with PTC (a solution that involves imbedded NIB magnets and a Hall-effect sensor)
- And many others!

Save the Date(s): Our Annual Membership Meeting/Annual Safety Refresher/ASU Roundhouse Renderings Presentation is scheduled for 22 February at 8:00 AM. It will be held at the Montgomery Church of Christ, 7201 Montgomery Blvd NE, Albuquerque, NM 87109-1508.

Our 3rd Annual New Mexico Railroad Days is planned for 26-29 September 2025 at the Rail Yards.

Profile of a member: It is really a shame that many of the current workers at the restoration site do not have memories of fun times working alongside one of our earliest and most knowledgeable members, Steve Bradford. Perhaps best known for being one of the inspirations (completely justified as shown below) for the PigPen award. Steve spent many hours in such soot laboratories as the firebox and the smokebox. Although he moved to Oregon in 2016 (presumably after several sequential showers), he is still very active remotely as the recording secretary for the Board.



Steve was born in Woonsocket, Rhode Island, but his early years were characterized by several moves as his father, a textile engineer, relocated the family up and down the east coast, eventually ending up in as a professor of textiles at NC State University in Raleigh, North Carolina. Steve graduated from Raleigh's Needham-Broughton High School in 1963 and entered North Carolina

State in the fall of that year. He graduated in 1967 with a history degree and a Second Lieutenant's commission in the Air Force.

During his military career as an intelligence analyst, Steve moved around the country and around the world. He served in Thailand in the 388th Tac Fighter Wing during the Vietnam era (where his principal memory is drinking at the longest bar in Southeast Asia at the officers' club at the Royal Thai Air Force Base in Korat, Thailand). In 1975, after five more years of active duty at Nellis AFB in Las Vegas NV, ~~in 1975~~ Steve joined the Air Force Intelligence Service Reserve program and began a civilian career while still doing lots of intelligence work as a reservist on weekends.

From then until retirement from the USAF Reserve as a LtCol in 1995, Steve supported numerous active-duty units, including HQ Strategic Air Command Intelligence, the 317th Mil Airlift Wing, US Army 18th Airborne Corp. By 1985 (after a 10-year sojourn in civilian life) he returned to intelligence work full time, as a civilian intelligence analyst at HQ Mil Airlift Command.

During his tenure in the Air Force, Steve met and married Mary, had two daughters (and now has five grandchildren), received a Master's Degree in Public Administration from the University of Northern Colorado. Using his new degree, Steve worked at local and state government jobs, first in 1975 in Dubuque, Iowa, and then in 1980 in Raleigh NC while continuing his weekend warrior assignments.

In 1990, Steve and Mary moved to Albuquerque where he went to work for the Air Force Operational and Test Evaluation Center (AFOTEC) at Kirtland Air Force Base as their senior intelligence civilian. He stayed at AFOTEC until his retirement in 2007.

Steve had been a rail fan since he was a child watching steam locomotives along the various railroads in New England, so it was no surprise that he joined the recently chartered NMSL&RHS after he arrived in Albuquerque. Although he isn't sure, he thinks that his badge is #5, making him one of the founding members of our Society!

Steve's first wife, his beloved Mary, passed away in 2013, and in 2016 he moved to Oregon to be close to his daughter and granddaughters. Oregon has been good to Steve, as he ~~also~~ met and married Patti in 2023 (they eloped to Reno!). While in Oregon, Steve has remained active with NMHR as well as serving as a docent with the Oregon Rail Heritage Center in Portland. It is a non-profit organization which restores, maintains, and operates five steam and two diesel locomotives, numerous pieces of rolling stock and now has recently purchased a small shortline railroad .

Steve visits the 2926 periodically and, as you can see from below, "cleans up good (just not often)." If you see him, a word of warning—if you ask him a question about our favorite locomotive, be prepared for a dissertation! He is famous for answering the question, "What time is it?" with an explanation of how to build a watch!



A short historical note: Normally, this part of the newsletter looks at “ancient,” or at least older, history. However, we have some more recent history that is worthy of note. Just a few years ago, the restoration site was awash in boiler welding tasks, the kind of operation that requires special training and certification. The American Welding Society (AWS) is the nationally recognized organization that sets these standards all around the US. Several years ago, NMHR (then NMSL&RHS) became affiliated with AWS when we needed to have our certification approved for the welding of dissimilar materials on our boiler. We provided examples of our ability to join two dissimilar pieces of metal and sent the test pieces to AWS. They passed with no exceptions.

Back in early spring of this year our CMO, Rick Kirby, received an email notice advising him of an opportunity to be considered for the national Excellence in Welding Award, co-sponsored by AWS and the Welding Equipment Manufacturers Committee (WEMCO). Rick downloaded the application and filled it in. There were several categories to apply for. He chose the Small Business category and returned the application along with some history of how welding was so important to the restoration of 2926. As soon he had dropped the letter in the mailbox, he promptly forgot all about it and returned to the daily frenzy of locomotive restoration.

However, in late September 2024 he received an email advising him that NMSL&RHS was the winner in the Small Business category. They requested he come to Orlando, FL to accept the award, saying they were sorry for the late notice. He advised them that we had a lot going on at 2926, and it would be hard to make it. The representative asked him to set a time for it next year in Chicago and Rick said would surely be there with some slides of the restoration. The trophy arrived in mid-November.

The trophy was awarded to NMSL&RHS (NMHR) during the AWS December general meeting. This is one of the best recognitions of our work here and kudos go out to three of our “super welders,” Danny Rivera, Carlos Osuna, and, of course, Rick Kirby himself. The trophy is on display in the Reefer.



How Does It Work: (courtesy of Steve Bradford) Last month's subject was cut-off. This month's article is about a related concept called Tractive Effort (TE), sometimes called tractive force. TE is the starting force exerted by the locomotive where the driving wheels meet the rails. It is especially useful when comparing the starting power of locomotives. Because of this it was often a component used by railroads to determine tonnage ratings for given locomotive types.

In practice TE is difficult to measure directly. It is calculated using a commonly accepted, standard formula. TE can be used to compare different types and classes of steam locomotives if the same formula is used.

The formula relies on the input data taken from characteristics common to all conventional, reciprocating steam locomotives. These are: driving wheel diameter, cylinder diameter and stroke, and boiler pressure:

$$TE = \frac{C^2 \times MEP \times S}{D},$$

where:

TE = The rated tractive effort at the driving wheel rim (pounds of force)

C = Cylinder diameter (inches)

MEP = Mean Effective Pressure (pounds per square inch)

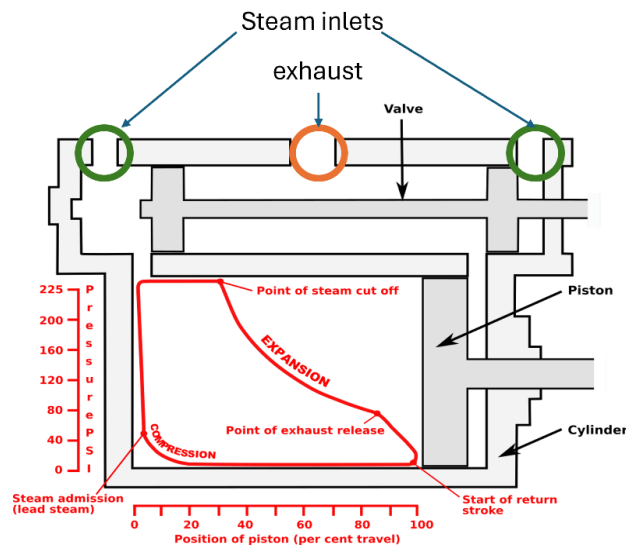
S = the cylinder stroke (inches)

D = driver diameter (inches)

MEP refers to the average steam pressure in the cylinder throughout one entire piston stroke. From the time the valve opens to let steam in until the valve closes (cut-off), the piston is pushed by steam supplied directly from the boiler. It pushes against the piston face with full boiler pressure. When the valve closes, conditions inside the cylinder change immediately. The piston continues to move to the end of the stroke, but now it is not the direct force of steam from the

boiler that is doing the work. Rather, it is the steam expansion derived from the internal energy in the steam. The steam loses pressure as it expands and is cut off from the supply of boiler pressure steam. Thus, at the end of the stroke, steam pressure against the piston in the cylinder has declined substantially.

The diagram below is an indicator diagram, a chart used to measure the thermal, or cylinder, performance of a steam engine. The term “indicator” derives from the steam era before digital electronic sensors and computers existed. In that era cylinder performance was mechanically plotted. An indicator chart records the [pressure](#) in the cylinder versus the volume swept by the piston throughout a stroke. The indicator diagram is used to calculate the [work](#) done and the power produced in an engine cylinder.



However, there were many locomotives designed with artificially limited cutoff in full forward gear (Santa Fe had many such engines, including the 2926). In limited cutoff engines, rather than cutoff occurring after some 80-85% of the stroke, it could be as low as 50%. This reduces MEP in the cylinders when starting and at low speeds, resulting in lower starting TE but substantially increasing the efficiency of the engine at track speeds.

There is no extant test data for 2900-class locomotives, but there is actual test data for #3766 which has identical specifications to 2926 except for a lighter tender. Indicator cards taken during testing with a dynamometer car in 1938 when the new 3766 was starting a train at Pasadena with full throttle shows an actual cutoff of 62.2% when starting, a boiler pressure of 292 psi, and an MEP of between 236 psi on the first stroke and 245 psi on the return stroke (see data published in *The Santa Fe's Big Three* by S. Kip Farrington Jr.). Using this data in the calculation yields a TE of 73,382 lbs., significantly more than the 66,000 lbs listed in most steam-age sources.

On the other hand, the drawbar pull measured at the rear of the tender (by a dynamometer car) was lower at 61,700 lbs. The difference results from friction losses in the engine and tender and the force needed to put the weight of the locomotive and tender into motion from a state of rest.

Next month we will take a closer look at the Santa Fe 4-8-4s, all of which were limited-cutoff locomotives when starting.

Attention ham hobbyists (hamsters??) of the radio, not porcine, variety: NMHR has an FCC-licensed club radio station which is online in the newly refurbished support car. Any hams

that are members (or non-members) of NMHR are welcome to join our club station. Please provide your name, call sign, and contact information to Jon Spargo at kc5ntw@sdc.org.



How you can help and other tidbits: If you are interested in donating to our cause (because operating a steam locomotive is expensive!) go to our [GoFundMe](#) and [Venmo](#) links! Be sure to check out our [Facebook](#), [YouTube](#), and [Instagram](#) pages as well! Other potential sites of interest: our friends at the [Wheels Museum](#) and activities at the [Albuquerque Railyards](#). Please see our Membership page to discover our other volunteer opportunities.

Welcome to 2025!

