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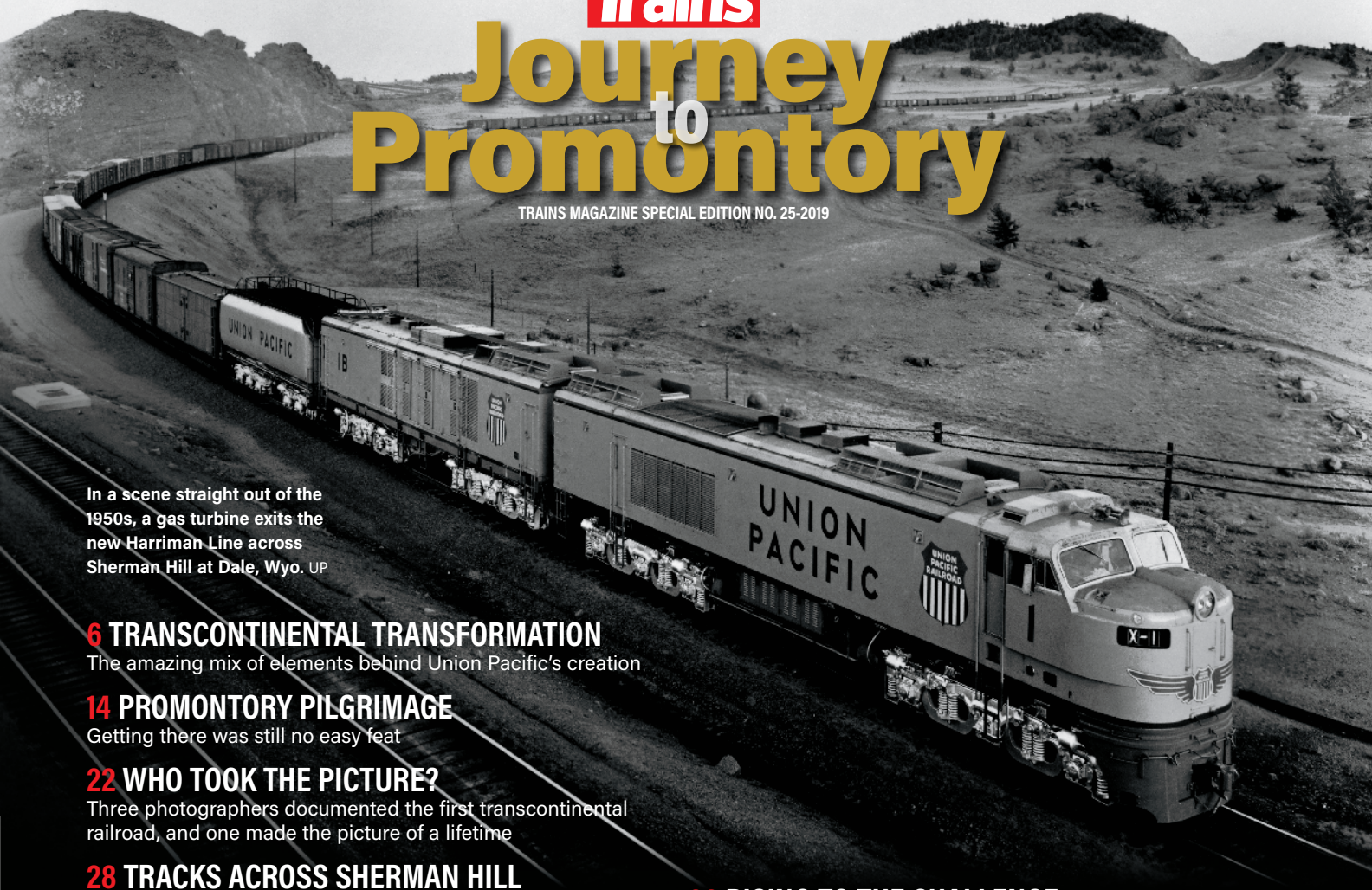

In a scene straight out of the 1950s, a gas turbine exits the new Harriman Line across Sherman Hill at Dale, Wyo. UP

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COVER ***Jupiter*** **meets modern Union Pacific diesel at Promontory.** Photos: Jim Wrinn, Drew Halverson. Tom Danneman illustration

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Uniting the nation, East meets West

May 10, 1868, was reported to have been a lovely day in northern Utah. The weather was favorable, and at Promontory summit, a joyous gathering marked the completion of a monumental task: Building 1,776 miles of railroad between Omaha, Neb., and Sacramento, Calif., the first transcontinental railroad across North America.

Given the weight of this achievement, can you imagine just how hard it must have been for photographer A.J. Russell to get everyone to pause for a moment? But somehow, he managed and the result is the photo at the left, one of the best-known railroad photos and one of the most iconic images in American history.

Today, 150 years later, in these pages, we gather to celebrate the magnificent genius — and just plain hard work — of humanity, in uniting a nation. We salute the tens of thousands of men and women who put forth the tremendous physical and mental effort to build the first railroad across a vast wilderness. And we memorialize those who lost their lives in building the line.

In these pages, we hope you will learn just how ambitious and challenging the seven-year journey to Promontory was. We hope you will become familiar with the key players and the thousands of nameless immigrants who made it possible. We hope you'll come away with a new appreciation for one of the turning points in our nation's long history.

But we don't want to stop in 1869. In fact, the story kept on going after the Golden Spike was tapped into place. The journey to Promontory is one that began in 1862 with President Abraham Lincoln's approval of the Pacific Railroad Act. But it didn't end when the construction was done and the big party took place on May 10, 1869. A railroad has run on this route ever since. It's a successful railroad, and the Union Pacific is one of the nation's largest and most profitable transportation companies. We are pleased that this special issue brings the first transcontinental railroad story up to date: The workers of 1869 would be amazed to see what became of their heroic efforts.

Freight trains don't go to Promontory any more, but they do in spirit every day as they roar across the main line from the Heartland to the Pacific shores. You can feel it as you drive U.S. 30 across the plains of Nebraska and watch the parade of trains there. It happens every time a stack train resists gravity in California's Sierra mountains. And it's there in red rocks of Utah's spectacular Echo Canyon, where trains struggle on Wasatch grade. As it has for 150 years since the Golden Spike, the journey to Promontory continues. Join us on this epic journey of America.

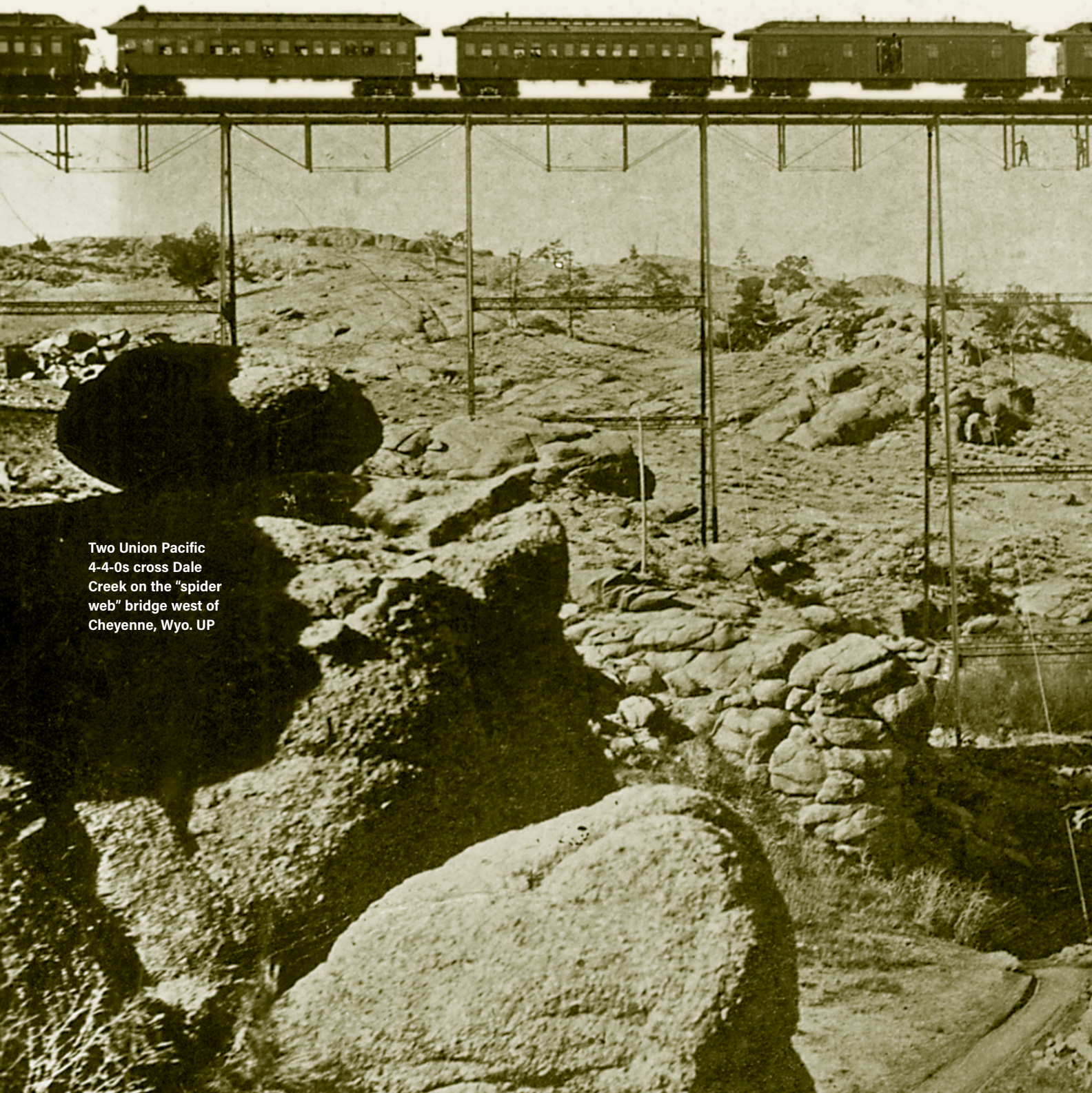
editor@trainsmag.com

"East and West Shaking Hands at Laying Last Rail" is the title photographer A.J. Russell gave this image from the completion ceremony on May 10, 1869. We know it best as the "champagne picture," possibly the best-known image of American railroad history ever made.

UNION PACIFIC AT 150

TRANSCONTINENTAL

Behind the clichés and glossy yellow of Union Pacific's creation are New England

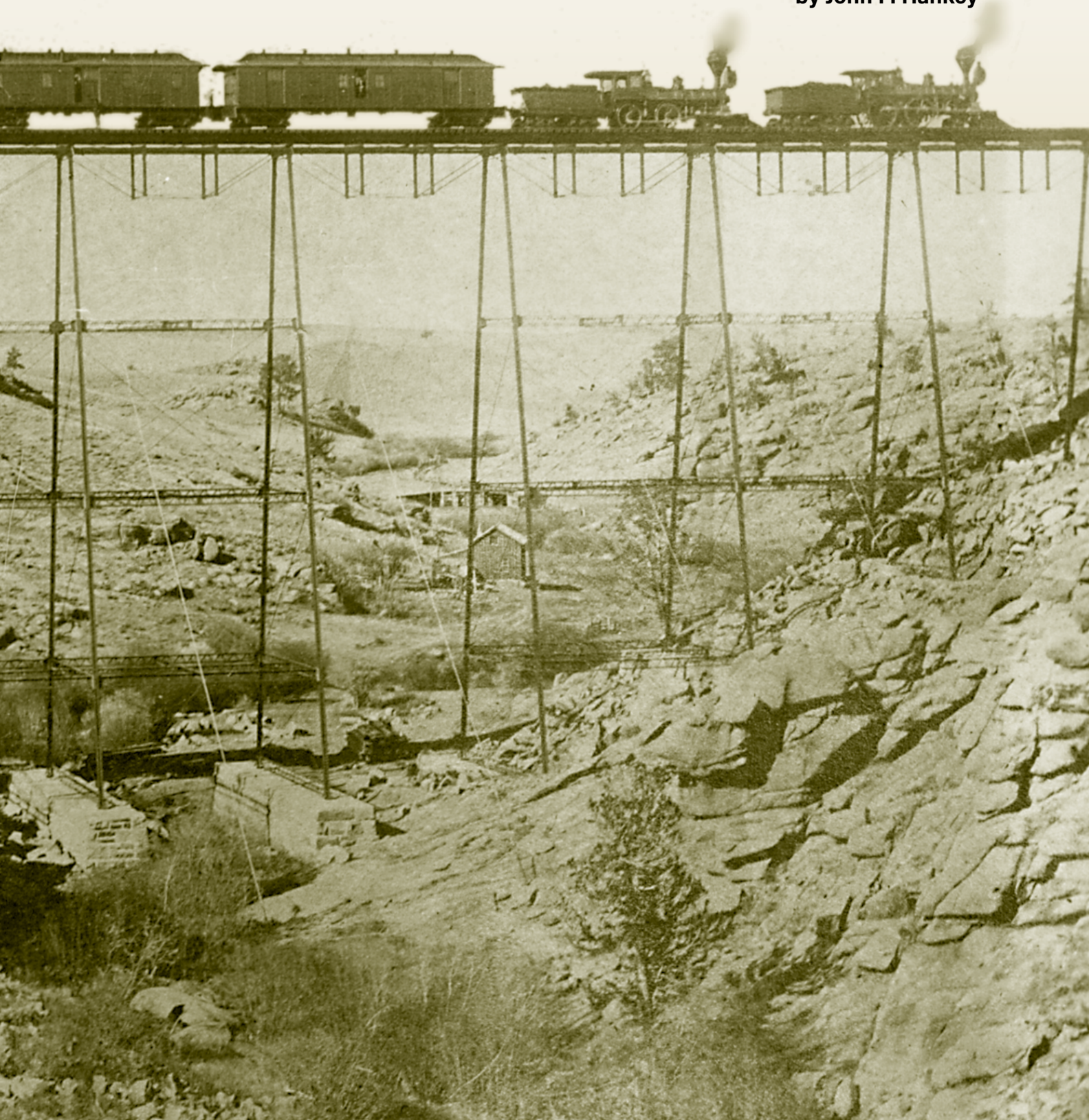


Two Union Pacific 4-4-0s cross Dale Creek on the "spider web" bridge west of Cheyenne, Wyo. UP

TRANSFORMATION

business savvy, Abraham Lincoln's pen stroke, and a Shakespearian drama

by John P. Hankey



Near Promontory, Utah, UP 4-4-0 No. 119 of Golden Spike fame is at Salisbury's Cut.
American Geographical Society

We Americans love to tell this story. At the beginning of the Civil War 150 years ago, we looked westward to the shimmering waters of the Pacific Ocean. In between lay a vast and challenging landscape of deserts, mountains, and hostile natives. We saw the promise of new lives and prosperity for millions willing to work hard and tame the land. After Irish and Chinese workers toiled seven years, locomotives from the East and West met on a windswept summit near the Great Salt Lake. With a final spike of solid gold, the Pacific Railroad was done. The United States was, at last, One Nation.

It is a nice fable, but it is a little like saying "Moby Dick" is about fishing. We still use it as cultural shorthand for the rapid westward push of Anglo-American settlement. However, there is much more to it.

Perhaps no other single railroad project epitomizes the astonishing transitions the United States endured in the last half of the 19th century. Union Pacific's creators envisioned the "Transcontinental Railroad" as a truly national project, with stewardship of the railroad shared broadly and managed for the overall good of the entire country. Theirs was a sincere, altruistic, and utterly naive vision for a great national highway.

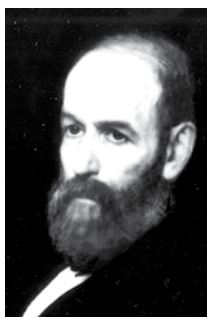
Instead, a decade after the first rails went down in Omaha, Union Pacific was in the hands of Wall Street speculators with developer and speculator Jay Gould as their leader. A handful of directors and officers had siphoned off more than a billion dollars in construction funding. The railroad struggled mightily: Rivals outflanked it. Debt hobbled it. Its fate seemed beyond the railroad's own control. UP's situation in the 1880s was so dire that the chair of a congressional commission recommended that the railroad forfeit its charter, liquidate its assets, and hand over its executives and directors for criminal indictment.

Many railroads had their share of drama and intrigue. But it is hard to recall another railroad with the narrative complexity, heroic scale, and Shakespearian qualities of the early UP. Except that this tale unfolds in three acts, not Shakespeare's usual five.

CHICAGO, 1862

A pall settled over the nation in summer 1862. A year of desultory fighting had neither compelled the Confederate states to rejoin the Union, nor weakened Northern resolve to preserve the Union intact. The 23,000 casualties at the Battle of Shiloh in April made it distressingly clear that this was going to be a long and brutal war of attrition. It also stoked growing Northern anxiety that the South might sustain its independence.

Against that backdrop, hundreds of railroad executives, politicians, businessmen, journalists, and opportunity seekers drifted into Chicago in late August. They were at the country's emerging railroad hub for the first meeting of the Board of Commissioners of the Union Pacific Railroad and Telegraph Co.



Jay Gould

The legislation Lincoln signed two months earlier could not have been more direct. The text of the Pacific Railroad Act began with the names of 156 prominent Americans from every state in the Union (except, oddly, Delaware). Listing these men upfront was not merely symbolic.

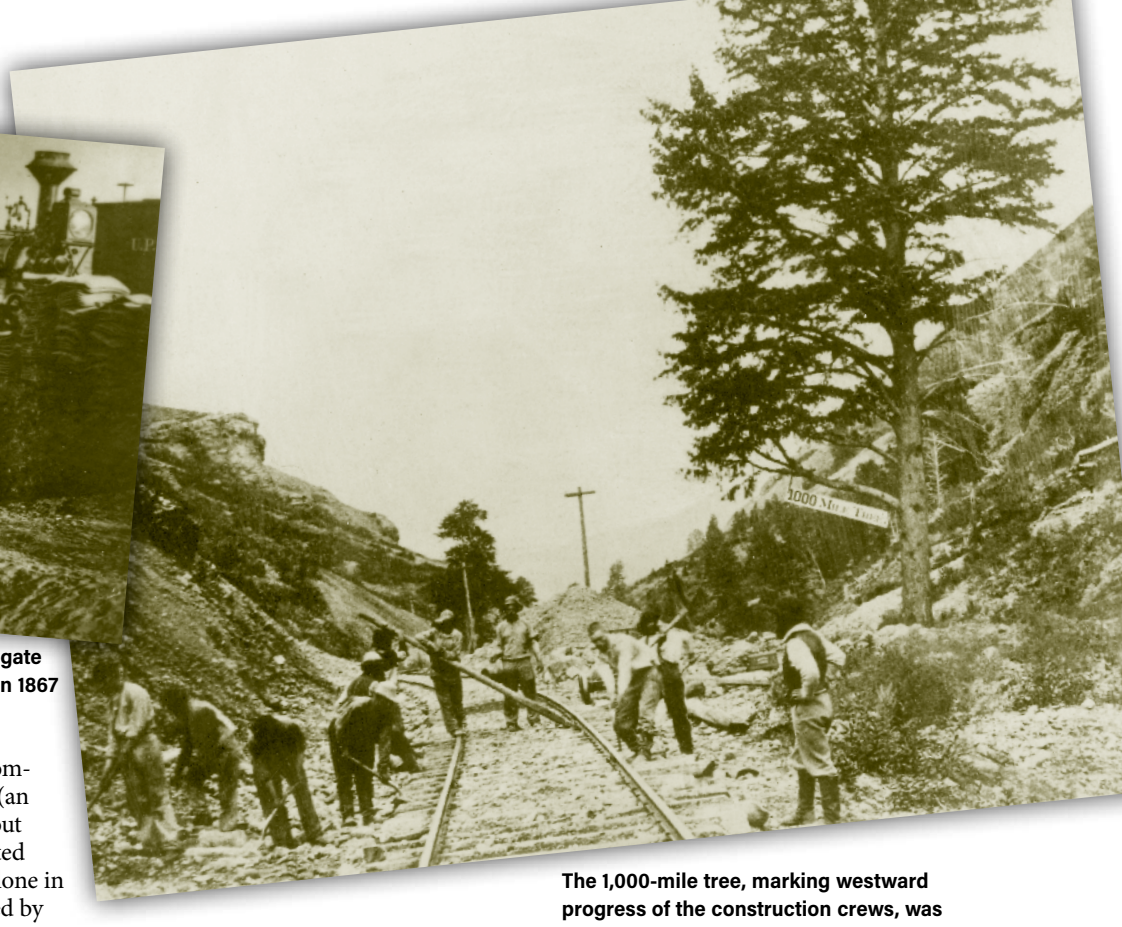
Proponents wanted everyone to understand that the legislation was bipartisan, broadly supported, and that the railroad it authorized was a truly collective effort. It was not to be regarded as the special project of a particular region or interests.

Nearly 80 commissioners assembled in Chicago, along with other dignitaries and interested parties. Over three days in early September, they convened to discuss implementing the objectives and requirements laid out in the Pacific Railroad Act. The commissioners elected Chicago Mayor William B. Ogden chairman, and Henry Varnum Poor, editor of the *American Railroad Journal,* as secretary.

Local and national newspapers extensively reported the meetings. Whether it was subtle propaganda or sincere belief, the participants stated that a railroad to the Pacific Coast was a matter of great urgency and national defense policy. The Confederacy was seeking diplomatic recognition by Great Britain (its primary cotton customer). Some people suggested that Great Britain might try to "peel off" the new state of Oregon, or that the Confederacy might make a play for California.

The overall economic arguments for the Pacific Railroad still made sense. The engineering remained sound, and the

UP trains and covered wagons congregate near the end of track at Archer, Wyo., in 1867 during construction westward. UP



The 1,000-mile tree, marking westward progress of the construction crews, was noted in Utah's Weber Canyon. UP

North clearly had the resources to complete 1,800 miles of additional track (an observer at the convention pointed out that railroad companies had completed 2,000 miles of new track in Illinois alone in the previous year). What had changed by summer 1862 was the conviction that a transcontinental railroad was needed sooner rather than later, and for a different set of reasons.

As a matter of practical politics, the only way to make that happen in the middle of an insurrection was to define the Pacific Railroad as a national priority with widely shared benefits, and then harness private entrepreneurial energy and naked self interest. That turned out to be more challenging than anyone might have foreseen.

VISION FOR A NEW WEST

By the time Lincoln signed the Pacific Railroad Act, the idea of a railroad to the West Coast had been in circulation for almost 30 years (since at least 1832). Asa Whitney, a New England merchant and traveler, began a surprisingly modern advocacy for a Pacific Railroad in 1845. The route he favored ultimately became the Northern Pacific. And the sophistication of Whitney's argument was impressive.

He recognized that the nation lay astride important trade routes, with Asia at one end and Europe at the other. A transcontinental railroad would open our vast interior for development and connect it to ports on both coasts. It would also create a shorter, faster cross-country route for commerce between Europe and Asia.

Whitney's insight was based on the perfection of oceangoing steam navigation in the 1840s, Morse's demonstration of the magnetic telegraph in 1844, and an astute understanding of economic trends. He grasped the potential for industrialization, large-scale agriculture, and expanded international trade. Whitney was proposing a global economy similar to ours today, with the United States at the center and railroads as high-speed conduits for trade.

Although Whitney's arguments were persuasive, the country simply wasn't ready. There were too many railroads to build in more populated areas. Gold had not yet been discovered in California. Rails had barely reached the Mississippi. The question of slavery gripped the country and distorted every aspect of politics, westward expansion, and national policy. Still, there was active discussion of a Pacific Railroad throughout the antebellum period.

In 1853, Congress appropriated $150,000 (between $50 million and $75 million today) for a comprehensive railroad survey from the Midwest to the Pacific Coast. Army topographical engineers surveyed five different routes: one Central, one Northern, two Southern, and one along the California coast. They did not survey the route ultimately followed by the Union and Central Pacific railroads because it was already reasonably well known.

Physical reconnaissance took two years, and assembling 12 volumes of findings took almost five (1855 through 1860). The result was the first systematic study of large areas of the Western U.S., and descriptions of three feasible transcontinental railroad lines. Railroads built all of those lines eventually. But we had to dispose of the slavery issue first. Southern secession cleared the way for a quick decision on building the initial Pacific Railroad.

Californians were actually ahead of the process. They anticipated the need for a railroad linking the coasts and had already contemplated a railroad across the Sierra Nevada to the rich mineral deposits of Nevada Territory. The Central Pacific Railroad incorporated in California a year before the Pacific Railroad Act. Congress folded it into the act, and it enjoyed many of the benefits and few of the restrictions imposed upon the Union Pacific.

In general, these were extraordinary times. Because the Union was freed from Southern obstructionism, the 37th Congress was a remarkably forward-looking and productive session. In addition to the Pacific Railroad Act, it passed the Morrill Land Grant Act, setting aside public lands to be sold to fund the creation of "land grant" colleges. They were to provide low-cost higher education to all Americans. Some of the country's largest and most distinguished public universities had their origins as "land grant" institutions.

The third remarkable piece of legislation was the Homestead Act, which granted (or sold at a minimal cost) 160 acres of land to any adult citizen willing to stake it out and cultivate it. This was in response to the Western railroad dilemma. Immense tracts of potentially productive land were

This wood engraving drawn by Arthur Lumley depicted a fanciful version of the UP's construction. Library of Congress

Construction crews working westward on the UP encountered rough going when they reached Utah's Weber Canyon. TRAINS collection

available in the West, but the land was almost worthless with no one to cultivate or exploit it.

The Homestead Act sparked a massive westward migration of families willing to break sod and establish farms and ranches on "free" land. Their produce and cattle were major sources of traffic for the Western railroads, and the basis of the new economy. The Pacific Railroad Act was not an outlier. It was part of a new vision of the American West, and the new Republican Party's progressive agenda.

ACT ONE: THREE UNION PACIFICs

For its first two decades, American railroading was usually a joint venture between a state or local government and private interests. Railroads were expected to generate fair returns to public and private investors. But their ultimate goal was to create a transportation infrastructure that enhanced general prosperity. Toll roads and canals were often organized the same way.

In the 1850s, major railroad projects were viewed as projects for the public good, in much the same way we justify public investment in airports, transit systems, or sports arenas today.

At the same time, general railroad development was moving toward a more speculative and entrepreneurial model, where profit and private interests took precedence. The debates we have today over public investment in transportation stretch back to the founding of the Republic.

The original UP emerged in this period of great national stress, and at a time when the nature of railroading was in transition. The Civil War was truly a hinge in American railroad history, and the original UP was conceived in one set of expectations and delivered in a different context.

It was the final — and perhaps, most remarkable — expression of the railroad as true public work and national (in that it would benefit the entire nation) project. The ideals that informed it, the manner of its creation, and the way it was built were characteristic of the earliest days of railroading and a more "republican" (small "r") spirit.

At the same time, it was one of the first major railroads begun essentially from scratch at a point when railroading had adopted a new, compelling, and rather ruthlessly capitalist business model. Think of the times: The entire economy was being militarized. Men like J. Edgar Thomson of the Pennsylvania Railroad were revolutionizing and systematizing railroad management. Great sums of money were sloshing about in new and undisciplined ways, which always complicates otherwise ethical business decisions.

Even as the UP was being created according to older, more cooperative and altruistic standards and expectations, its speedy completion and efficient operation relied on new business methods and different styles of railroading. In that context, the original UP was something of a Chimera, the mythological creature composed of parts from different animals.

There were three hurdles the original UP had to surmount: project design and funding, construction, and regular operations. Its governance accomplished the first two splendidly, and badly botched the third. Or rather, it introduced a level of financial fraud and corruption that almost guaranteed that the UP could not operate as a profitable company.

According to the political and cultural climate of the times, to be approved and funded, the Pacific Railroad (specifically, the UP) had to be represented as an old-fashioned, patriotic, and cooperatively run "public" project.

To be built, it had to become a

TRANSCONTINENTAL TIME LINE

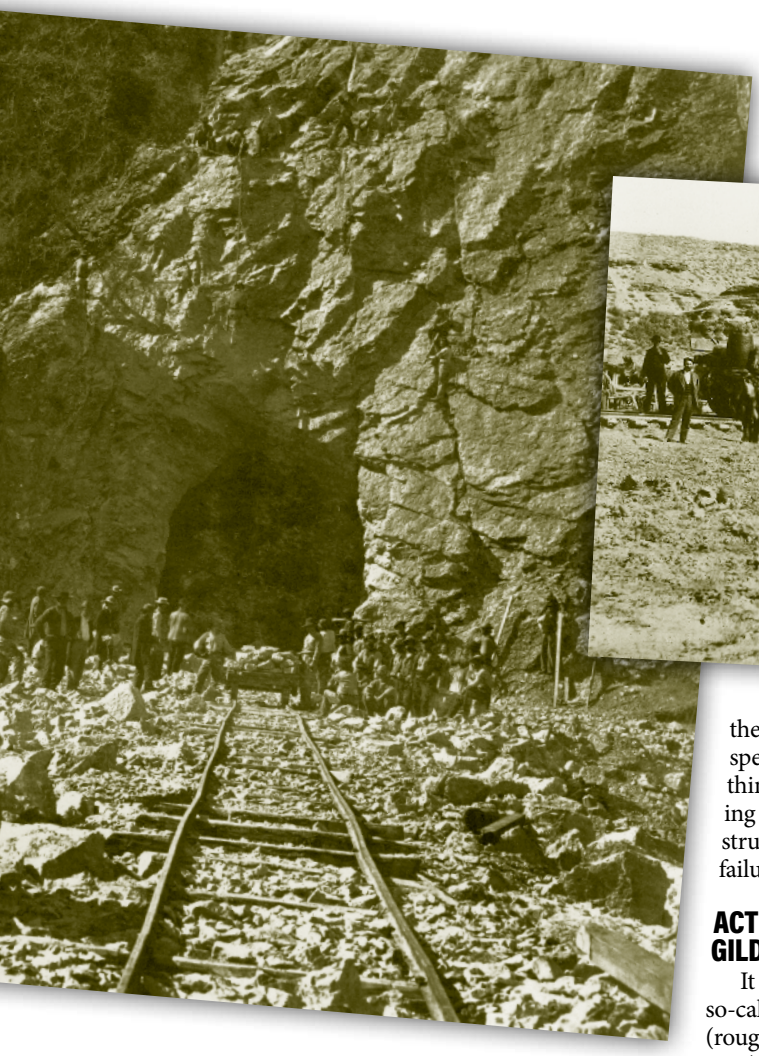
1832
Proponents call for transcontinental railroad

1845
Asa Whitney begins advocacy for Pacific Railroad

1853
Congress appropriates $150,000 for survey of five routes

1855-1860
12 volumes of findings prepared for four feasible routes

1861
Central Pacific incorporated in California

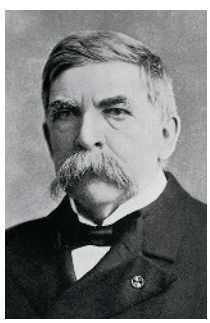


Construction workers lined up for a portrait. Only one more year of construction lay ahead. UP Museum

quasi-military organization with ruthless discipline and laserlike focus. That was the work that Gen. Grenville Dodge, the Casement brothers, and tens of thousands of immigrants, civilians, and former soldiers accomplished under harsh conditions. Too often, we understand the UP in terms of its physical construction and not in terms of its larger contexts.

To operate successfully in the changing post-Civil War economic environment, UP needed to be a modern, well-managed, entrepreneurially motivated private entity with the freedom to innovate and grow. Instead, it was both constrained by the terms of the Pacific Railroad Act and hijacked by successive managements intent upon extracting whatever cash they could from an increasingly fragile and damaged company.

The hinge seems to have been the end of the Civil War and the railroad's construction period. By that time, patriotic motivations had largely dissipated. The company slipped into the hands of crooks and speculators. In the "anything goes" spirit following the war, UP was both structurally doomed to failure, and easy pickings.



Gen. Grenville Dodge

ACT TWO: PIVOT TO THE GILDED AGE

It is easy to caricature the so-called "Gilded Age" (roughly between 1865 and 1900) as a period of explosive growth and change, unbridled greed and corruption, corporate mischief, and a survival-of-the-fittest ethos. For the most part, it was.

The gloss of public oversight and national purpose had begun to fade by fall 1863, when the UP was formally incorporated in New York. In the year since the board of commissioners' meeting in Chicago, the tide of war had shifted in the Union's favor and Great Britain no longer seemed a threat in the Pacific Northwest. The Pacific Railroad was no longer a matter of national defense.

While it may have been inevitable, it was nevertheless unfortunate that UP evolved into the kind of speculative entity then common on Wall Street. Control passed to groups of manipulators and financiers who regarded the railroad as a kind of 19th-century automated teller machine. While front-line railroaders and operating managers strove greatly to run an effective railroad, the company itself seemed constantly in play in the casino economy of the time.

The Union Pacific of the late 19th century was challenged by inept management, serial scandals, two financial panics, two bankruptcies, political pot shots, and the kinds of external events that damage even strong corporations. It was a period of highly elastic ethics, blatant hypocrisy, and a "get it while you can" mentality. Mark Twain called it "the Great Barbeque." Astute observers regarded Congress as one of the most creative and successful auction houses ever established.

Perhaps the most clever (and certainly the most egregious) scheme UP's management executed was Credit Mobilier of America, the independent construction company hired to build the Union Pacific from Council Bluffs to Ogden. The original idea was to keep everyone honest by separating the management and operation of the railroad from its construction. In that way, the government could closely monitor payments, and the company could ensure that it was getting fair value for its money.

In practice, the use of supposedly separate construction companies was a splendid way to set up regular programs of embezzlement. Many 19th-century family fortunes, and many colleges, charities, and other philanthropic works are the result of profits from railroad construction companies. On the Central Pacific Railroad, the vehicle was the Contract & Finance Co. It was owned by the so-called "Big Four:"

July 1862
Abraham Lincoln signs the Pacific Railroad Act

August 1862
First meeting of UP commissioners in Chicago

1863
Union Pacific incorporated in New York

1869
First transcontinental railroad completed

1872
Credit Mobilier scandal breaks

1887
Pacific Railroad Commission investigates the Pacific Railroad

1888
Commission investigation shows $23.3 million in fraud ($1.17 billion today)

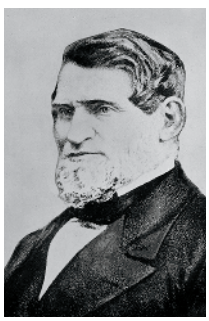
1897
Union Pacific reorganized and rechartered

UP crews built a switchback to reach a tunnel during the construction. The work was amazing in many ways. UP

C.P. Huntington, Mark Hopkins, Charles Crocker, and Leland Stanford.

On the UP, a group of the railroad's directors and officers owned Credit Mobilier, which meant that Credit Mobilier could (and did) submit grossly inflated invoices to the UP for payment by the U.S. government. It wasn't explicitly illegal, and there were few consequences for those involved. The one exception was Congressman Oakes Ames, who as president of Credit Mobilier had been especially generous in providing his colleagues with cash gifts and opportunities to buy stock on favorable terms.

Politicians who got Credit Mobilier stock profited handsomely, either through dividends (sometimes 100 percent) or by selling the shares at inflated values. Naturally, the 30 or so congressional beneficiaries of Credit Mobilier's generosity were staunch advocates of additional funding for the railroad's construction. This particular scandal broke during the 1872 presidential election. In an unseemly case of scapegoating, Oakes Ames was censured and died soon afterward.



Oakes Ames

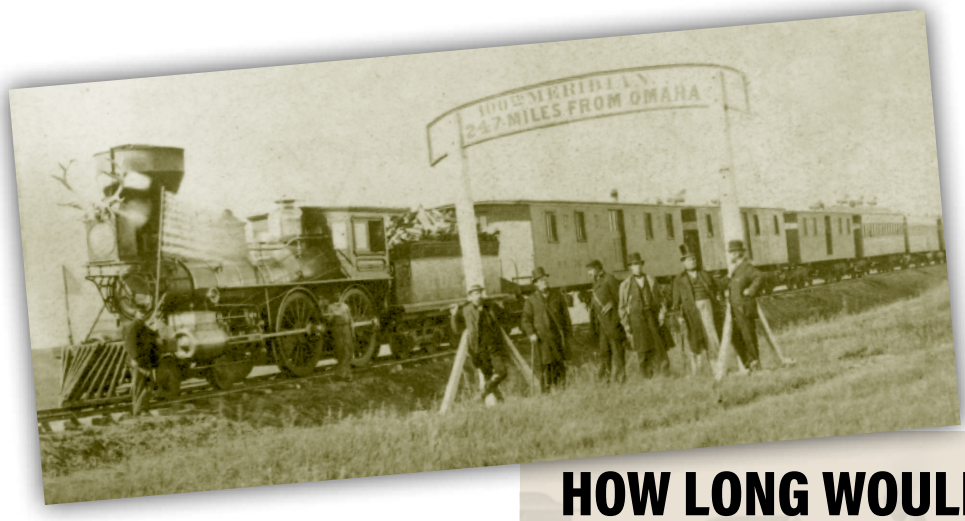
Even when UP tried to grow its business legitimately and confront rising competition from newly completed transcontinental railroads (Southern Pacific, 1881; Northern Pacific, 1883; Atchison, Topeka & Santa Fe, 1887; and Great Northern, 1893), it faced sustained (and undeserved) criticism for building "branch" lines. These were secondary main tracks to places like Denver, Julesburg, and Pocatello. Its critics argued that UP was legally bound to remain a bridge line, and that the lateral lines represented a misuse of capital or a violation of its original purpose. In fact, it was clear that traffic generated by these additional lines was keeping the railroad alive.

After just 18 years of operation, there had been so many irregularities and so much concern over UP's ability to repay its federal loans (30-year bonds, with principal and 6-percent interest due in the 1890s) that in 1887 Congress created the "United States Pacific Railroad Commission" to investigate the finances and structure of all the major railroads initially described as "the Pacific Railroad" project. President Grover Cleveland (who was considered a reformer and advocate of "clean government") appointed Pennsylvania Gov. Robert Pattison as chairman.

Over months, the commission held hearings, took depositions and testimony, traveled over the railroads in question, and tried to reconstruct the financial records of the entire Pacific Railroad project. Pattison noted that their work was made more tedious by the fact that "the construction companies or inside combinations that built five of the six roads have destroyed or concealed their books."

At the conclusion of the probe, Pattison summed his feelings this way: "The public interest has been subordinated by these companies to the stockholding interest upon the claim that the stockholders owned the railroads and could manage their own business in their own way. Nearly every obligation, which these corporations assumed under the laws of the United States, or as common carriers, has been violated. Their management has been a national disgrace. Since the date of their inception they have been conducted upon a purely speculative basis. Their permanent prosperity has been lost sight of, while their managers greedily strove for temporary advantage." At that point, Pattison was just clearing his throat.

The commission submitted its official report to President Cleveland in 1888. After thorough investigation, it estimated that the cash profit to the officers and directors of UP and Credit Mobilier as a result of the construction fraud alone was $23.3 million. Conservatively, the amount stolen was just shy of $1.17 billion in today's dollars, or about $1.25 million for each of the railroad's 1,038 route-miles from Council Bluffs to just west of Ogden. And that was just the construction phase. No wonder the government



UP directors pose at the 100th meridian, 247 miles west of Omaha. They had many more miles to go. Library of Congress

and progressive folks of the day grew increasingly annoyed with UP management as "The Great Barbeque" chugged along.

ACT THREE: THE HARRIMAN SOLUTION

The UP we know today is an iron horse of a different color. Its corporate charter dates from 1897, when it was reorganized for the second time. From that point, UP was free from lingering restrictions dating back to the Pacific Railroad project.

The railroad's final pivot (as significant as its transformation from grand public work to Wall Street plaything) came under the leadership of E.H. Harriman, one of the industry's most successful executives. Harriman had a vision: a UP with a first-rate physical plant competing in markets throughout the West and taking full advantage of its location, strategic opportunities, and the booming traffic of the early 20th century. All it required was brilliant leadership, close attention to detail, and lots of cash. Harriman supplied all three.

Like all real history (as opposed to the fables, shorthand, and snippets that reveal only part of the story), a full accounting of the UP's 150 years is more complex, and rewarding, than a first glance reveals.

The original UP was a collective expression of national will and resolve. Like the equitable distribution of land and access to higher education, its objectives — to physically unite a continent struggling to become one nation — were rooted in sincere patriotism and a belief that the nation was a unique and successful experiment in self-determination.

The Civil War and its aftermath subverted the ideals of the Pacific Railroad Act. Despite the best intentions of the act's framers, it took only a few years for corporate crooks and post-Civil War opportunists to turn the Union Pacific into a perverse kind of business-school case study: a visionary project launched with high expectations, then cynically manipulated to benefit a few people. That was a common outcome during the late 19th century. And it set the stage for the Progressive Era, which restored some notion of fair play and ethical business conduct.

That trajectory is less about the UP, and more about the United States in which it developed. At almost every step, the UP was a reflection of the society that created it, and that it served. It is a testament to the original purpose of the Pacific Railroad that it has continually reinvented itself as the future required.

In its third act, UP not only survived, it prospered. It became North America's largest railroad, and one of its most respected. Along the way it didn't dodge the less admirable aspects of its history. When UP invited historian Maury Klein to shine a bright light into dark corners, the result was one of the most thorough, honest, and useful corporate histories yet written.

UP's sesquicentennial began July 1, 2012, on the 150th anniversary of the Pacific Railroad Act. It will wind down in 2019, after the sesquicentennial of the golden spike ceremony and the opening of a rail route between the Atlantic and Pacific coasts.

Seven years is a long time to celebrate a railroad's anniversary. But this is no ordinary railroad and no ordinary anniversary. The story we continue to tell about the Pacific Railroad sounds familiar. But beneath the cliches and glossy yellow surface is much more.

E.H. Harriman

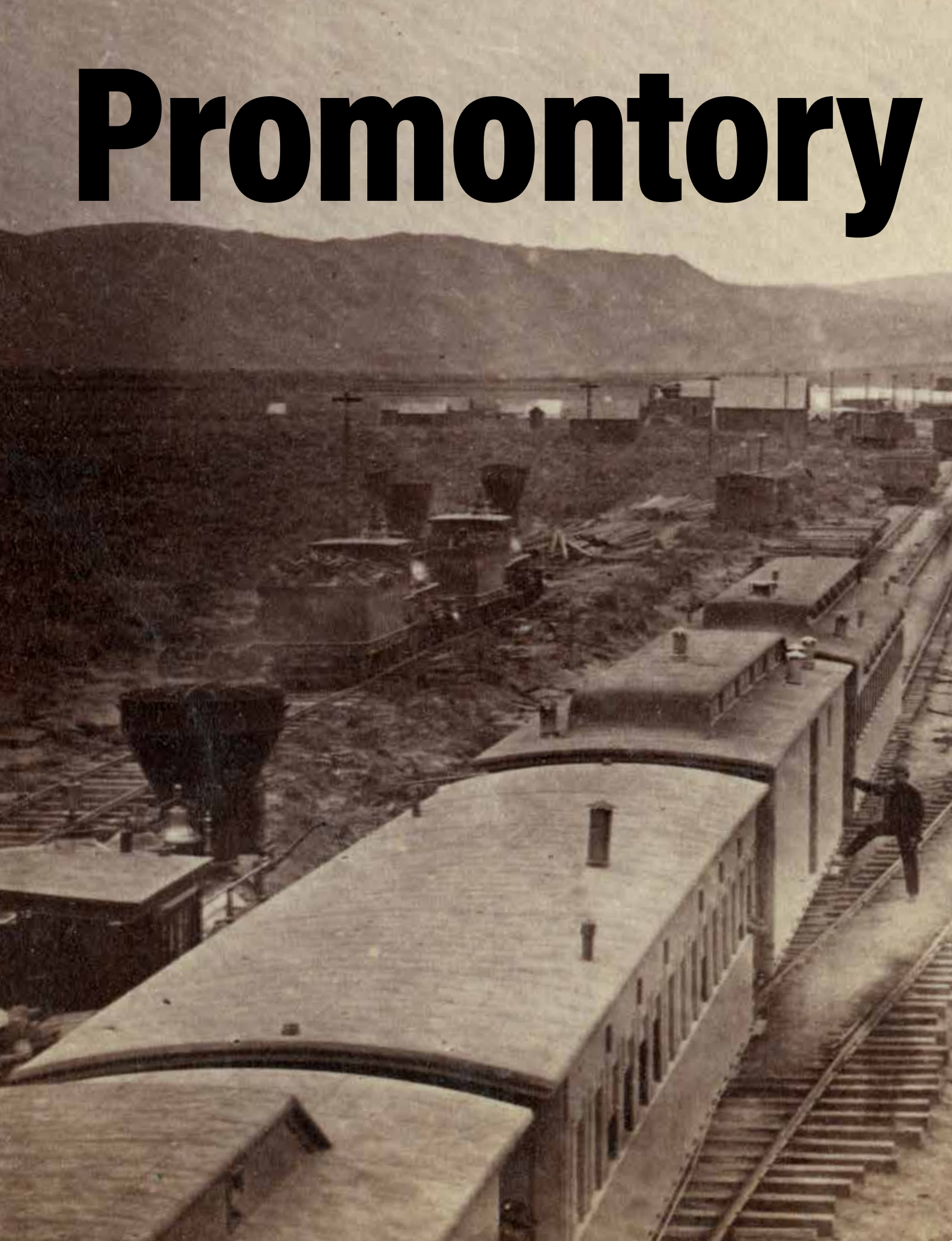
HOW LONG WOULD IT TAKE TODAY?

If you built a transcontinental railroad today from scratch, how long would it take, given the regulatory environment of the modern world? Nobody knows for sure, but the best guess is about 57 years. Here's a look at how it might just play out in headlines:

Jan. 1, 2019 ..... **Trump proposes transcontinental railroad**
Jan. 2, 2019 ..... **Federal court enjoins railroad plan**
Dec. 12, 2022 ..... **Supreme Court OKs new railroad**
Jan. 16, 2023 ..... **Environmental study will take 10 years**
July 30, 2033 ..... **Environmental study raises emissions concerns**
Aug. 1, 2033 ..... **EPA moves against rail line, citing emissions**
Feb. 13, 2040 ..... **President proposes electrification of new railroad**
June 14, 2044 ..... **Electrification financing collapses**
March 2, 2054 ..... **GOP Congress: No federal money for new rail line**
March 2, 2056 ..... **Democratic Congress: No federal money for new rail line**
Aug. 17, 2060 ..... **President Jenna Bush declares new railroad dead**
Nov. 24, 2062 ..... **China will finance transcontinental railroad**
April 30, 2064 ..... **Railroad groundbreaking!**
May 1, 2065 ..... **EPA sues to stop construction**
Oct. 31, 2066 ..... **Congress abolishes EPA**
Nov. 1, 2066 ..... **Construction resumes**
Nov. 2, 2067 ..... **Sierra Club sues to stop new rail line**
July 24, 2068 ..... **Sierra Club settlement truncates railroad at Reno, Nev.**
June 10, 2071 ..... **Bald eagle nest stops construction**
April 20, 2074 ..... **Eagle nest mysteriously destroyed by fire**
Feb. 21, 2075 ..... **Last Interstate highway crumbles**
May 8, 2076 ..... **Transcontinental railroad completed in Utah**

— Fred W. Frailey

Promontory



pilgrimage

Even with the railroad complete, traveling was still no small feat

by Kyle Wyatt

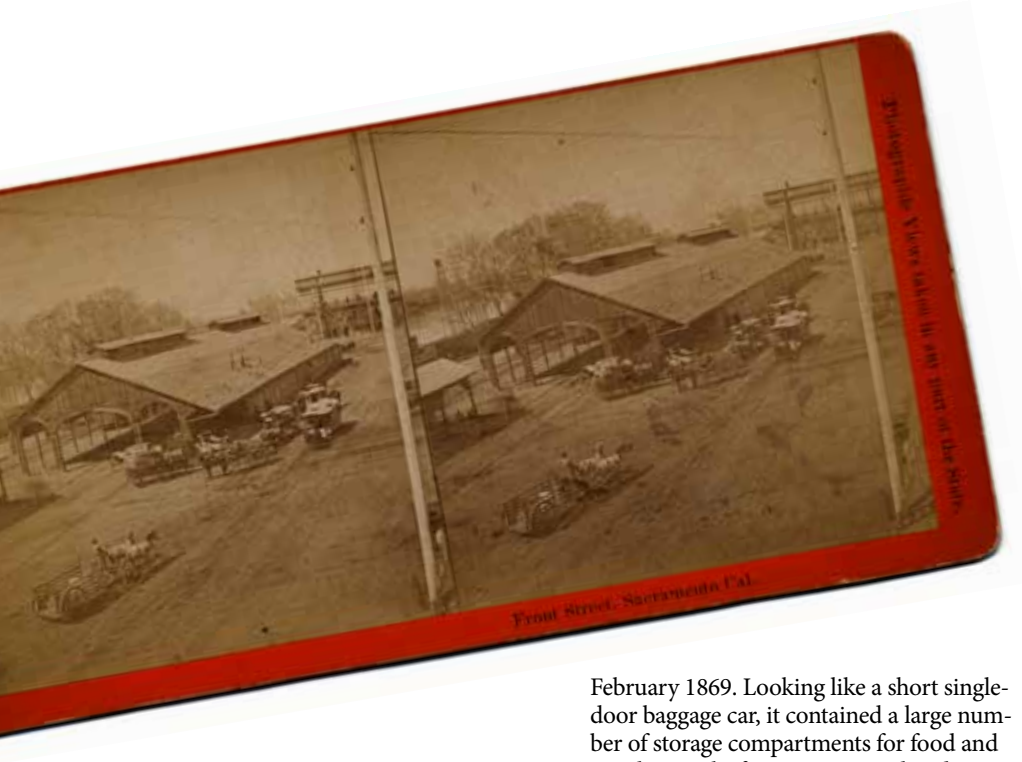
On a dusty plain in the Tranquility Basin on July 21, 1969, the eyes and ears of the nation, and indeed much of the world, were focused as the first human set foot on the surface of the moon. The event was almost instantaneously relayed by television and radio to the people on Earth. Everyone then alive remembers where he or she was when mankind first stepped onto the moon.

One hundred years earlier, the attention of the nation was focused on another dusty plain, this one in the Promontory Mountains of Utah on May 10, 1869. The occasion was the driving of the last spike, uniting the Central Pacific and Union Pacific railroads and creating a through line from the Atlantic to the Pacific. It was a moment that united a broken nation. The event was almost instantaneously relayed by telegraph to cities across the country, setting off parades and celebrations. One hundred years apart, each event celebrated an unobtainable goal achieved in less than 10 years from commitment to completion.

Construction of a transcontinental railroad, or Pacific Railroad as it was referred to in the 19th century, had been advocated for nearly 50 years by the time of its completion. Construction started slowly; UP had built only 15 miles of track by 1865, and some observers predicted that their descendants three or four generations removed might witness its completion. But it ultimately took a mere seven of the 14 years allotted by Congress. And then it came down to one day to mark the completion.

But the days and hours before May 10 are worth reviewing, too. They reveal the rough-and-tumble environment in which the first transcontinental railroad was built. It was a time when something as insignificant as a felled tree or as big as a washout, or track builders who were unhappy that their pay had not shown up, could change history. Let's look at the lead up to Promontory.

On the Central Pacific route to Promontory, Carlin, Nev., was some 445 rail-miles east of Sacramento, Calif., where the CP began. Behind photographer A.A. Hart is the route to Promontory. Department of Special Collections, Stanford Libraries



The Central Pacific depot in Sacramento, where the transcontinental railroad began its eastward journey, was located on Front Street. Today, a replica is one of the main buildings in Old Sacramento. Martin M. Hazeltine, Courtesy of California State Railroad Museum

Stanford's special

The Central Pacific special train to the ceremonies at Promontory left the Sacramento, Calif., depot at 6:45 a.m. on May 5, 1869, departing 15 minutes after the regular passenger train. On board were Central Pacific President Leland Stanford, accompanied by about 17 friends and associates, and other people "of import."

The Central Pacific special train consisted of two cars. The "Directors' Car" carried Stanford and the other dignitaries. (It was also sometimes referred to as the "Commissioners' Car" for its use by the government commissioners inspecting the completed railroad, and as "Crocker's Car" for its use by then Central Pacific General Superintendent Charles Crocker.) The car was built in the Central Pacific Sacramento Shops, completed in late November 1868. Quoting a contemporary account in the San Francisco Daily Alta California:

"The car contains a parlor, fitted with mirrors and sofas, which, in a pinch, can be converted into comfortable beds; a bedroom, containing two fine, large roomy black walnut bedsteads and soft spring mattrasses [sic]; a tastefully fitted up dining-room and a kitchen."

The car had sleeping accommodations for 10, but apparently the lucky passengers "stretched" that number for this important trip. Remarkably, the car survives, converted into a coach in 1880 by the Virginia & Truckee Railroad, and preserved today by the Nevada State Railroad Museum in Carson City [see "Promontory's Last Passenger Car," Trains, March 2019].

In front of the directors' car was a "subsistence car" or "tender," completed in February 1869. Looking like a short single-door baggage car, it contained a large number of storage compartments for food and supplies, tanks for water, a zinc-lined compartment for meats, and even a cage for live birds. At one end were several berths for the train crew and servants.

The train was in the charge of well-known Conductor Eli Dennison. The steward was Jacob Yates. There would also have been a cook, so far unnamed in the records, and likely personal servants of several passengers who would have slept in the crew berths in the subsistence car, and remained with the car for the entire trip to Promontory and return. There would also have been several brakemen (one per car in these days before air brakes), who would have changed when the engine crew changed.

Modern accounts have claimed that Central Pacific locomotive No. 29 *Antelope* was chosen to pull Stanford's special to Promontory, but there do not appear to be any 1869 accounts naming the locomotive pulling the train from Sacramento. It would have been surprising in any case for a single locomotive (and crew) to run all the way from Sacramento to Promontory, since normal practice was to change engines and their crew at every division point. The trip from Sacramento to Wadsworth, Nev., the next division point, took 12 hours according to the passenger-train schedule. In the 19th century, individual locomotives were typically assigned to a specific crew who then took a particular interest in the maintenance and appearance of "their" locomotive, so when a crew changed, the locomotive also changed.

In the end we cannot say which locomotive pulled the special out of Sacramento; it is not until the middle of Nevada that we can actually identify the locomotives pulling the train.

As the special departed the Sacramento depot, the assembled crowd of well-wishers gave "three hearty cheers and a tiger." Stanford, on the rear platform, doffed his hat and bowed in acknowledgement. The passengers enjoyed the trip over Donner Summit in the fresh spring air. Following the Truckee River east of the new town of Truckee, they came near to disaster. Chinese wood cutters were working above the rail line near Tunnel 14. They had seen the regular passenger train pass, and knew nothing of Stanford's special, so when a large log, 50 feet long and 3 feet around, rolled down onto the tracks, they were not concerned. As the engineer rounded a curve he had time to close the throttle and whistle "down brakes" so the train was slowed before it struck the log. In throwing the log to the side, the pilot was torn off the locomotive and most of the steps on the right side of the passenger cars were wiped off. But the locomotive and cars remained on the rails, and the only injury was one passenger who had been riding on the locomotive and "joined the birds" (jumped) before the collision, slightly bruising his ankle.

After assessing the damage, and thankful that nothing worse had happened, the special continued past Verdi and Reno, and finally reached the division point at Wadsworth near sundown. Stanford may have had second thoughts about running as a "wild train," the name for an unscheduled train. A telegraph message held the regular passenger train at Wadsworth, where it had been scheduled to depart at 6:30 p.m. The special's cars were coupled onto the rear for

Route for Gov. Stanford's special train to deliver him to the Golden Spike event was through the Truckee River canyon. This photo shows the line in 1869 at Tunnel 14, located about 134 miles east of Sacramento, Calif. Alfred A. Hart, Department of Special Collections, Stanford Libraries collection

the rest of the journey, and its locomotive was sent to Wadsworth for repairs.

As it happened, *Antelope* had struck a tree across the tracks east of Truckee, Calif., in 1868 and lost its pilot, among other damage. It is possible that modern researchers have combined these two accidents and placed the *Antelope* on the special in error.

Alfred A. Hart was the official photographer of the Central Pacific during construction. It is unclear whether he was on Stanford's train when it left Sacramento, but he was clearly on board as it crossed Nevada to Promontory. At several stations along the way, he photographed the train, including the cars of the special.

Elko, Nev., reached about mid-afternoon on May 6, was the end of the run for the regular Central Pacific passenger train from Sacramento. Most passengers were headed for nearby camps of the White Pine mining district. Only a few were continuing east by rail. There was a regular stagecoach connection between the end of track of the Central Pacific and the Union Pacific, hauling mail and express, and the few passengers going through.

East of Elko, the CP operated an accommodation train, mostly to support its work camps, with older passenger cars. The Stanford cars were coupled to the end of this train. It appears the accommodation train terminated at Victory (later Rozel), the main Central Pacific construction camp before Promontory, and near the end of the famous 10 miles of track laid in a single day. It appears Central Pacific No. 60 *Jupiter* was attached to the Stanford special at Victory and took the train to Promontory.

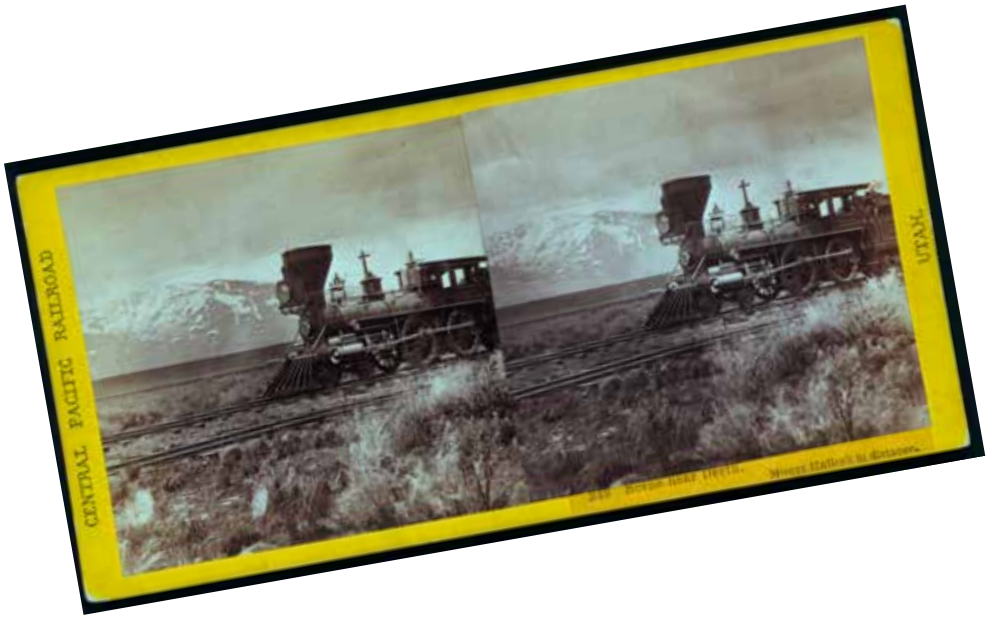
Finally, after more than two days of travel, around mid-morning on May 7 the Stanford special arrived at Promontory, anticipating last-spike ceremonies the following day, May 8. The weather was rainy and dreary.

Only upon arrival did they learn that UP officials had been delayed and would not arrive until the morning of May 10. With two days to kill, and Promontory a desolate encampment, the passengers of the Stanford special sought other diversion. The construction camps and most workers of both

The Sacramento depot was in a business district adjacent to the Sacramento River. Today, this is the site of the relocated Huntington & Hopkins Hardware building, named for two railroad supporters. John P. Soule, California History Room, California State Library collection

There are eight balloon stacks from early Central Pacific power, plus the engine to the right, as well as two boilers and cabs in this image. At left is Gov. Stanford's special. The location is the machine shop at Carlin, Nev. Alfred A. Hart, Department of Special Collections, Stanford Libraries collection

"The Desert" was the title for a collection of images of Elko, Nev., including this one looking east. The community near the Utah border was on the route of Gov. Stanford's special train to the ceremony at Promontory. Alfred A. Hart, Department of Special Collections, Stanford Libraries collection



Central Pacific 4-4-0 *Leviathan* poses near Deeth, Nev., with Mount Halleck. A replica of this locomotive, made in Illinois in 2009, has stirred new interest in the original, built by Schenectady Locomotive Works in September 1868. Alfred A. Hart, Library of Congress collection

railroads had been pulled back from Promontory summit, except for those needed to finish the UP trackage. The Central Pacific workers were at camp Victory, the UP at Blue Creek, at the foot of the final grade to the summit.

San Francisco Alta California editor Frederick MacCrellish and Chronicle editor H.W. Atwell arrived at Promontory aboard the Stanford special. They were present the afternoon of May 7 when the first UP locomotive to reach Promontory, No. 66, puffed a salute of several smoke rings to the Central Pacific, and was answered with whistle salutes by Central Pacific No. 60 *Jupiter* and No. 62 *Whirlwind.* All three locomotives were built in the erecting halls of the Schenectady Locomotive Works at the same time, and were sisters. The Central Pacific photographer took a photo representing this first meeting and greeting.

About half the members of the Stanford party managed to reach the UP camp at Blue Creek the afternoon of their arrival. From there, Jack Casement, UP superintendent of construction, who had been a passenger on the Stanford special from Sacramento, provided a train to take them to Ogden. The following day, May 8, the UP offered a more formal tour over its line, with fine views of the Wasatch Mountains and a visit to Ogden. Most remaining members of the Stanford group took advantage of this, including photographer Hart. UP locomotive No. 117 and Utah Division

caboose No. 8 made up the train. At Taylor's Mill the UP staged a "splendid luncheon" on the banks of the Weber River. The party then went a short distance up Weber Canyon, and spent the night in Ogden before returning to Promontory Sunday morning for its own short excursion westward.

Sunday's excursion was to Monument Point, 21 miles west of Promontory, on the shores of the Great Salt Lake. The Alfred Hart photos from this trip are the first time we can confirm that *Jupiter* was attached to the Stanford special. The steward, Jacob Yates, took his gun to a nearby marsh and brought back a mess of snipe, a bird native to the West, for the meal.

Durant's special

The travels of UP officials to Promontory were not as linear as that of the Stanford special. Most of them were already around the western end of the railroad, engaged in oversight of work and in negotiations, including those with the Central Pacific, and with Brigham Young and the Mormons.

Vice President and General Manager Thomas Durant traveled in the UP directors' car, accompanied by its own subsistence car. On the UP, the kitchen was in the subsistence car instead of in the directors' car. Both cars were built in 1866, reportedly by the carshops of the Pittsburgh, Fort Wayne & Chicago Railway under contract for the new UP.

Sidney Dillon, a UP director, traveled in another car, the famous "Lincoln Car." Completed by the U.S. Military Railroads carshop in Alexandria, Va., in February 1865, it was used only to carry Lincoln's body to Illinois after his assassination. Durant purchased it for the UP in 1866. Army Captain John Charles Currier, part of a company of soldiers on their way to the Presidio in San Francisco, saw the car at Echo City on May 7. Dillon had invited the officers' wives, traveling with the soldiers, to make use of the car's comforts. Capt. Currier described it in his journal:

"It is the famous 'Lincoln car' built especially for the use of our ex president Lincoln in '64 and is without exception the most beautiful design I ever saw. There are seats and sofas stuffed and lined with plush & velvet; the sides of it are likewise stuffed; carpeted with Brussells — and window curtains of heavy 'Nep silk'., windows stained glass, and the paneling over head is [illegible] upon a second tier of windows used for ventilation and painted the coats of arms of the several states of the Union. — Wash stands of marble and long mirrors, it is a perfect ladies' boudoir." While the car did not survive (it was destroyed in a 1911 grass fire while stored in a shed in Minneapolis), some of its furnishings and decorations, removed when it was converted into a coach,

What's the "Point?"

Today, Promontory Summit is home to the recreated Golden Spike Historic Site, home for two replica 4-4-0s: Union Pacific No. 119, shown, and Central Pacific *Jupiter*. TRAINS: Jim Wrinn

Most school children learned that the Transcontinental Railroad was completed May 10, 1869, at "Promontory Point," where the Central Pacific and the Union Pacific met, and where the Golden Spike was driven. But modern researchers and scholars have taken issue with this name. They point out that if you consult a map, "Promontory Point" is at the tip of the Promontory peninsula that extends into the Great Salt Lake. They further point out that the meeting place of the railroads was at "Promontory Summit," as designated in the Joint Resolution of Congress of April 10, 1869, and that the name of the station at that location was simply "Promontory." Lastly they note that the railroad finally did reach "Promontory Point" in 1904, when the Lucin Cutoff was constructed on trestlework across the northern part of the Great Salt Lake. This touched the tip of the Promontory peninsula, with a station named "Promontory Point" close to the actual geographic Promontory Point. It allowed the railroad to bypass steep grades on the eastern approach to Promontory Summit. These researchers and scholars tell us that the proper name for the Golden Spike site is either "Promontory Summit," or just "Promontory," and that referring to the place as "Promontory Point" is a mistake.

But maybe it is the researchers and scholars who have it wrong; maybe "Promontory Point" is also a correct name for the location. In 1869 all three names, "Promontory Summit," "Promontory," and "Promontory Point" were commonly used when referring to the Golden Spike site; but by far the most common was "Promontory Point." Did the people in 1869 not know what they were talking about?

Actually, it is the modern researchers and scholars who have applied modern geographical identifications and usages instead of the appropriate 1869 usages. Back then "Promontory Point" was not a singular geographic point or place; it referred to a geographic feature — the modern Promontory Mountain range, including the entire Promontory peninsula. For instance, the agreement signed by General Grenville Dodge, chief engineer of the Union Pacific, and Collis P. Huntington, vice president of the Central Pacific, in Washington, D.C., on April 9, 1869, designated the meeting point of the two railroads as "the summit of Promontory Point." Dodge in his correspondence regularly referred to "Promontory Point", and even referred to "the summit of Promontory Point" a number of times. Sidney Dillon, vice president of the Union Pacific, spoke of Union Pacific construction "on [the] West slope of Promontory Point" (referring to the parallel grading of the Union Pacific and Central Pacific). A survey of contemporary 1869 sources finds individual writers freely intermixing references to "Promontory," "Promontory Summit," and "Promontory Point." And of all those terms, "Promontory Point" probably accounts for two-thirds of the historical references. So the next time you say "Promontory Point" and some "expert" corrects you, tell them that they are mistaken; that in 1869 "Promontory Point" referred to the whole Promontory Mountain range, and that it is a correct 1869 name for the place, along with "Promontory Summit" and "Promontory."

— *Kyle Wyatt*

Construction of a temporary bridge at Devil's Gate in Weber Canyon, Utah, provided Union Pacific officials a way to reach the celebration at Promontory Summit two days late on May 10, 1869. That's UP 4-4-0 No. 145 in the distance with a work train. Oakland Museum of California collection

There is so much in one photograph: Note the crew member on the running board. The glittering brass on this UP locomotive at Taylor's Mills, near Ogden, that would have been much like No. 119 at Promontory. Alfred A. Hart, Department of Special Collections, Stanford Libraries collection

are preserved at the Union Pacific Museum in Council Bluffs, Iowa.

Durant, Dillon, and another UP director, John Duff, were at Echo City on May 5 when the Devil's Gate Bridge to their west partly washed out, preventing them from going to Ogden and Promontory. The next day Durant and Duff decided to take a pleasure excursion to the east in the Directors' Car while awaiting the bridge repair; Dillon remained at Echo City in the Lincoln car.

At Piedmont, Wyo., about 60 miles east of Echo City, a group of about 300 tie cutters waylaid Durant and Duff demanding payment of money owed; they had not been paid since January. They removed the car from the train, chained it to a siding, and threatened bodily harm to the occupants if they were not paid. Durant wired for money; accounts vary on the amount, $80,000 or $800,000, but the former seems more likely on short notice. Money was delivered on May 8, and Durant and Duff were released. UP Chief Engineer Grenville Dodge suspected the whole thing had

been staged by Durant, who Dodge thought had likely skimmed off a portion of the money for himself, although Dodge had no proof. The railroad's leadership was in transition, with Durant on his way out; he was dropped from the board of directors on May 25, 1869.

While the Piedmont incident was over, the Devil's Gate Bridge was still not passable. Early May saw a lot of rain in Nevada and Utah, and the river rose, undermining some of the bridge support. The bridge crew arrived to shore up the bridge on May 5.

Finally, around midnight of May 9 — perhaps minutes before it was May 10 — the UP crew had strengthened the bridge enough so that cars could be rolled across by hand. Locomotives could still not cross. Durant's directors' car and its subsistence car rolled across, as did executive sleeping car No. 29, and a Pullman sleeping car. These four cars, pulled by locomotive No. 119, comprised the "official" train at the Promontory ceremonies. The train stopped at Blue Creek, the main Union Pacific camp, about 7 a.m. for breakfast, and proceeded to Promontory by about 10 a.m.

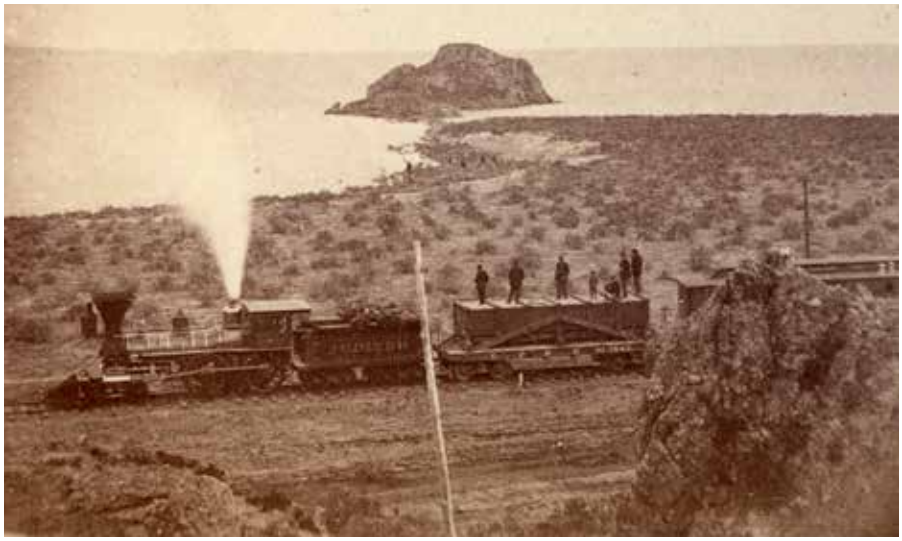
What it all means

The event at Promontory hinged on many factors, most of them out of control of the key players of the day. This was a time when big events were less of a seamless production and more of a spontaneous nature. They were fitted in and around catastrophes, minor and major, and could change at the whim of the weather or the ire of an angry mob.

This year, we will celebrate the completion of the first transcontinental railroad on that most hallowed days for fans of railroad history. Most people will recognize the famous picture of the locomotives facing each other. But few will know about the struggles and challenges that stood in the way of getting the trains and the people to Promontory Summit.

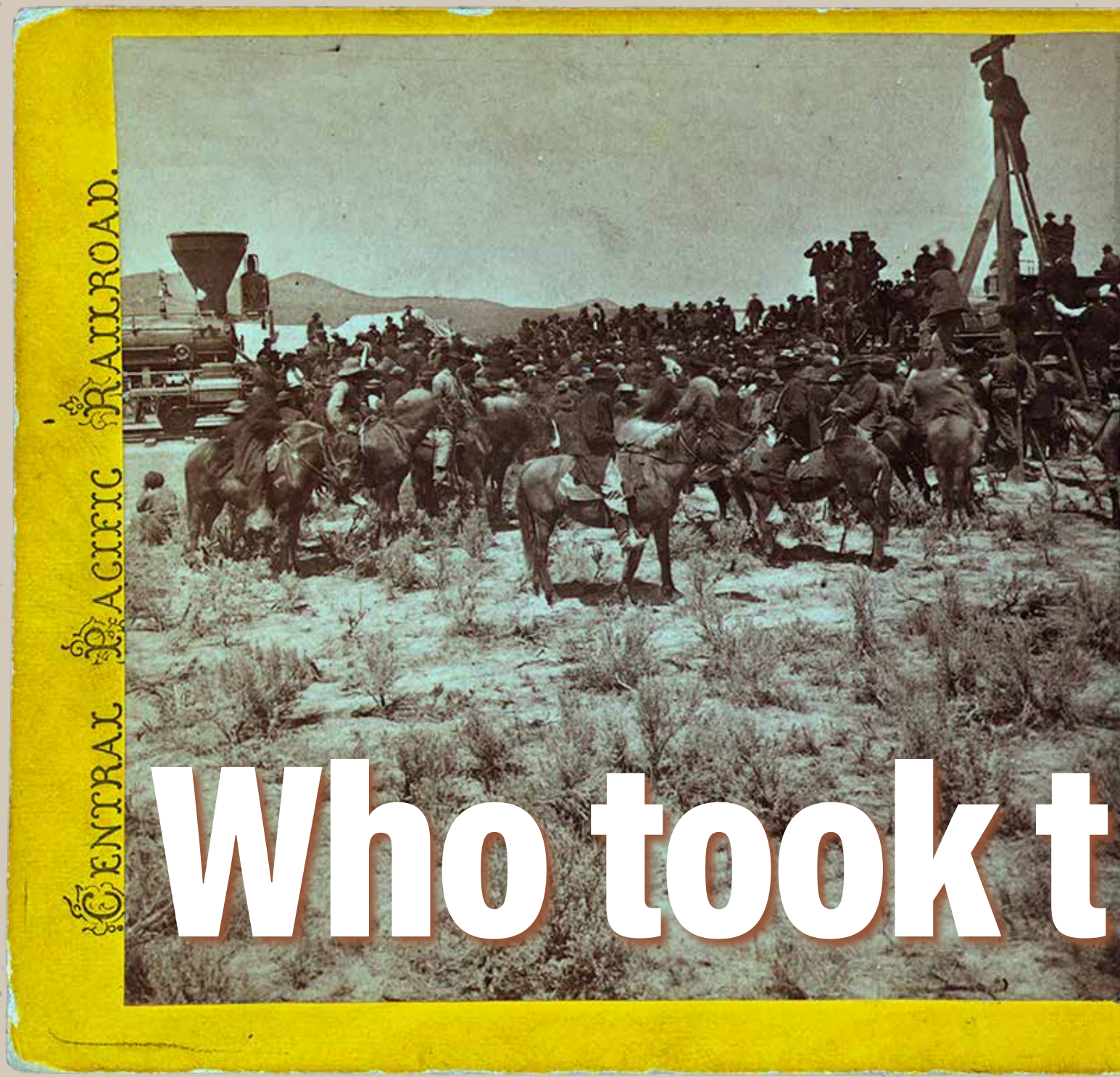
KYLE WYATT is a railroad history and museums consultant from Sacramento, Calif. He retired in 2018 as historian and was previously curator at the California State Railroad Museum in Sacramento. He also was curator of history at the Nevada State Railroad Museum in Carson City. A widely published writer, he served as the keynote speaker on May 10, 2010, the 141st anniversary of the golden spike at the National Park Service site at Promontory Summit, Utah.

How much could the typical 4-4-0 tote in 1869? Central Pacific No. 108, *Stager,* shows that it is up for seven cars at Argenta, Nev. Alfred A. Hart, Department of Special Collections, Stanford Libraries collection



***Jupiter,* the Central Pacific 4-4-0 of Golden Spike fame, poses at Monument Point, Utah, along the Great Salt Lake.** Alfred A. Hart, Department of Special Collections, Stanford Libraries collection

Few railroad bridges are in locations as spectacular as this one, UP's Devils Gate Bridge, not far from Ogden, Utah. The work evident here enabled the UP train to travel through to Promontory. William Henry Jackson, National Archives collection



Who took t

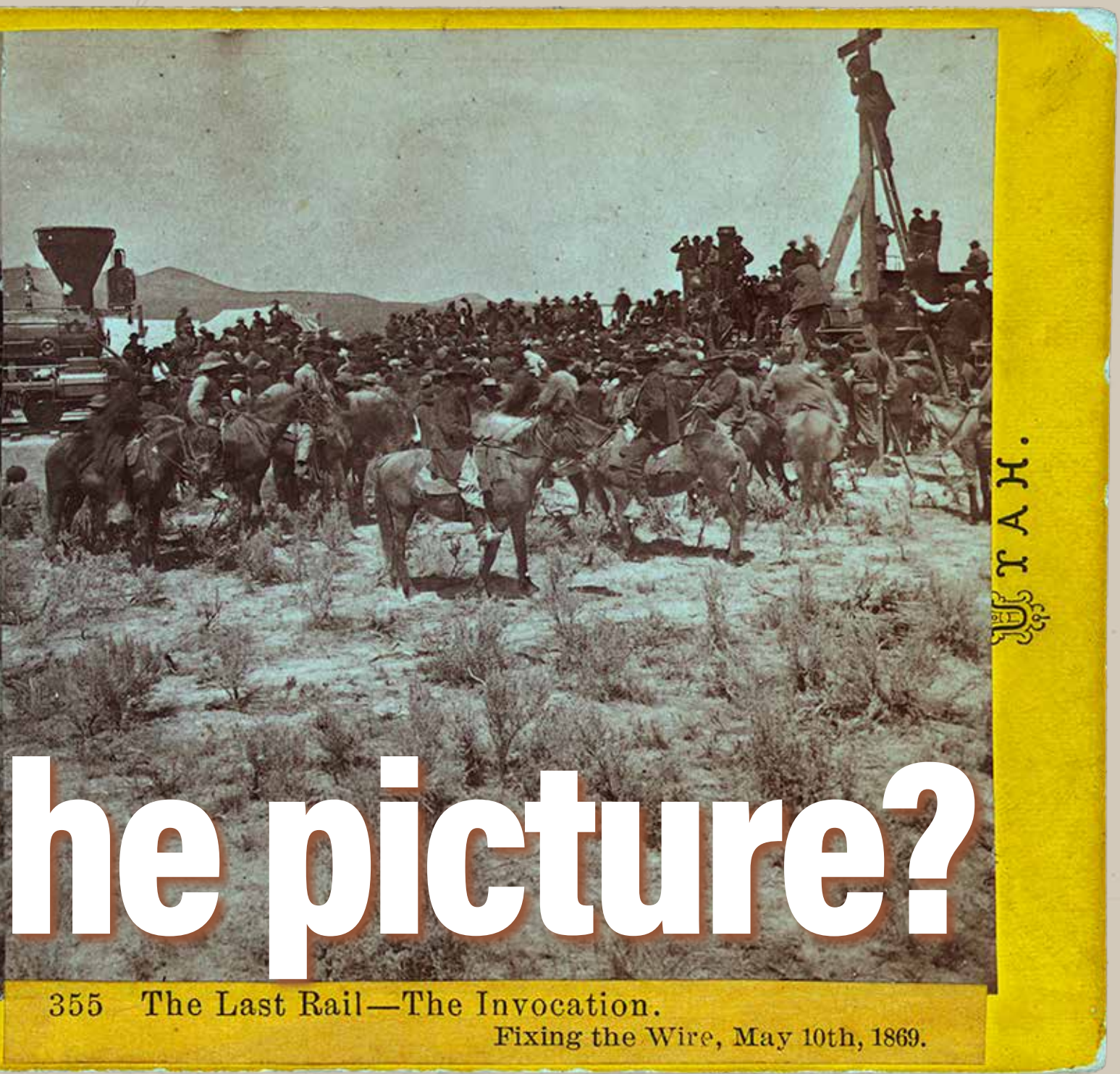
Three photographers documented the first transcontinental

One hundred and fifty years after the completion of the first transcontinental railroad, we are grateful to have images of this amazing work. Images of the people, the trains, and the environment tell us the story of this incredible effort that is often referred to as the moonshot of its day. We have three photographers to thank for these images, and one, who made one of the most iconic images of American history.

The photographers were Andrew J. Russell (1829-1902) for the Union Pacific, Alfred A. Hart (1816-1908) for the Central Pacific, and Charles R. Savage (1832-1909) of Salt Lake City. Good weather did not ease the difficulties of working with glass sensitized plates that needed to be exposed quickly. The wet-plate collodion process required coating, sensitizing, exposing, and developing the negative in about 15 minutes. Each photographer kept a portable darkroom nearby.

Photographers at the golden spike ceremony faced far more challenges than photographers today, but they produced many of the most significant images in the history of westward expansion — a (some say the) dominant theme in U.S. history.

he picture?



railroad, and one took the photo of a lifetime ▪ **by John Gruber**

Photographer Hart documented the construction of the Central Pacific and traveled with President Leland Stanford to Promontory. Library of Congress

All took stereo negatives, while Russell was the only photographer to take large-format negatives. Let's take a look at each photographer and his contributions to the record.

Alfred A. Hart

Hart was born in Norwich, Conn., and trained as a portrait and landscape artist. He was the official photographer for the Central Pacific from 1865 to 1869, showing the construction of the western half of the transcontinental railroad. He photographed with a dual-lens camera, traveling from Sacramento, over the Sierra, to Promontory, a distance of 690 miles. Hart created a series of 364 views documenting the challenging construction project. Hart traveled to Promontory on the train that brought CP President Leland Stanford and his party from Sacramento.

Hart's mentor, Edwin B. Crocker, attorney for the railroad, approved Hart's first invoice. Because of this connection, he was able to stop and pose construction workers on the job. Crocker retired late in 1869 and Hart's position ended in a few months. The railroad owned most of Hart's negatives and when

Carleton Watkins (1829-1916), a friend of CP Vice President Collis P. Huntington and an outstanding photographer in his own right, took over, Watkins published Hart's views without credit. Another well-respected contemporary photographer, Eadweard J. Muybridge (1830-1904) also followed Hart in making scenic views along the railroad.

While the speeches received columns of space, newspaper coverage of photography was limited to a short paragraph. "A.A. Hart, artist of the Central Pacific, today took numerous sketches of the scenery around this point and vicinity, which promise to afford complete views of this region," the San Francisco Chronicle wrote.

"The Railroad Photographs of Alfred A. Hart, Artist" (1996) by Mead B. Kibbey acknowledges that "Russell's record of the joyous occasion is probably the most famous photograph ever taken of an event in the 19th century."

After his work for the railroad, Hart exhibited at the California State Fair. He won $10 for the best uncolored photo in September 1869. He continued to paint and was awarded a gold medal for his paintings at the fair in 1872. When he died, Hart's body was disposed of "for anatomy." It was not until 2017 that Kibbey dedicated a granite monument to Hart at Sacramento's Historic City Cemetery. In 2014, Kibbey donated his complete set of Hart's original stereoviews to the California State Library Foundation.

Andrew J. Russell

Russell, the photographic star of the Promontory extravaganza, produced one of the best-known views in the history of photography — a celebration showing locomotives facing each other with the engineers of UP No. 119 and CP *Jupiter* holding champagne bottles against the sky. Russell called his photo "East and West Shaking Hands at Laying Last Rail" (see pages 4-5).

Newspapers described the scene. When the speeches were over and a report telegraphed to the U.S. president, "the photographers began their work while the crowd stood still." They "had instruments on the ground, and when these attempts to perpetuate the scene were over cheering commenced for the united roads," according to the Lassen (California) Sage Brush, in a widely reprinted article apparently from the Daily Alta, San Francisco.

Woodcut engravings of Russell's photos of the "Wedding of the Rails" appeared in Frank Leslie's Illustrated Newspaper; he wrote: "The great railroad problem of the age is now solved. The continental iron band now permanently unites the distant portions of the Republic and opens up to commerce, navigation, and enterprise the vast unpeopled plains and lofty mountain ranges that divide the East from the West." Leslie's printed his famous view as the two-page center spread and two other views on the cover remarkably quickly, on June 5, 1869.

Russell's stereographs do not show Chinese workers prominently, but three of the eight who leveled the roadbed with picks and shovels in preparation for the laying of the last rail lived into their 90s — Wong Fook, Lee Chao, and Ging Cui. They returned for a parade in Ogden on the 50th anniversary of the laying of the last rail.

Dr. Thomas C. Durant, a UP vice president, authorized Russell's photographs of construction activities, and in return, Durant and others purchased his photos. Russell made two trips as official photographer for the UP, one in 1868 and the other in 1869. His extensive series, "Union Pacific R.R. Stereoscopic Views," showed construction from Cheyenne, Wyoming Territory, to Promontory.

Russell arrived in spring and returned to New York City for the winter in 1868. In February 1869, when he showed 12 prints at the Photographers Section of the American Institute meeting, Russell described the scenery as "curious and remarkable, differing in all respects from any found on the Atlantic coast."

Russell completed The Great West Illustrated, an album of 50 1868 photographs, in April 1869, and shipped the albums west in May 1869. Illustrated is an example of a publication issued to impress investors and government officials.

On his way back west in May

Andrew J. Russell, above, made the image at left on May 10, 1869, one of many he shot that day. Oakland Museum of California

1869, he showed advance pages to a writer from Echo City, Utah, to the Deseret Evening News, which described this "magnificent illustrated work now about ready for publication" as "a model of mechanical excellence."

In the preface, Russell noted that only few people and a small number of scientific expeditions had traveled through "this Great Central Belt" and concluded that the album would "excite the admiration of all reflecting minds as the colossal grandeur of the agricultural, mineral, and commercial resources of the are brought to view."

After Promontory he continued coverage of the Pacific Railroad, traveling to California for photographs of prominent Central Pacific locations such as Donner Pass and the Sacramento shops.

Russell and his companions faced some "unpleasant and not uncommonly ludicrous" problems, he told fellow photographers at a meeting in New York City in 1870, according to correspondence published in the Philadelphia Photographer. Because of alkaline water in large sections of the West, he had to carry good water 70 miles. He often traveled 50 miles on foot for views, and he was forced to subsist on game. He fell off his mule, saying "that had it not been for the ears of the mule he would have gone overboard."

For years his images were attributed to Stephen J. Sedgwick, who made slides from them for the lecture circuit in the 1870s. Credit was slow coming, but in 1969, the centennial of the golden spike ceremony, tributes by Barry B. Combs in "Westward to Promontory, Building the Union Pacific across the Plains and Mountains" (1969), and Gerald M. Best's "Iron Horses to Promontory" (1969) were published.

In 1987 and 1988, the Oakland Museum of California sponsored a major exhibition, "The Nation at War! The Nation at Work, Andrew J. Russell's Photographs of the Civil War and the Transcontinental Railroad." Susan E. Williams, the California scholar who has been tracing Russell's record since 1978, curated the exhibition. His collection of more than 200 large plates and 400 stereo-glass negatives is preserved in the Oakland Museum's collections.

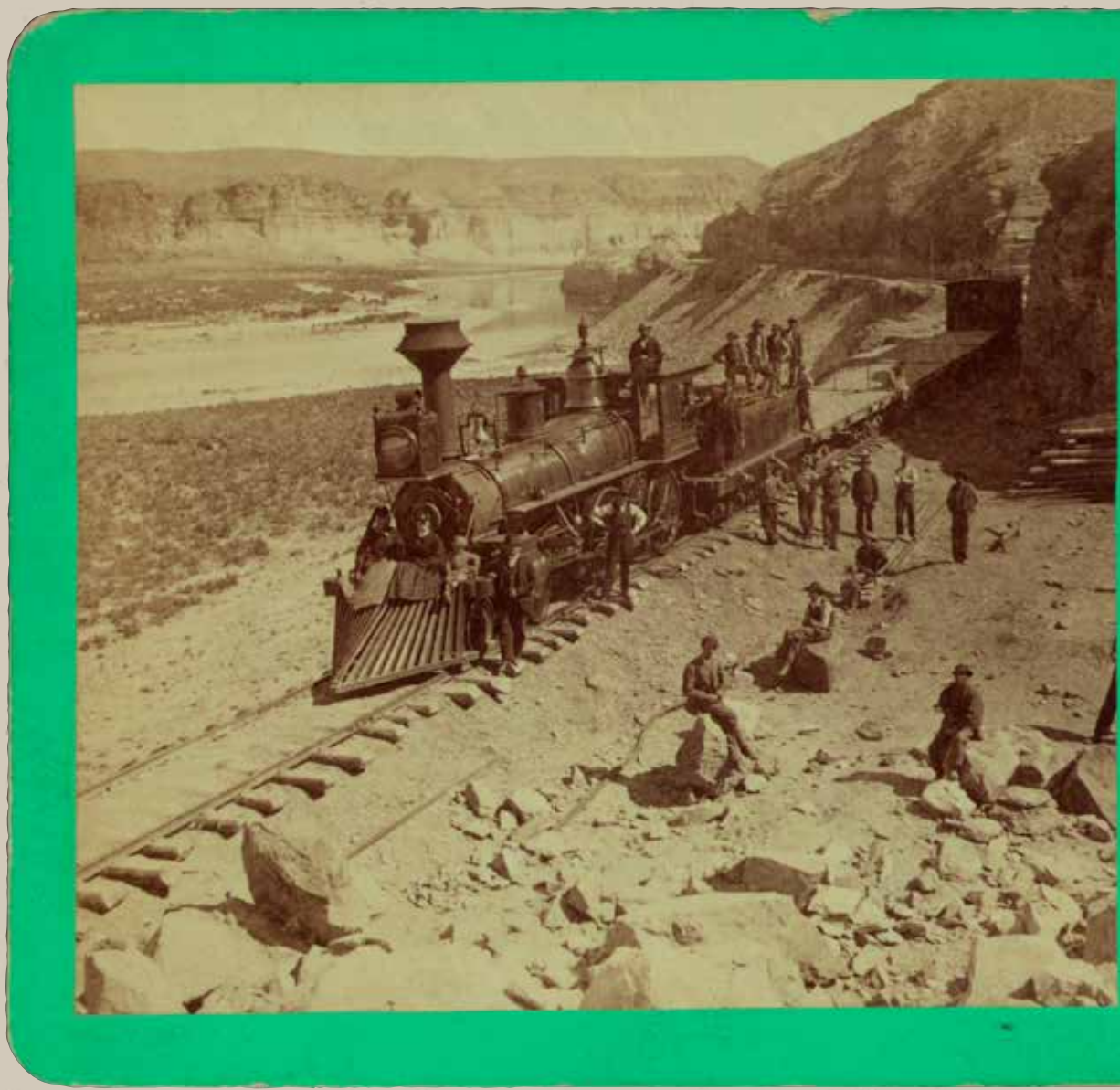
Russell was born in Walpole, N.H. His birth date, sometimes erroneously listed as 1830, was March 20, 1829. He grew up in Nunda, N.Y., where his family worked in canal and railroad construction. He painted portraits, taught art and handwriting at the Nunda academy, then opened a painting studio in Hornellsville, N.Y. In 1862, the second year of the Civil War, he was a captain in the 141st New York Infantry. He apprenticed in photography, was assigned to special duty as government photographer on March 1, 1863, in Alexandria, Va., and he photographed United States Military Railroad and Quartermaster Department operations for the rest of the war. He exposed hundreds of negatives of the construction, destruction, and reconstruction of railroads and bridges and documented the evolving engineering and supply operations that resulted in the Union Army's occupation of the Confederate capital at Richmond, Va., in May 1865.

After he finished the railroad project in the West, he made two photos in Columbus, Ohio, returned to New York City, and joined Leslie's as a full-time staff photographer in 1870. Leslie's attributes some photos to "our staff photographer" and others to Russell. Russell continued at Leslie's until 1891, when he applied for a disability pension from the military and retired to Brooklyn.

"Russell was one of the earliest to capture the essence of the megamachine — the organization and American will behind it — that would later rocket men to the moon," Karen Current concludes in "Photography and the Old West" (1978). Railroad writer Lucius Beebe, known for exaggerations, did not exaggerate when he described the Promontory view as "the most important single document in the iconography of the Old West."

Charles R. Savage

Savage, a Mormon from Salt Lake City, was invited to cover the ceremony by UP's consulting engineer, Silas Seymour. Savage, who received $10 for expenses, arrived early and at Blue River wrote in his



journal, "Every ranch or tent has whiskey for sale verily the men earn their money like horses and spend it like asses."

On May 10, Savage worked all day and wrote in his journal that he "secured some nice views of the scenes connected with the laying of the last rail ... Everything passed off lively and the weather was delightful. Saw but little of the actual driving of the gold spike — and laying of the laurel tie — as I was very busy." Savage left at 5 p.m. and as soon as he was back in Salt Lake City, started selling stereos. His photo of the event appeared in Harper's Weekly, also on June 5, 1869.

Savage, born in Southampton, England, sailed across the ocean, arriving in New York City in 1856. After a few years, he started a new career as a photographer. He traveled in a Mormon wagon train in 1860 to Salt Lake City. He established a studio, then returned east in 1866 on a "Photographic Tour of 8,000 Miles" (title of a two-part article in the Philadelphia Photographer), going by way of San Francisco and the Panama Canal. In New York, he looked into "new apparatus, new processes." In Philadelphia, he purchased a wagon, with a 9-foot-by-6-foot darkroom, and shipped it by rail and steamboat to Nebraska City, returning home on the overland route. As he reached Salt Lake City, he told photographers that they must be well prepared. "By all means stick to the wet process ... herein lies the principal difficulty, for everything evaporates at a fearful rate, and you must watch your collodion very closely," he warned.

The photographers sometimes traveled together. Russell met Savage in Salt Lake City in 1868. Russell's photographic wagon shows in the background in Savage's stereographs. They stood side by side at the Promontory ceremony in 1869. A month later, they were together again at Echo, Utah. The same summer, Russell accompanied Timothy H. O'Sullivan into the Uinta mountains with the War Department's U.S. Geological Survey Exploration of the 40th Parallel.

UP construction engineer Samuel Reid gave Savage a pass on May 20, 1869. He was at the "grand finale to track laying" on Jan. 10, 1870, on the Utah Central, connecting Salt Lake City and Ogden. He continued photographing UP and with more free passes on the Denver & Rio Grande, Central Pacific, Utah Central, and others recorded a large segment of the West. D&RG provided Savage and guests with a private car for photography in 1889 and 1893. According to an obituary, railroaders, "among whom he was respected and loved," mourned his death.

Savage, above, photographed at Promontory on May 10 and also covered other construction projects on UP, Rio Grande, Central Pacific, and Utah Central. Library of Congress

Other photographers and the legacy

The Pacific Railway Act, which Abraham Lincoln signed into law on July 1, 1862, authorized the UP and the Central Pacific railroads to construct the lines and provided government bonds and vast land grants to help fund the work. Photography did not begin immediately, but eventually the photographers followed the construction crews west on the UP and east on the CP. Earlier, John Carbutt of Chicago, photographed a UP trip to the 100th meridian in fall 1866.

All the photographers' work are today recognized as sources of historical information, but their economic value to businesses, especially for garnering more investment funds and freight and passenger service, seems to elude economic, political, and social historians. According to a Ph.D. dissertation by Leland K. Wood, a journalism professor at University of Pittsburgh-Johnstown, "sophisticated and systematic corporate public relations were practiced during the construction of the first transcontinental railroad, 50 years before historians generally place the beginning of such practice." But words dominate. He mentions photography only four times.

Newspapers across the country published reams of text about the event. One of the best commentaries comes from an unexpected source, the Galveston News (June 4, 1869): "The artist of the Union Pacific Railroad photographed this scene — a locomotive flanked by Chinese on one side and a locomotive flanked by Caucasians on the other, taking in some of the accessories — the meeting of America, China, and Europe in the midst of the vast and fruitful desert which is hereafter to be filled with busy multitudes and with all the evidence of human progress and power." But it was too soon for the writer to have seen the photo, and the Chinese were more prominent in his imagination than in the photo.

While Russell, Hart, and Savage are best remembered for their railroad work, many others photographed along the transcontinental railroad, including a woman, Sarah Luse Larimer (1836-1913), Sweetwater, Wyoming Territory, who also sold crossties to the UP.

To each of these photographers, we owe a debt of gratitude for documenting early railroading's most amazing feat. 1

Author JOHN GRUBER, *founder of the Center for Railroad Photography & Art, completed this story shortly before he passed away Oct. 9, 2018, at age 82.* TRAINS *publishes this, his last work, in honor of his rich legacy.*

See the photos!

See the works of Hart and Russell in an exhibit called "The Race to Promontory, The Transcontinental Railroad and the American West" at the Utah Museum of Fine Arts in Salt Lake City, Feb. 1-May 26, 2019; and the Crocker Art Museum in Sacramento, Calif., June 23-Sept. 29, 2019.

Tracks across Sherman

How the Union Pacific built — and rebuilt — the main line in Wyoming and Utah

by James Ehernberger

Hill

A westbound stack train climbs the famous "gangplank" that Grenville Dodge and a survey party discovered by accident. The story has it that he was running from Native Americans when he stumbled upon the ideal route for the first transcontinental railroad. Main photo, TRAINS: Jim Wrinn; inset, TRAINS collection

Sherman Hill is one of the landmarks on the transcontinental railroad. It was the first major obstacle for the railroad as it headed west. It is the place where Big Boys, gas turbines, and Centennials were all put to the test. It's the highest point on the first transcontinental railroad, but at the same time is one of the lowest and easiest rail crossings of the Rocky Mountains. Today, it's one of the busiest main lines in North America — one of the best displays of modern railroading with heavy intermodal, coal, and merchandise traffic traversing not one, not two, but three tracks.

How the railroad put down tracks on this imposing grade and rebuilt them, here and across Wyoming and Utah for decades hence, is an epic story of pioneering effort, strategic growth, and an unending quest to run a better railroad.

The transcontinental railroad's first rails were laid in Omaha, Neb., on July 10, 1865, and the railroad reached North Platte, Neb., on Dec. 3, 1866. Locating the route was a tremendous task for survey parties. They followed every stream to its headwaters in an effort to obtain the easiest grade possible. Their goal was to locate grades that should not to exceed 43 feet per mile, or an impressive 0.8 percent. Surveyors searched a broad area of about 200 miles. After leaving the Plate River Valley and moving into Wyoming, and especially on Sherman Hill, the terrain became more difficult with few favorable routes.

Gen. Grenville Dodge, who was in charge of determining the route, was on a reconnaissance trip when he spotted a Native American group, and while escaping, he came upon a rise and discovered the future Shermn Hill route west from Cheyenne. While it was impossible to maintain the desired grade, this route was the best one, and was not considered excessive. Today, we know it as the "gangplank," a gently climbing strip of land west of Cheyenne to the south of the Crow Creek Valley, and east of present Granite Canon.

Challenging this effort were troublesome and hostile Native Americans, particularly Sioux. They conducted hit-and-run raids, scalped workers, and even wrecked trains. Their guerrilla warfare tactics were difficult for those building the grade, bridging ravines, and laying track. Military posts (including Fort D.A. Russell, the predecessor to Cheyenne's F.E. Warren Air Force Base) were built to protect construction workers.

Dodge's survey party set up camp, and on July 2, 1867, surveyors began staking out the boundaries of Cheyenne, a task completed on July 10. Cheyenne was named for one of the most important tribes of original Great Plains inhabitants, according to Dodge's biography. Dodge envisioned this location, blessed with plentiful water, to be a terminus and shops at the eastern base of the Rocky Mountains.

After rails passed Julesburg, Colo., 145 miles east of Cheyenne, the Colorado town's structures were picked up board by board, including many tents, and most of the town was moved by team and wagon to Cheyenne. Julesburg was one of the many notorious end-of-track towns where gambling and other sins prevailed in a setting best known as Hell on Wheels.

Construction continued westward until the rails crossed from Nebraska (statehood on March 1, 1867) into the Dakota (later Wyoming) Territory at the end of the first week of October 1867. On Oct. 20, the track reached Hillsdale, 21 miles east of Cheyenne. From this point, heavy construction work was required leaving the Lodge Pole Creek Valley to Archer, where the line crossed into the Crow Creek Valley.

Searching for the best route, Dodge chose the lower route via the Lodge Pole Creek Valley toward Cheyenne, instead of a South Platte survey, due to the difficulty of constructing a railroad over the mountains west of Denver. Established in 1858, Denver had a large population, primarily due to mining and minerals in the mountains. Of course, Denver desired a railroad, but it was not about to get one.

Many Denver businesses moved to Cheyenne. N.A. Baker moved from Denver to Cheyenne and issued the first edition of the Cheyenne Leader newspaper on Sept. 19, 1867. Reports vary, but many indicate Cheyenne's population during winter 1867-68 reached more than 4,000, with several thousand more at Fort Russell and Camp Carlin. People lived in dugouts, tents, and wagons.

After arrival of the railroad in Cheyenne on Nov. 13, 1867, a 3-mile-spur track was built to serve Fort Russell. Thus, supplies could be distributed from nearby Camp Carlin to military outposts throughout the region. Cheyenne was destined to become the end-of-track material and supply location during the winter months of 1867 and 1868.

UP built a frame depot of 24 by 135 feet, consisting of baggage, mail, and express rooms, a lobby, and a ticket office. A hotel and eating house were constructed. A 20-stall stone roundhouse with a 54-foot iron turntable, sand house, and a 44-pocket elevated coaling trestle were erected. Nearby stood a 65,000-gallon wood water tank.

Carloads of supplies, especially for mining in Colorado, arrived daily to be transferred to teams and wagons. Stages ran between Cheyenne and Denver as many as six times a day. Cheyenne thrived handling supplies for the cattle industry in the north, as well as shipments for Fort Russell and Camp Carlin.

Beyond Cheyenne loomed the rugged

Dale Creek trestle, just west of the summit of Sherman Hill, at more than 8,000 feet in elevation, was one of the major obstacles on the grade. This structure, reinforced in 1885, was the second trestle at the site, replacing a wooden bridge built when the railroad first passed here in the late 1860s. Union Pacific

Roadbed and track construction on the original Union Pacific main line was fast and rudimentary. This scene in Wyoming shows the cut-and-fill work, as well as the lack of ballast and the rough-hewn ties that marked the initial effort at building a transcontinental railroad. A.J. Russell

terrain known as Sherman Hill. Construction continued westward, and by the end of 1867, the end of track had reached Granite Canon, 19 miles from Cheyenne, and 536 miles west of Omaha. Here, construction became more difficult. The highest and longest earthen fill was built during the winter months of 1867 and 1868. This work required manpower and mules, hand tools, wagons and carts, and blasting powder.

Tracklayers worked westward to Sherman station, arriving on April 5, 1868, at what was the highest railroad station in the world at 8,247 feet above sea level. Dodge bestowed the name Sherman in honor of Civil War Gen. William Tecumseh Sherman, who also happened to be the tallest general in the U.S. Army.

Located 549 miles from Omaha, the town of Sherman swelled quickly to a population of more than 250. Company buildings consisted of a station, a small repair shop, a five-stall stone roundhouse, turntable, and a water tank. A post office, telegraph and express office, one store, two hotels, two saloons, and about 20 houses constituted the town.

Dale Creek ravine, about 3 miles beyond Sherman, was the second major obstacle on Sherman Hill. A huge trestle, 650 feet long and 126 feet high, was built during winter 1867-68, using timbers from Chicago. Dale City was located at the bridge construction site and included a short-lived post office. As soon as track was installed on the bridge April 21, workers pushed westward.

Fort Sanders, another military camp built to protect railroad workers, was only 16 miles away. The first train worked its way into Laramie on May 4. Laramie immediately became a terminus. Dr. Thomas C. Durant, who was in charge of the construction, overruled Dodge's plan that Cheyenne would be the location of the railroad's major shops, and placed them at Laramie. This arrangement remained for more than 20 years.

Sherman Hill grades (up to 1.92 percent), as originally constructed, required the use of helper locomotives on most all trains. But gravity was only one problem. Snow was a major issue in the early days, due to the narrow cuts made during the line's hasty construction. At one time, 13 snow sheds lined the route between Archer (9 miles east of Cheyenne) and Laramie. The sheds became a hazard for trainmen riding the top of cars. Many sheds were destroyed when a hot cinder lodged in the dry timbers and fanned in the wind. Over time the cuts were widened, and the remaining sheds removed one by one prior to 1900.

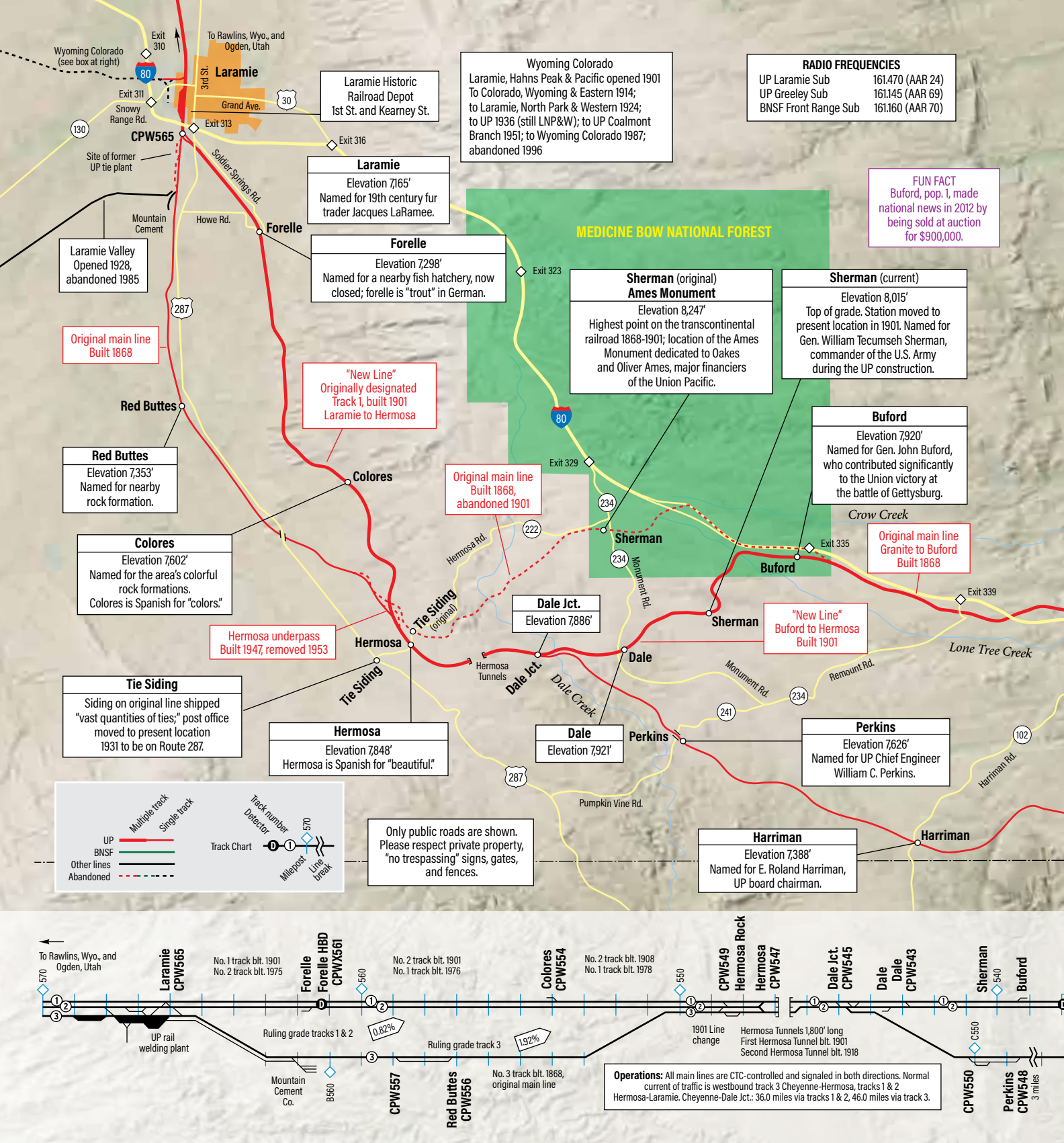
By 1868, the Central Pacific was rapidly building across the Nevada desert. The UP no longer experienced Native American troubles west of the Continental Divide. West of Green River, Wyo., tough Irishmen laid nearly 8 miles of track in one day. By the end of the year, UP established the western terminus at the Utah border, at Wahsatch (the railroad spelling), 966 miles west of Omaha. From Wahsatch, UP descended through Echo Canyon to the valley of the Weber River into Ogden, Utah, 1,032 miles west of Omaha, in 1869. Soon, the meeting of the rails would take place at Promontory. But that's not the end of the story. Because the UP had built rapidly and cheaply, it soon found its main line from Omaha to Ogden (where the Central Pacific interchange was soon moved) needed serious upgrades.

Railroad competition

America experienced "railroad fever" in the 1880s, with new lines built everywhere. This was especially true in the West. The advancement of other lines meant competition, and the result was that revenues were shared with those lines, cutting profits for UP. A Burlington Route extension into Denver was completed on May 24, 1882. To counter this competition, UP in 1881 revived a Colorado Central extension, originally graded in 1872, by building a 151-mile cutoff between Julesburg and La Salle, Colo.

The Northern Pacific (across southern Montana) was completed to the Pacific coast in 1883. The UP backed construction of the Oregon Short Line from Granger, Wyo., making a connection at Huntington, Ore., that was completed in 1884.

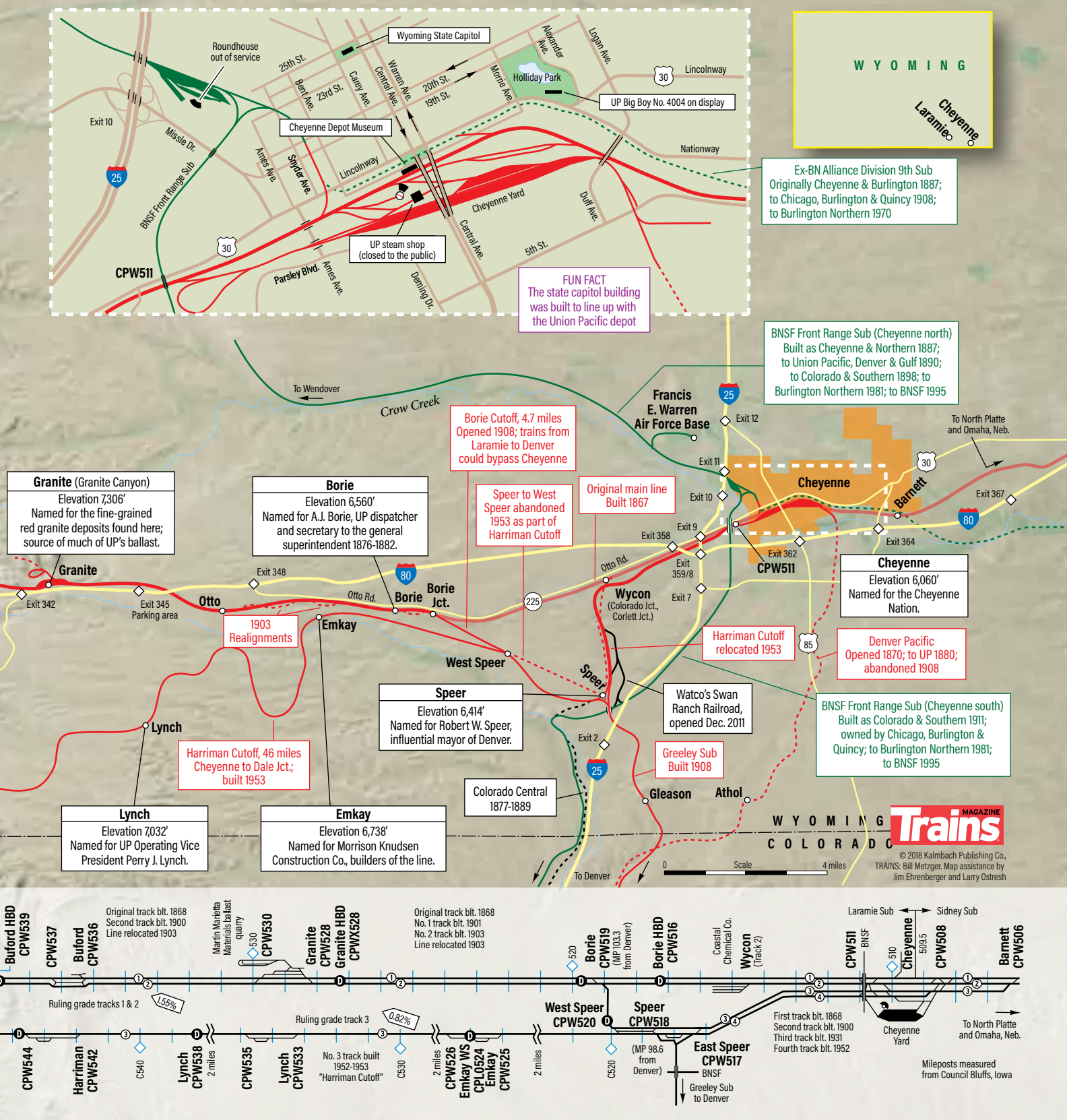
The Fremont, Elkhorn & Missouri Valley Railroad, a Chicago & North Western sub-



sidiary, crossed into Wyoming territory near Lusk, Wyo., in 1886, terminating at Douglas, Wyo., and was completed to Casper, Wyo., in 1888. Until this road was constructed, Cheyenne was a trade center, especially serving the livestock industry, where thousands of herds roamed open rangelands. For the cattlemen, the Elkhorn line reduced the distance to drive cattle to a railhead.

Cheyenne felt this change, and reacted when local business leaders incorporated the Cheyenne & Northern Railway on March 1, 1886, to construct northward. This line, subsidized by a county bond issue, extended 125 miles by the end of 1887, at Wendover, Wyo., where stockyards were built to serve large cattle shipments. UP operated it as a branch line from Cheyenne.

The Burlington built a central route (known as the High Line, from Holdrege, Neb.) that was completed into Cheyenne on Dec. 11, 1887. The original plans were to continue this line to Ogden to connect with the Central Pacific.



UP management gave special favors to Cheyenne after the passing of the Cheyenne & Northern bonding. Among them, the railroad completed a new station in 1887, replacing the rickety old batten board structure built in 1867. And in 1889, UP decided to relocate its shops from Laramie to Cheyenne.

Reorganizing the UP

By the 1890s, Congress demanded repayment of UP's construction bonds. Payments had been neglected during the eras of Durant and Jay Gould. Charles Francis Adams became president in the mid-1880s. But due to heavy competition, UP never earned enough revenue to make payments. Adams attempted to make a deal with Congress, but failed. The government foreclosed on the UP, which was placed in the hands of a receiver on Oct. 13, 1893.

A syndicate of Wall Street investors developed a grand plan for reorganization. On Nov. 1, 1897, on the freight house steps in Omaha, the UP main line to Ogden was

The railroad's presence in Cheyenne was secondary to nearby Laramie at first, but eventually the city became the heart of the transcontinental railroad. American Geographical Society

auctioned to satisfy the government debt. The Colorado & Southern Railway, created Dec. 19, 1898, acquired the former Cheyenne & Northern branch line north from Cheyenne to Orin Junction. But the main line went to Wall Street investors, including a small bespectacled man named Edward H. Harriman. He became chairman of the company's executive committee in 1898 and served in that capacity until his death in 1909. Harriman's influence brought about vast improvements and major changes. Those changes prepared the railroad for the future, and their value is evident in their longevity and usefulness.

Visionary Harriman believed in the future of the West. From previous railroad experience, he knew exactly what UP needed. Harriman had a keen eye toward making it profitable. He studied maps, and on his first inspection trip, he insisted on being pushed ahead of a locomotive, so he could sit on the platform of his business car and observe conditions.

Harriman wired New York for significant money to rebuild the line. Major changes shortened the distance between Omaha and Ogden by more than 40 miles, doing away with excessive curvature and steep grades. Across the system, existing grades were raised to a higher standard, and hundreds of trestles were filled in. These improvements eliminated potential fire hazards and expensive maintenance.

Heavier rails, larger locomotives and cars, and deluxe passenger equipment soon became standard. Train speeds and tonnage increased. Profits soared. UP built new facilities, stations, terminals, and stores departments. With traffic increasing after Harriman took over, he set out to double track the entire main line between Omaha and Ogden. One of the first double-track segments was 9 miles between Cheyenne and Borie, Wyo., in 1900. Yard congestion initially drove double-track projects.

Harriman's inspection tour brought changes, especially where heavy grades and tight curves existed. Two major projects, the most expensive, took place in Wyoming. The multimillion-dollar, 5,900-foot Aspen Tunnel in western Wyoming eliminated 9.5 miles over steep Piedmont Hill when it opened Oct. 16, 1901.

The second major project was between Cheyenne and Laramie. Survey crews determined a new route west of Buford to Laramie was possible with the construction of a tunnel, passing Sherman and lowering the elevation by 247 feet. The distance between Buford and Sherman was 6.7 miles. After carefully assessing all possible routes, President Horace Burt presented this proposition to the board of directors, which authorized $2.5 million for construction.

On April 18, 1900, the Sherman Hill contract was awarded to Kilpatrick Brothers & Collins, of Beatrice, Neb., with a deadline of two years. This firm sublet much of the work, except the tunnel. Grading required numerous high fills to cross deep ravines. West of Buford, Lone Tree fill was 130 feet high and 300 feet long. The largest fill, 115 feet high and 800 feet long, was at Dale Creek, about 3 miles from the infamous bridge. A 3-foot-gauge construction railroad moved dirt and rock onto trestles to be dumped. Seventeen steam shovels worked at various locations.

The line change to ease the grade between Buford and Laramie involved the construction of a single-bore, 1,800-foot tunnel. The approaches required extensive earthwork, making a deep cut on the east end and heavy rock work on the west end. The new line, which increased mileage by only 0.37 of a mile, was placed in service on June 2, 1901.

During preliminary survey work, options were considered to eliminate Dale Creek bridge, by then a replacement structure 542 feet long, 135 feet high, hobbled by a 4-mph speed restriction, and tested by the increasing size of steam locomotives. Because of it, 1500-class 4-8-0 locomotives were banned west of Cheyenne. Replacing the bridge, or possibly filling in the ravine, were among the options, but that still did not eliminate pushers. UP management admitted the principal objective was to enable the company to abandon the bridge.

The expenditure for the new line obviously proved that there would be a savings in operating expenses. The elimination of pusher engines from Red Buttes to the summit, and doubleheading eastward

Cheyenne's earliest days are shown by this view of 16th Street between Eddy and Ferguson about 1869. The railroad reached here in 1867 and reports show that many Denver residents and businesses soon followed. As many as 4,000 lived here by 1868. Wyoming State Archives

Dale Creek trestle, measuring 650 feet long and 126 feet high, was built during winter 1867-68 using timbers from Chicago. Union Pacific

passenger trains, were expenses Harriman wanted eliminated. The last train crossed the Dale Creek Bridge in 1901, and not long after, crews tore down the old structure. It was gone, according to a newspaper account, by Sept. 17, 1901.

New line east from Laramie

Meanwhile, there was activity on the western slope of Sherman Hill. Civil engineers located an easier grade east from Laramie, and a new line was constructed in 1901, providing a second main track. This alignment gradually passed close to the base of the Sherman Mountains. It was located about 3 miles east (compass direction) of Red Buttes, at a new station named Colores. This obtained the desired 0.8-percent grade, compared to the heavy 1.92-percent climb eastward from Red Buttes on the original route. This segment was placed in service on June 2, 1901. As a result, helpers were no longer required on eastward trains.

Double tracking was a massive undertaking for the UP. Certain areas were favored due to operating conditions and for eliminating congestion. A second bore at Hermosa Tunnel was placed into service on Oct. 14, 1918. This provided UP with a second main line between Omaha and Ogden, with one exception.

The Aspen Tunnel section in western Wyoming remained a single-track bottleneck. In 1947, the UP authorized construction of the adjacent 6,700-foot Altamont tunnel and additional tracks that would completely double track the main line between Council Bluffs, Iowa, and Salt Lake City, Utah. The $8 million project was placed into service in 1949.

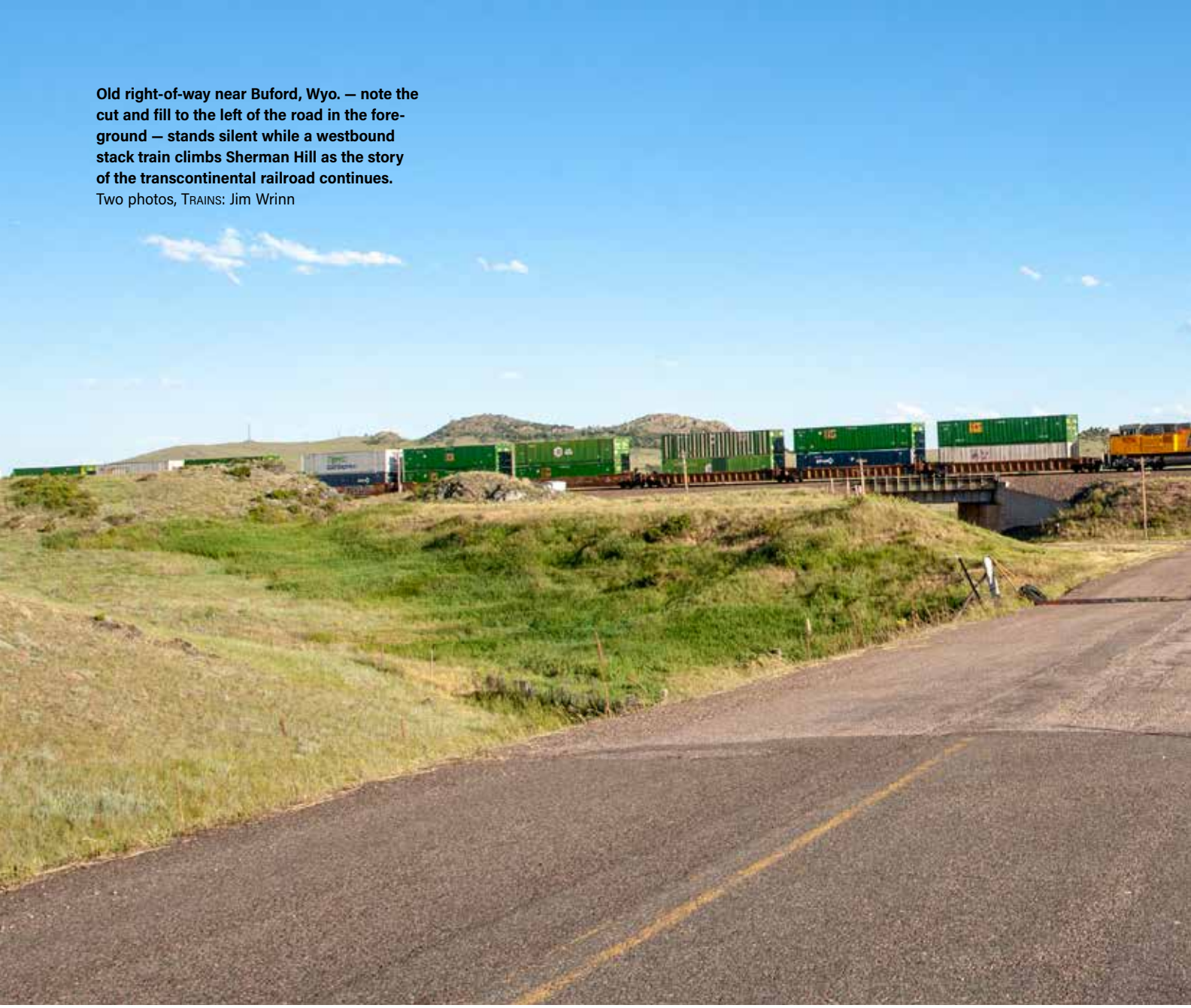
Cheyenne shops and roundhouse

In the early years, the Laramie shop was adequate for smaller power, but operating conditions changed. The Laramie shop was limited by its size, and new facilities were required. On July 10, 1889, in Cheyenne, the cornerstone for a mammoth railroad repair shop was laid. Acres were filled with facilities that would employ thousands for the next 70 years.

Management's desire to increase profits required the development of heavier and larger motive power. Looking at the development and acquisition of locomotives, beginning with Harriman Common Standard designs, we can see an increase in their sizes about every eight to 10 years. When Harriman acquired the UP, motive power was light and inadequate. Improvements required heavier motive power to move trains in an efficient manner.

While Consolidations were adequate for freight operation in 1900, they were not 10 years later, when Mikados were available. Each type was able to handle additional tonnage that justified its purchase price. The 2-10-2 came in 1917; the 2-8-8-0 in 1918; the 4-12-2 in 1926; the 4-6-6-4 in 1936; the larger 4-6-6-4 in 1942; and the Big Boy 4-8-8-4 in 1941 and 1944. Passenger power improved as well, with the 4-6-2 arriving in 1903; the 4-8-2 in 1922; and the 4-8-4s in 1937 and 1944.

Larger locomotives made the 1890 Cheyenne steam shop inadequate. A replacement was needed. A 410-foot shop building was completed in 1919, consisting of 17 bays. It became the system's largest steam locomotive repair shop. During the Great Depression, the man-hours reported



Old right-of-way near Buford, Wyo. — note the cut and fill to the left of the road in the foreground — stands silent while a westbound stack train climbs Sherman Hill as the story of the transcontinental railroad continues.
Two photos, TRAINS: Jim Wrinn

in Cheyenne exceeded those of the Omaha shops. The Cheyenne shop handled all major repair work for the railroad's 25 Big Boy locomotives. The last major steam shop work took place in 1956. Light repair work continued into July 1959, when dieselization was completed.

The Cheyenne roundhouse has also gone through several changes due to the larger locomotives and service requirements. The original 20-stall stone roundhouse constructed in 1868 was removed in 1910. At its peak, the roundhouse in Cheyenne consisted of 48 stalls. Today only seven stalls of the 1930 roundhouse remain in use for UP's heritage fleet, mostly for indoor storage of the most valuable pieces.

Harriman line

After years of being satisfied with its main line across Wyoming, UP officials in 1951 revisited Sherman Hill and its difficult grades. The purpose was to seek a route that would eliminate the 1.55-percent maximum grade between Cheyenne and Buford and the need for helper locomotives. The only way to obtain a westward grade of 0.8 percent was to add mileage. The result was a new line that was 9 miles longer than the Buford route.

The company estimated significant cost savings by eliminating helper crews, plus the need for additional motive power on westward trains between Cheyenne and Laramie. UP figured these savings would pay for this investment in the long term. By then, modern machinery allowed for heavy construction that crossed ravines with high fills, and deep cuts, until the new line met the other main line at Dale Junction. The $16 million Harriman line went into service on May 24, 1953, and 50 enginemen were promptly laid off.

All lines over Sherman Hill between Cheyenne and Laramie were placed under Centralized Traffic Control in 1953. The Cheyenne train dispatcher originally controlled movements. The new Harriman Dispatch Center at Omaha replaced the Cheyenne office in 1989. The operation has flexibility so that trains can operate in any direction on all three main tracks. Today, only the short segment through the Hermosa Tunnels is double tracked over Sherman Hill; all the rest is triple tracked.

With high-horsepower diesel units operating today, high-priority trains now traverse the Buford route. The Harriman line is designated as No. 3 track, and normally only handles the slower westward trains. However, eastward traffic can be seen on this route as well, depending upon conditions.

Through 150 years, the UP main line

across Sherman Hill has undergone drastic changes. The challenging and difficult terrain that stymied Dodge and his survey and construction crews in the 1860s has been conquered over and over again with every new bridge, tunnel, or line relocation. Trains work their way across Sherman Hill every day on a route that would be foreign to the original workers, passing the abandoned earthworks of ancient alignments. Not far from Dale Creek and the abandoned town of Sherman, the imposing granite Ames Monument watches over skittish antelope at dusk on a stormy July evening, while nearby trains meet on the busy triple-track section just east of the Hermosa Tunnels.

The Sherman Hill saga continues. T

JAMES EHERNBERGER *is a retired UP train dispatcher, prolific author and photographer, and noted western railroad historian.*

Dusk on a stormy July night at the legendary Ames Monument: Nearby UP stack, coal, automotive, and merchandise trains flow freely on the three-track main line across today's Sherman Hill.

Union Pacific 1870-2020

Railroad history obviously didn't end the moment the telegrapher tapped out "DONE" at Promontory on May 10, 1869. In fact, Union Pacific history was just beginning. Here are significant dates and events in the history of America's oldest railroad still operating under its original name. We'll carry you right on into the future as there's a big infrastructure event coming up in 2020. — *Jim Wrinn*

1872
UP completes Missouri River bridge between Omaha, Neb., and Council Bluffs, Iowa

1880
UP acquires the Oregon Short Line

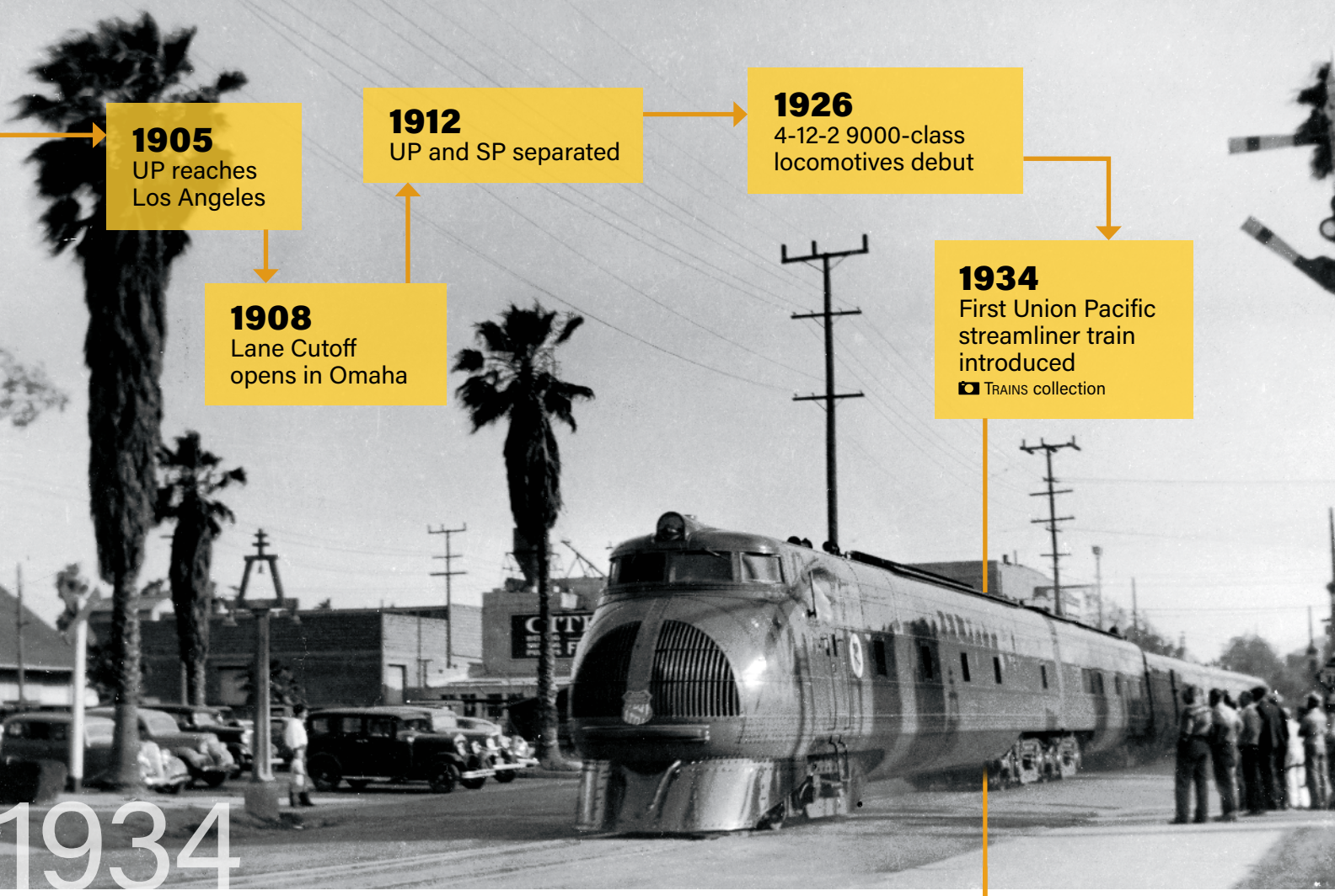
1893
Government foreclosure results in receivership

1897
Syndicate of Wall Street investors (including E.H. Harriman) purchases the Union Pacific

1901
Southern Pacific comes under UP control

1904
Lucin Cutoff across Great Salt Lake opens

A.P. Hill collection



1905
UP reaches Los Angeles

1908
Lane Cutoff opens in Omaha

1912
UP and SP separated

1926
4-12-2 9000-class locomotives debut

1934
First Union Pacific streamliner train introduced
TRAINS collection

1934

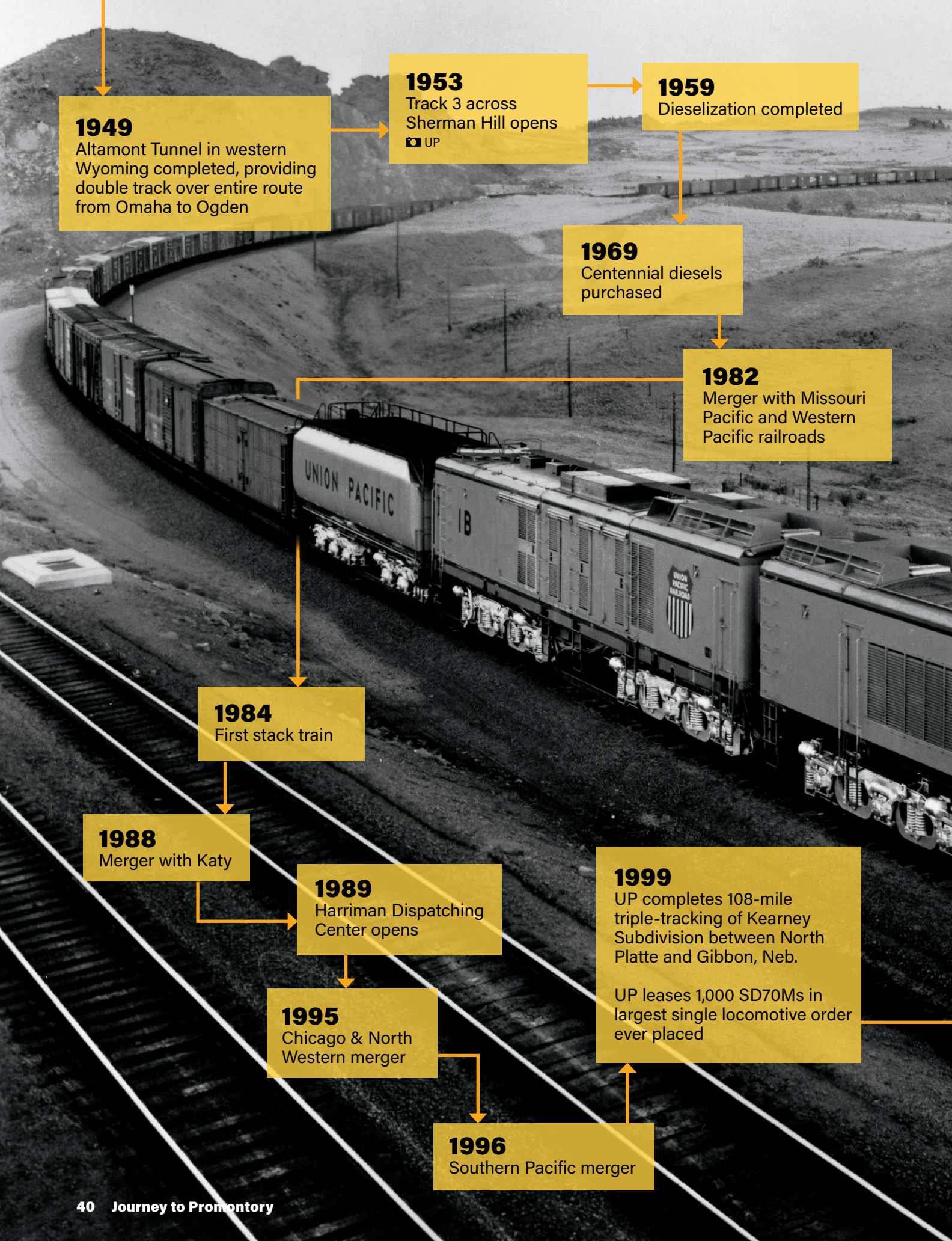
1948

1937
First 800 series 4-8-4 locomotives purchased

1941
First Big Boy delivered

1944
Last steam locomotive, No. 844, purchased

1948
First hump yard placed in service at North Platte
Art Stensvad



1949
Altamont Tunnel in western Wyoming completed, providing double track over entire route from Omaha to Ogden

1953
Track 3 across Sherman Hill opens
UP

1959
Dieselization completed

1969
Centennial diesels purchased

1982
Merger with Missouri Pacific and Western Pacific railroads

1984
First stack train

1988
Merger with Katy

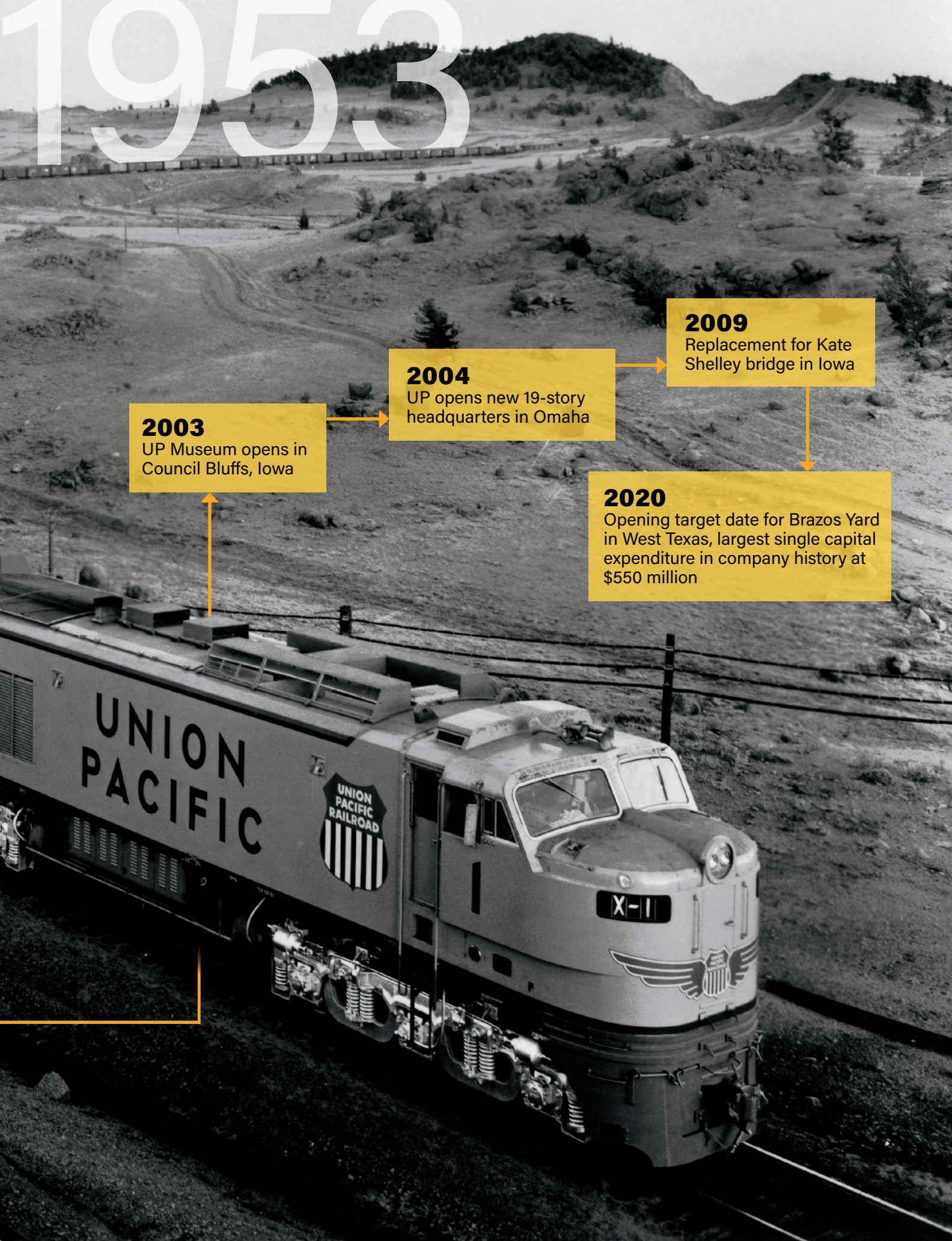
1989
Harriman Dispatching Center opens

1995
Chicago & North Western merger

1996
Southern Pacific merger

1999
UP completes 108-mile triple-tracking of Kearney Subdivision between North Platte and Gibbon, Neb.

UP leases 1,000 SD70Ms in largest single locomotive order ever placed


1953
2003
UP Museum opens in Council Bluffs, Iowa
2004
UP opens new 19-story headquarters in Omaha
2009
Replacement for Kate Shelley bridge in Iowa
2020
Opening target date for Brazos Yard in West Texas, largest single capital expenditure in company history at $550 million
UNION PACIFIC
UNION PACIFIC RAILROAD
X-1

Following the

One man's pursuit of the ghosts of the original transcontinental railroad

By any measure, it was the moon shot of the 19th century. Like the Apollo program of the 1960s, the construction of the nation's first transcontinental railroad a century earlier was a test of new technology across enormous and hostile distances, required unprecedented government expenditure, and garnered the attention of the world.

As students of railroad history know, the Union Pacific built west from Omaha, Neb., and the Central Pacific built east from Sacramento, Calif., across some 1,800 miles of mountain, desert, and plain to meet at lonely Promontory Summit in Utah on May 10, 1869. This great event bound the nation east and west and spurred the development of lands from the Missouri River to the West Coast, displacing native populations along the right-of-way.

A dozen or more books have been written about the monumental construction of the railroad, but except for corporate histories and railfan homages, little recent attention has been paid to this historic route. A couple decades ago, as I conducted field work and photography for a book on the Lincoln Highway, the nation's first transcontinental road, I often looked to the sometimes-parallel transcontinental railroad and wondered what stories, what secrets, hid near the tracks and along the abandoned embankments of sections bypassed for better alignments.

Other projects intervened, but thoughts nagged me: What became of Terrace, Utah, once an important Central Pacific town on the now-abandoned route across the Promontory Mountains? The Dale Creek Bridge in Wyoming? Bloomer Cut in California? The famous Summit Tunnel on Donner Pass, where Chinese workers drilled some of the hardest rock on the planet? And where the original line and the current line are the same, how much has changed? Is anything besides the track gauge the same?

During the past several summers, when the snow is well melted in the Sierra and Wasatch, I've set out to explore this extraordinary path, deeply historic such as the Oregon Trail, the Lancaster Pike, and the Lincoln Highway.

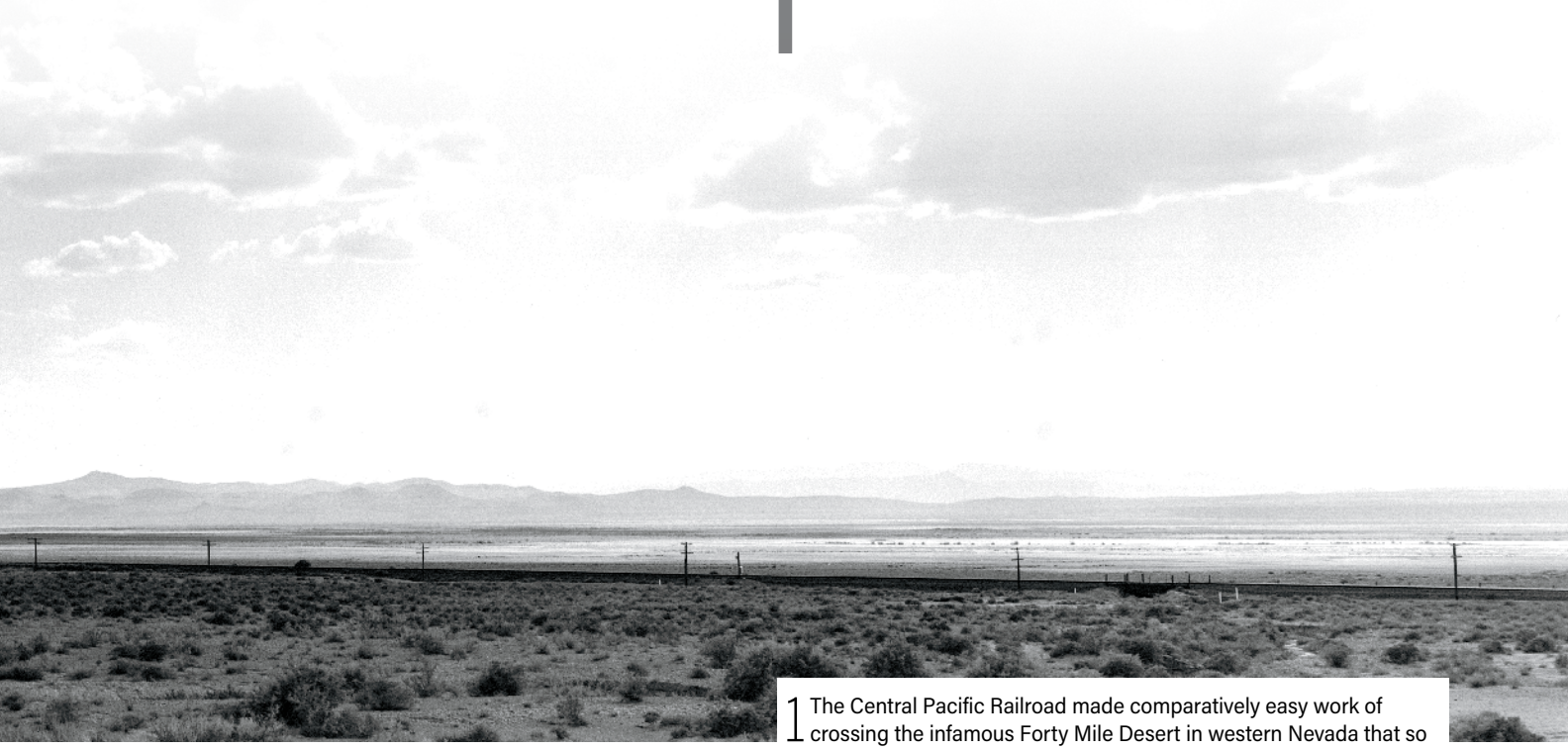
It hasn't been easy. Today much of the path is the busy Union Pacific Overland Route and access is limited. Many of the bypassed and abandoned portions are on private property, and though the original Promontory line is on public lands, the road is difficult and sometimes impassable.

My tool kit is specific to the job. A high-clearance, four-wheel-drive vehicle, including a second spare tire; a full camp outfit, including cooking setup and food for several days; a great pile of maps and books; a list of cell numbers and contacts for local access; a tall tripod and a short ladder; several big cameras; and a cooler full of black-and-white 120 film.

Film?

First, I enjoy the entire process from shooting to traditional darkroom printing, and

Golden Spike



1 The Central Pacific Railroad made comparatively easy work of crossing the infamous Forty Mile Desert in western Nevada that so worried California Trail travelers a short generation earlier and Lincoln Highway motorists a couple generations later. On this day, Amtrak's *California Zephyr* makes time eastbound in the late-day sun.

Story and photos by Drake Hokanson

somehow feel that this more deliberate method honors the work of A.J. Russell and Alfred Hart, photographers who struggled with immense wet plate cameras and tent darkrooms to record the construction of this epic railroad.

In early days of its operation, the line was a tenuous thread. In order to hasten government subsidies, which were paid per mile of construction, it was built fast and cheap. Construction-era photographs show ties projecting beyond the edge of too-narrow embankments, shaky trestles, and poorly aligned track. The railroad and its parallel transcontinental telegraph line suffered frequent interruption due to washout, mountain blizzard, and accident.

The railroad seeded new towns. Some thrived: North Platte, Neb.; Cheyenne, Wyo.; Ogden, Utah; Reno, Nev. Many others faded or disappeared altogether as the line shifted or the trains no longer stopped: Piedmont, Wyo.; Kelton, Utah; Palisade, Nev.

Though slow in coming, improved alignments — including the Lucin Cutoff across the Great Salt Lake, several generations of heavier bridges, the 8-mile-long Bailey Yard in North Platte, and a new longer but lower-altitude summit tunnel in the Sierra — helped create a modern 21st-century railroad.

The Union Pacific now owns the entire line between Sacramento and Omaha, a fact that would no doubt make the builders of the Central Pacific tremble in their graves. Long trains, using distributed power, climb and descend the Sierra on much the same route surveyed in the 1860s. Coal trains, double-stacks, and mixed freights speed across central Nebraska on the triple-track main, so fast and frequent that crossing gates sometimes stay down for the passage of three or four trains in a row.

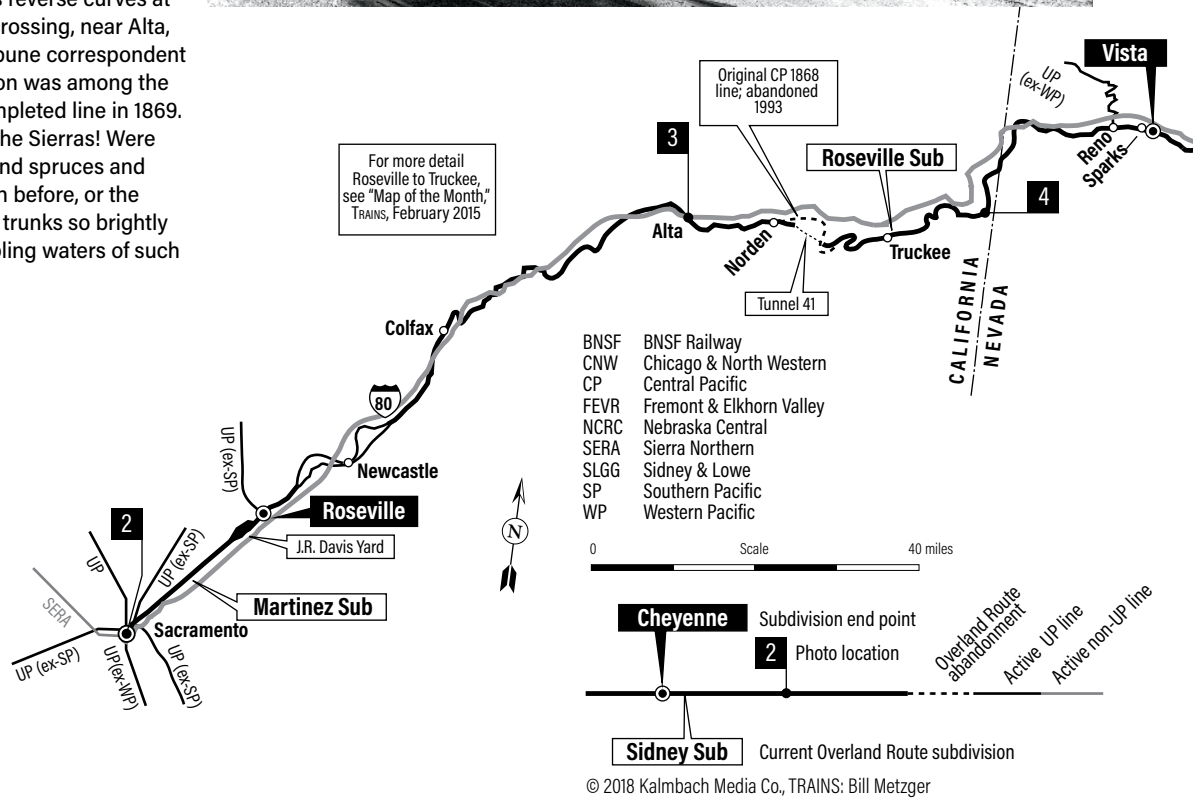
During the heyday of passenger service, the route hosted dozens of passenger trains, from lowly locals to the famous *Overland Limited* that in the 1920s took a mere 56 hours between Chicago and Oakland, Calif. Today's Amtrak passengers on the *California Zephyr* between Sacramento and Winnemucca, Nev., travel much of the original line and have fine views of the exquisite Sierra crossing, often narrated by volunteers from the California State Railroad Museum. Both east- and westbound trains cross the Sierra in daylight.

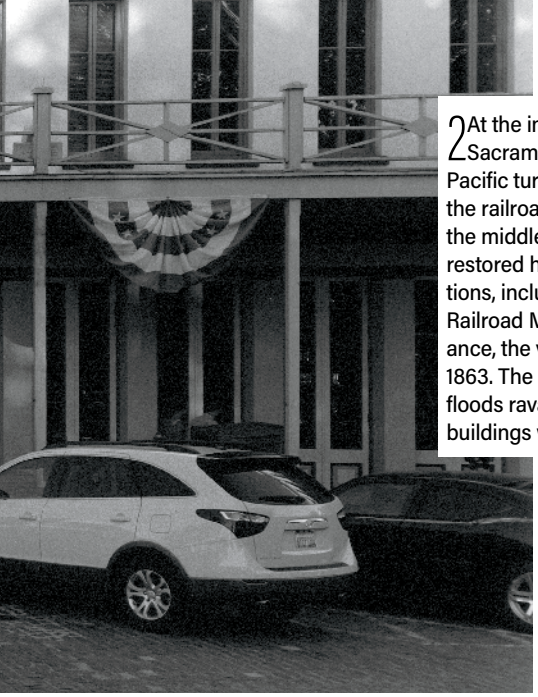
Between Winnemucca and Wells, Nev., the *Zephyr* runs on either the original transcontinental or the parallel former Western Pacific, and does so mostly at night. The line east of Wells and all the way to Omaha hosts no regularly scheduled passenger trains.

As proof of the soundness of the original route, today's Interstate 80 runs parallel and nearby for most of the distance between Omaha and Sacramento, at times right next to the railroad.

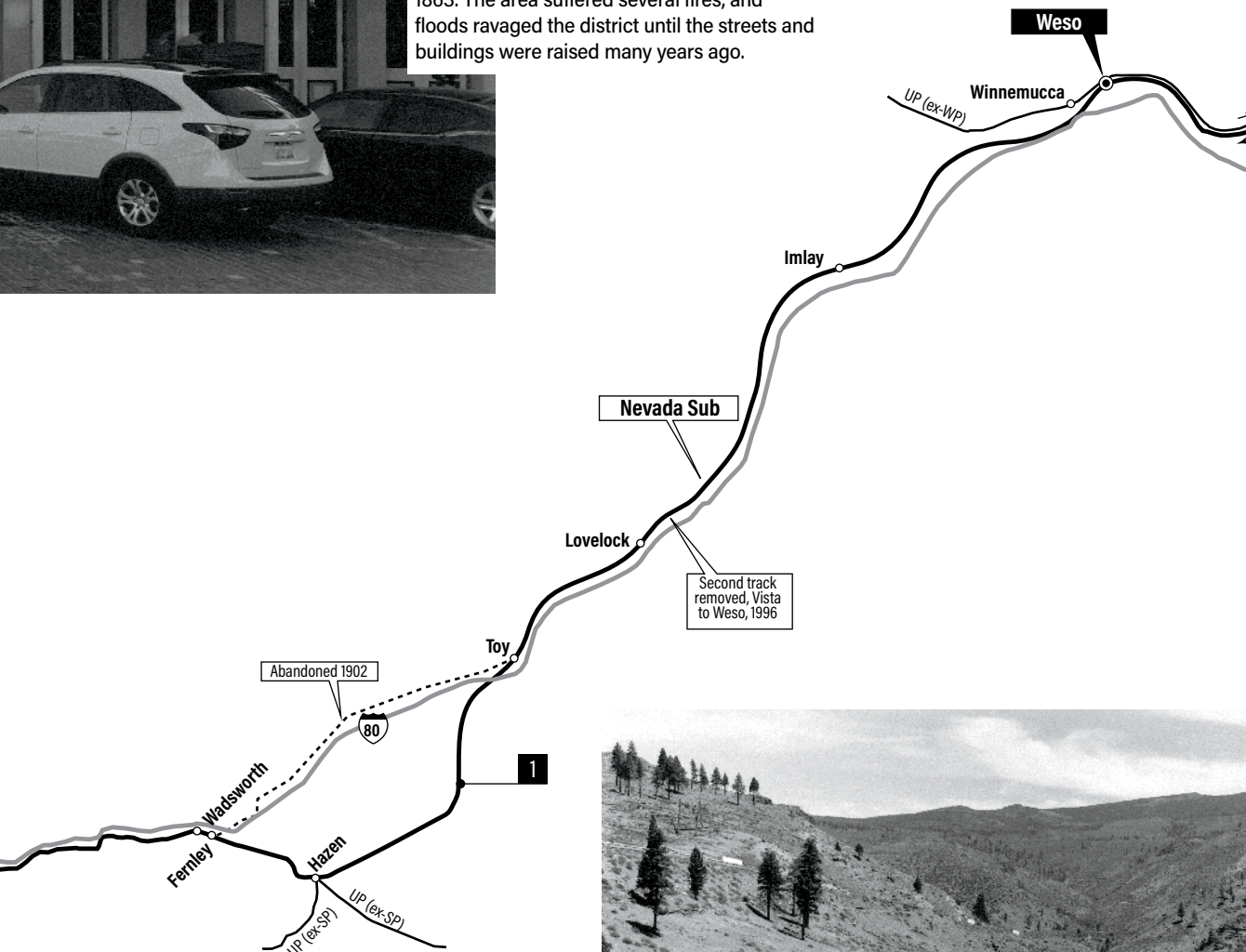
For 150 years, this historic line has provided a foundation story in our railroad history. What will the next 150 bring? I

3 The line is steep and blessed with near continuous reverse curves at Casa Loma Road crossing, near Alta, Calif. New York Tribune correspondent Albert D. Richardson was among the first to ride the completed line in 1869. He wrote: "Hail to the Sierras! Were ever these pines, and spruces and firs, so darkly green before, or the mosses upon their trunks so brightly yellow, or the tumbling waters of such foamy whiteness?"

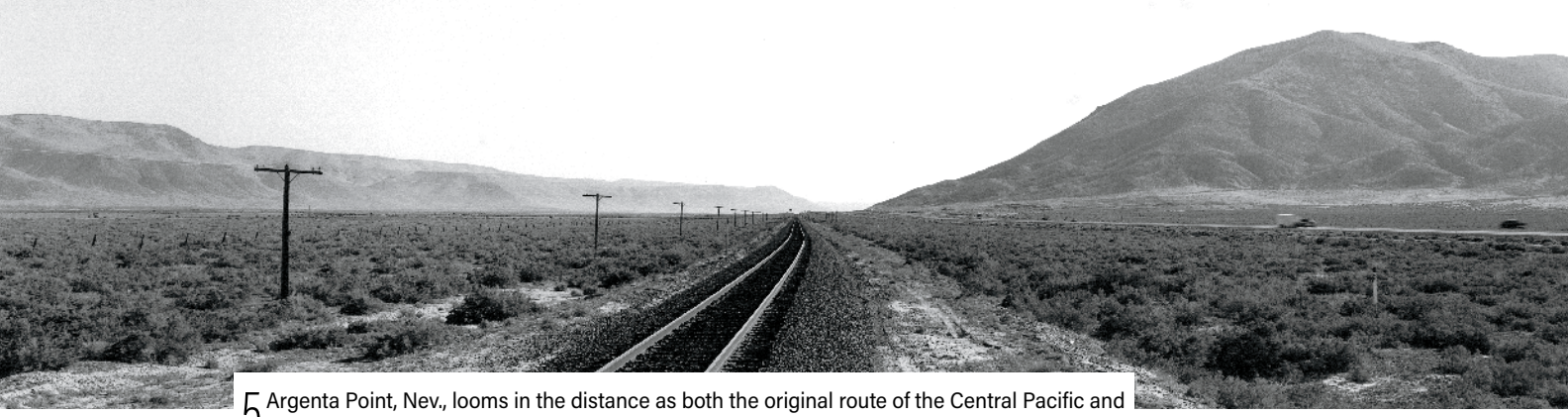




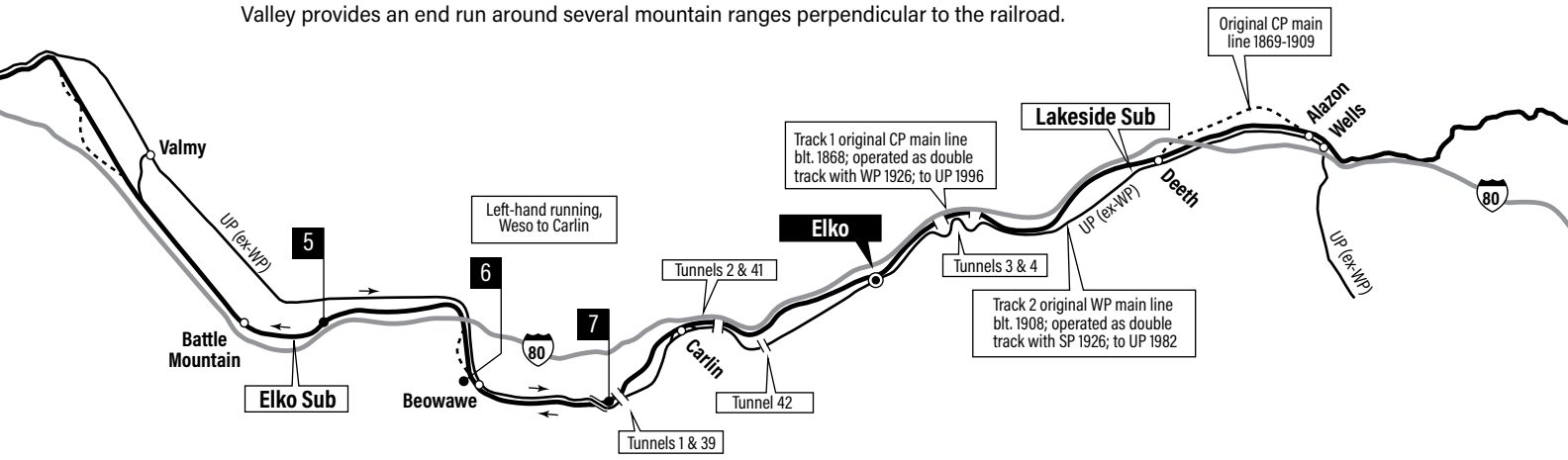
2 At the intersection of K and Front streets in Sacramento, Calif., dignitaries of the Central Pacific turned the first soil for the first mile of the railroad on Jan. 8, 1863. The site today is in the middle of Old Sacramento, a 28-acre restored historic district of shops and attractions, including the nearby California State Railroad Museum. Despite its historic appearance, the view has changed enormously since 1863. The area suffered several fires, and floods ravaged the district until the streets and buildings were raised many years ago.

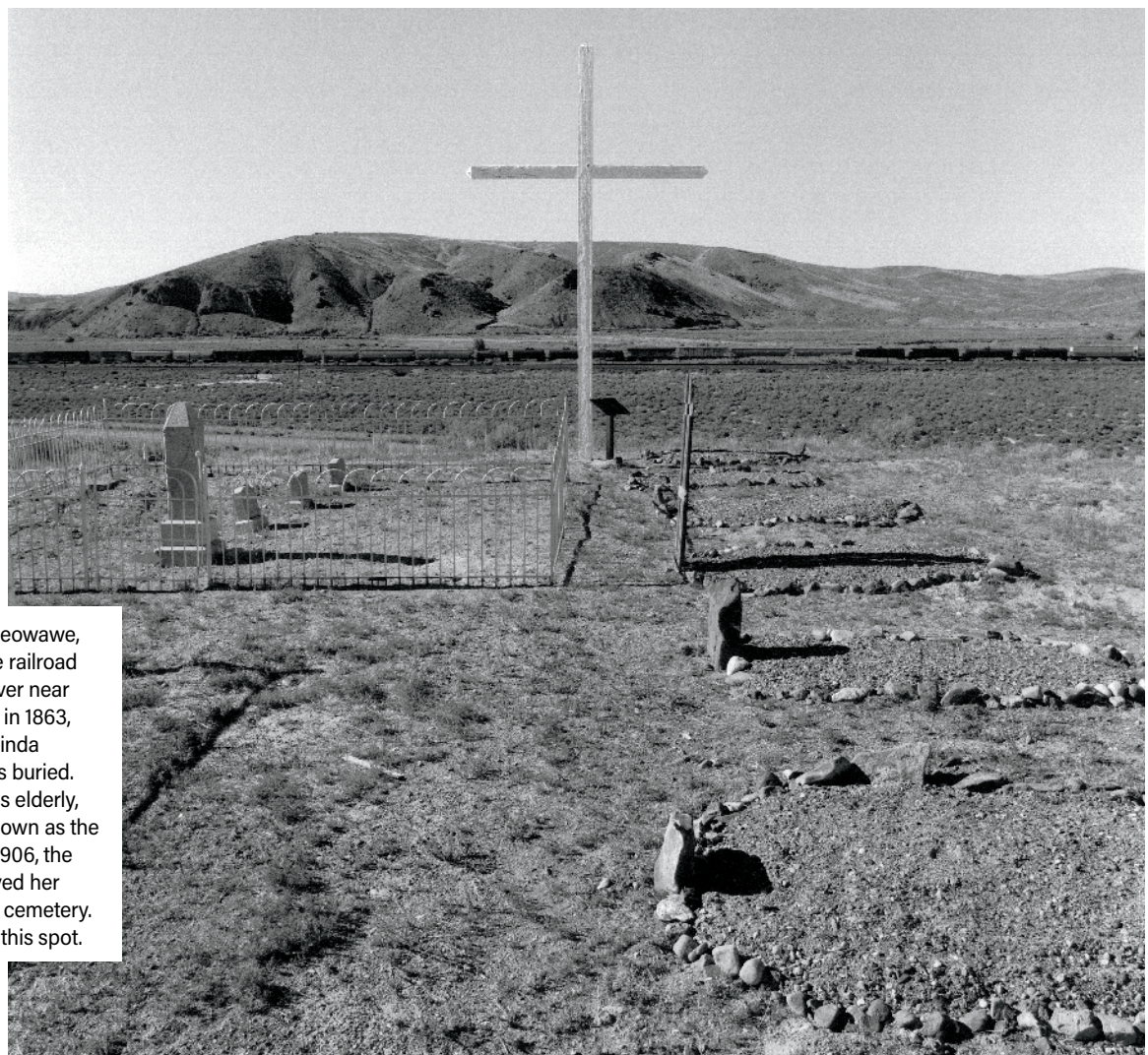


4 A westbound Union Pacific stack train fills the Truckee River Canyon with the sound of heavy, uphill railroading as trucks on Interstate 80 above add tire whine to the background sounds of a mountain river and wind in the pines. Here, near a place called Iceland, some 7 air miles northeast of Truckee, the Southern Pacific once operated ponds where winter crews cut ice for the railroad's reefer fleet.

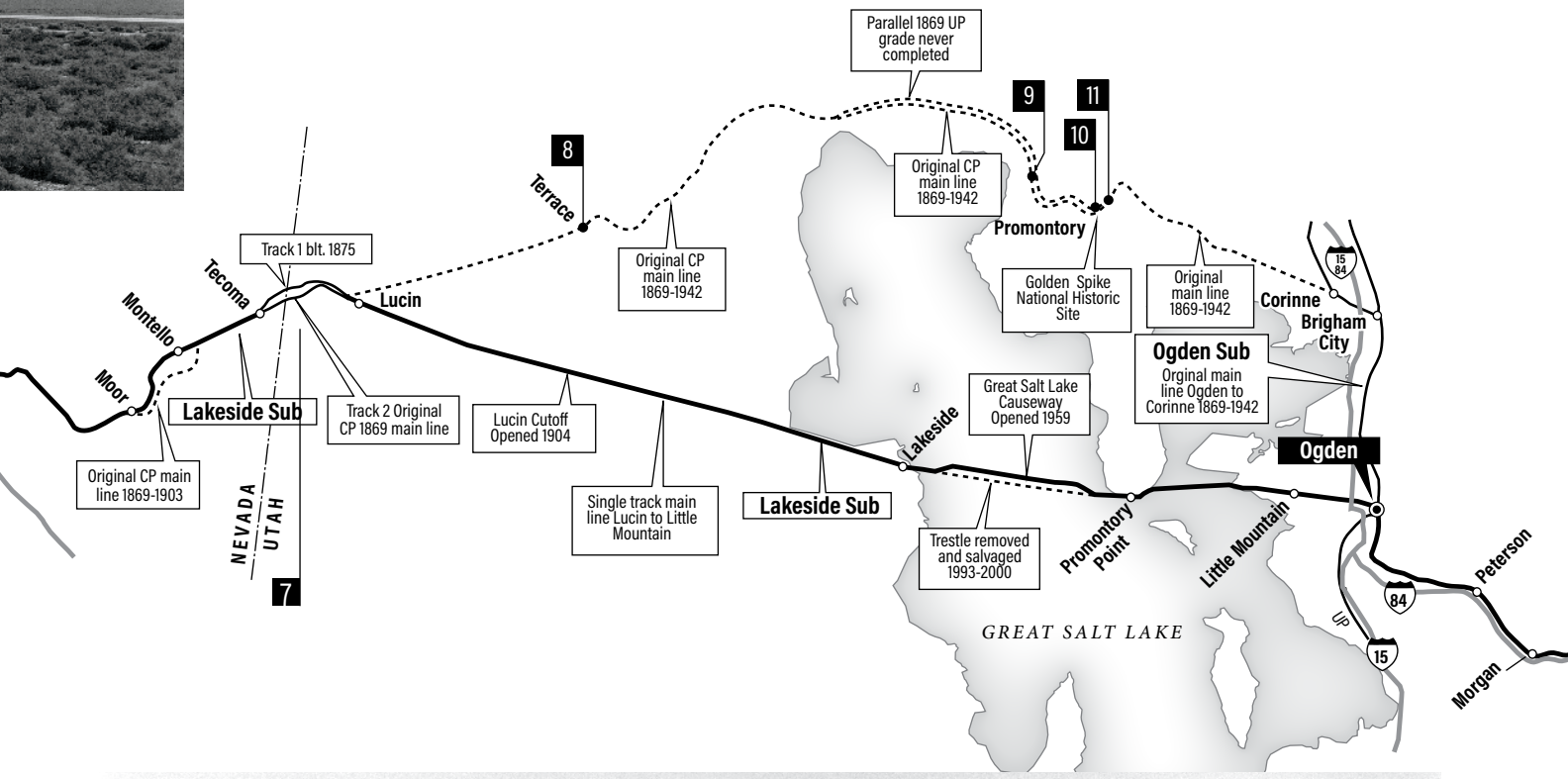


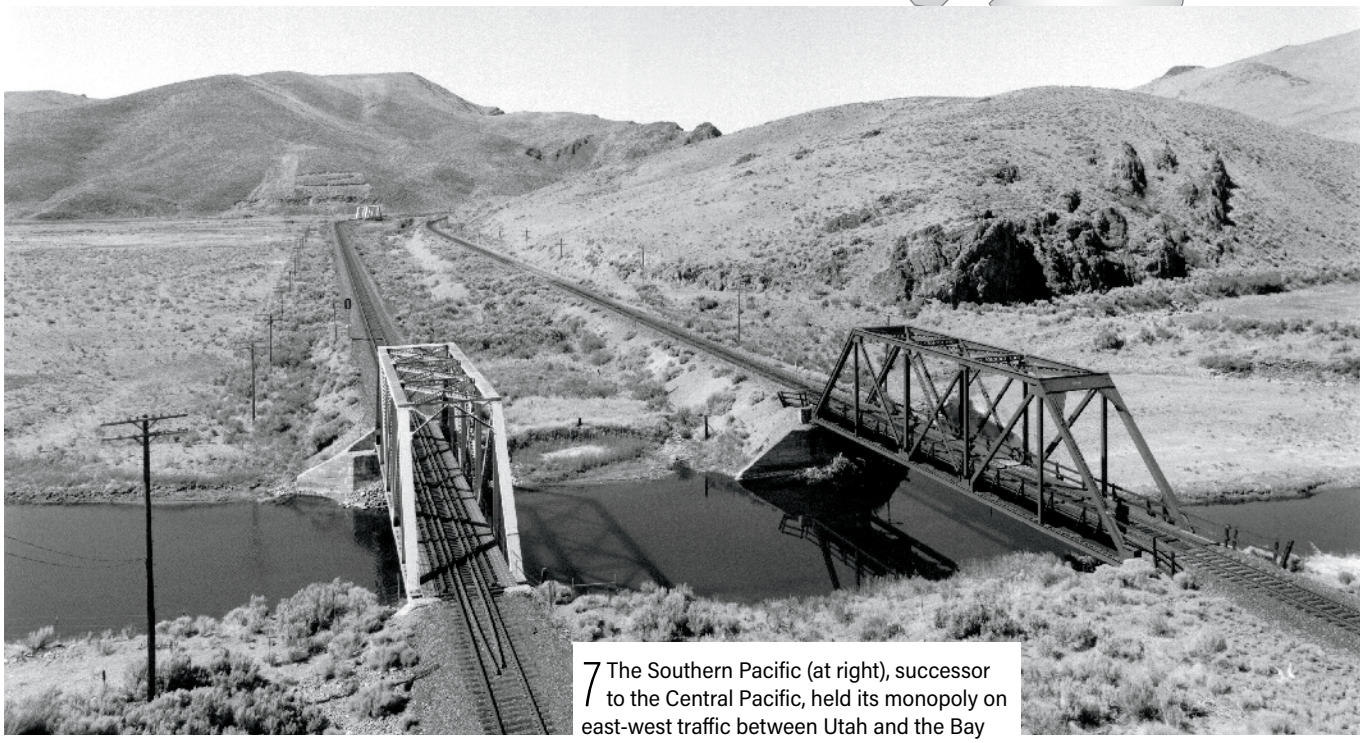
5 Argenta Point, Nev., looms in the distance as both the original route of the Central Pacific and Interstate 80 converge at the vanishing point where both bend around the north end of Argenta Butte, at right. In this part of Nevada, known as "Basin and Range," the Humboldt River Valley provides an end run around several mountain ranges perpendicular to the railroad.



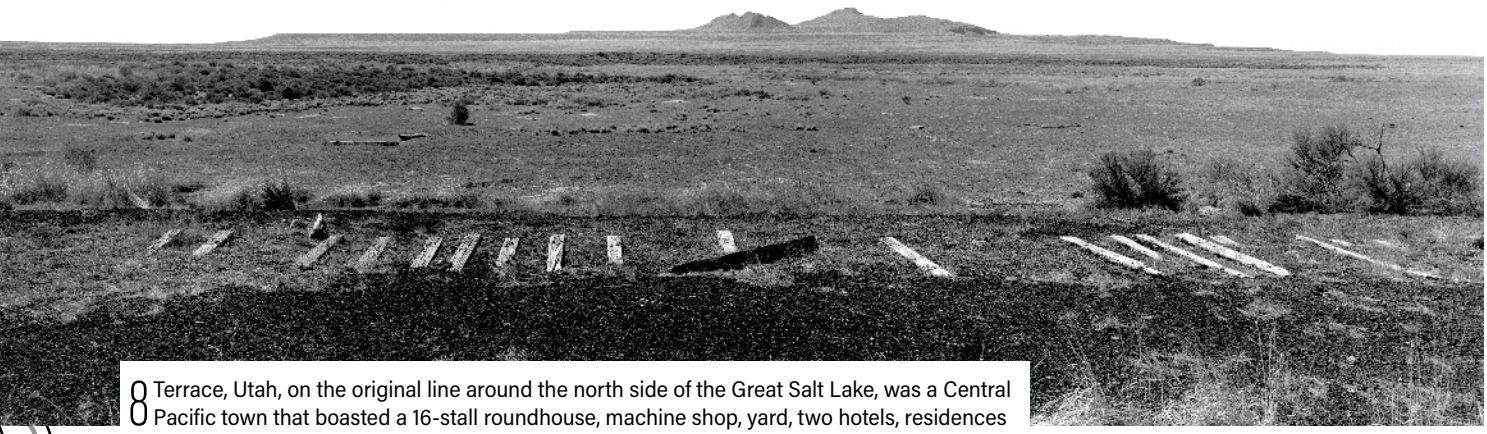


6 The cemetery at Beowawe, Nev., overlooks the railroad and the Humboldt River near Gravelly Ford, where, in 1863, California-bound Lucinda Duncan died and was buried. Although Duncan was elderly, her grave became known as the "Maiden's Grave." In 1906, the Southern Pacific moved her remains to the hilltop cemetery. Her cross dominates this spot.

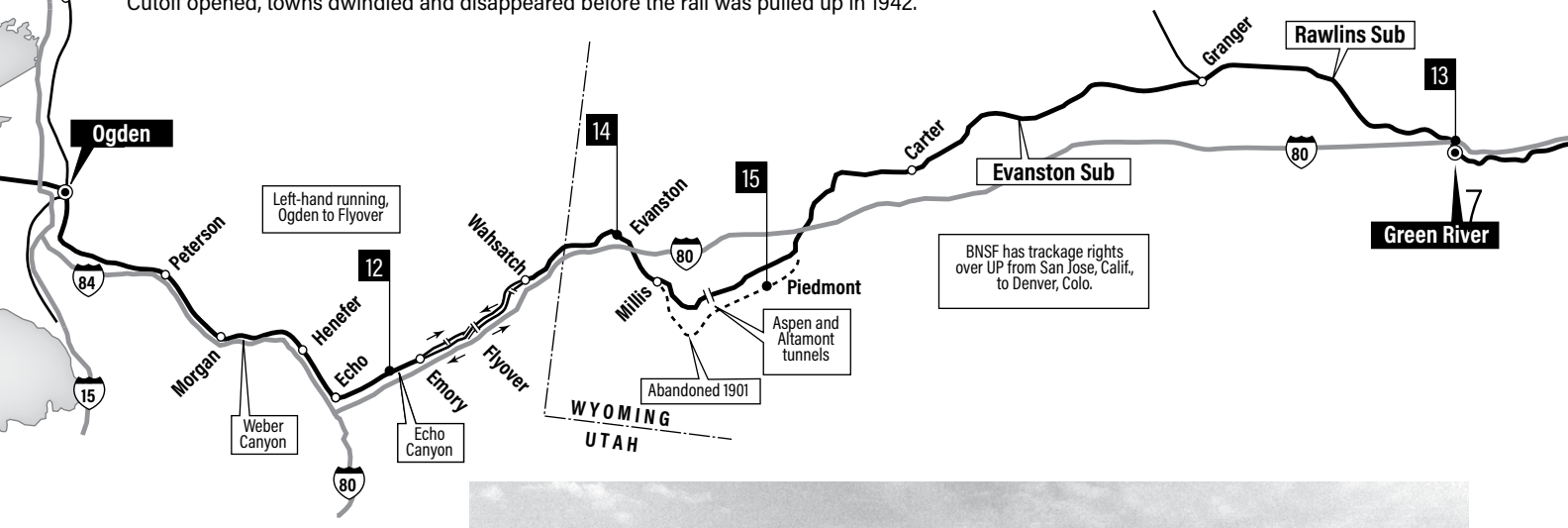




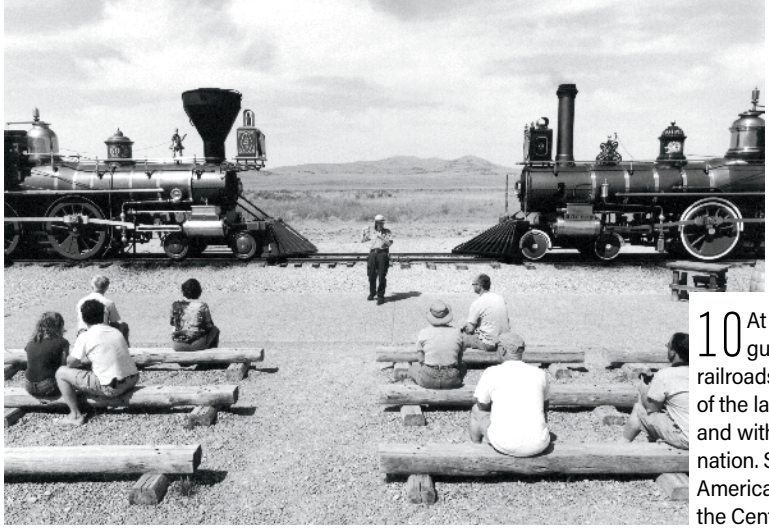
7 The Southern Pacific (at right), successor to the Central Pacific, held its monopoly on east-west traffic between Utah and the Bay Area until 1909, when the Western Pacific completed its line (at left) between Salt Lake City and the West Coast. The railroads run parallel across portions of Nevada, including here, emerging from Palisade Canyon and crossing the Humboldt River. Today, the Union Pacific owns both and operates them as a double-track main line.



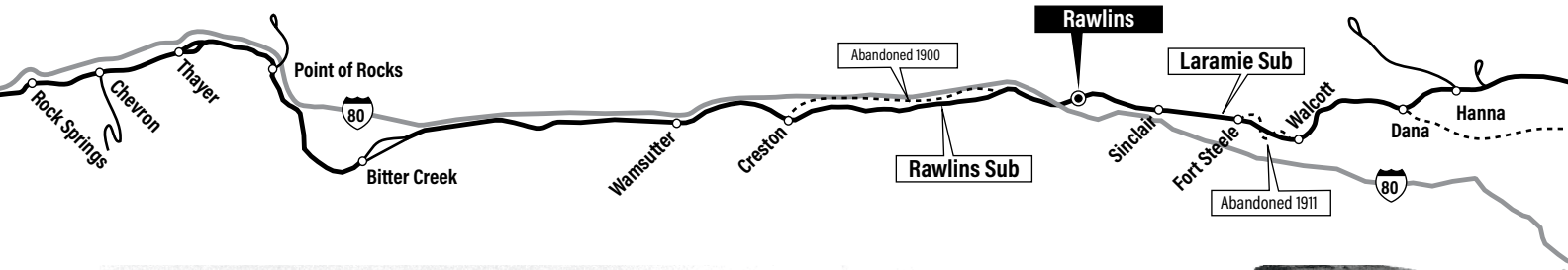
8 Terrace, Utah, on the original line around the north side of the Great Salt Lake, was a Central Pacific town that boasted a 16-stall roundhouse, machine shop, yard, two hotels, residences including a Chinatown, and a population as high as 1,000. Today, not a single structure stands. Terrace was one of some 25 named places on the 120-mile Promontory line. After the Lucin Cutoff opened, towns dwindled and disappeared before the rail was pulled up in 1942.

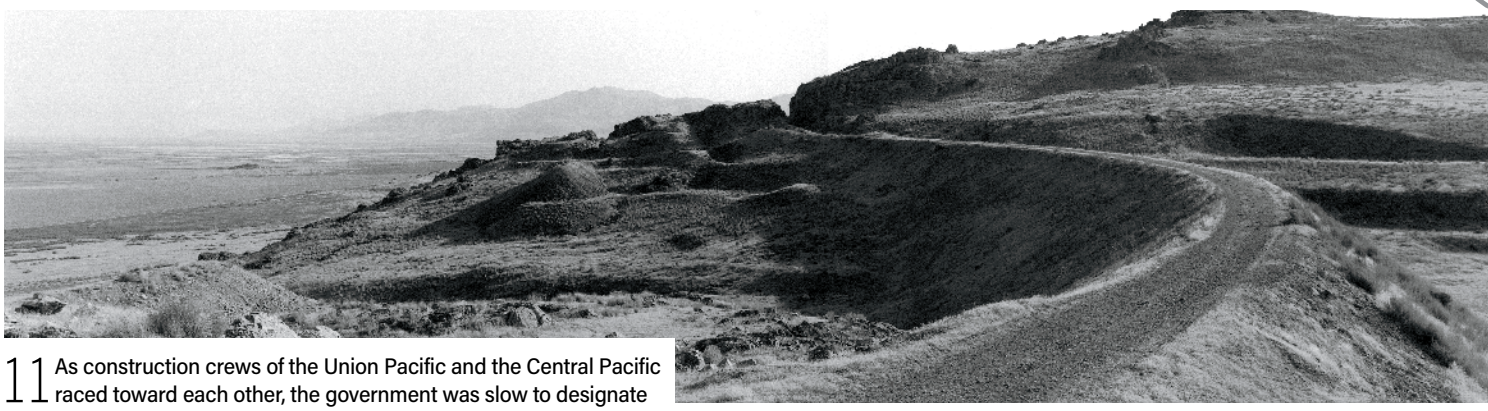


9 Wood was scarce for the Central Pacific as it built east toward Promontory Summit, but stone was plentiful. By 1869 when this culvert was built just a few miles west of Promontory, Chinese stonemasons had become experts at building sturdy, utilitarian structures. This culvert carried the railroad until its abandonment in 1942 and today carries autos and visitors on the self-guided tour of the Golden Spike National Historic Site.

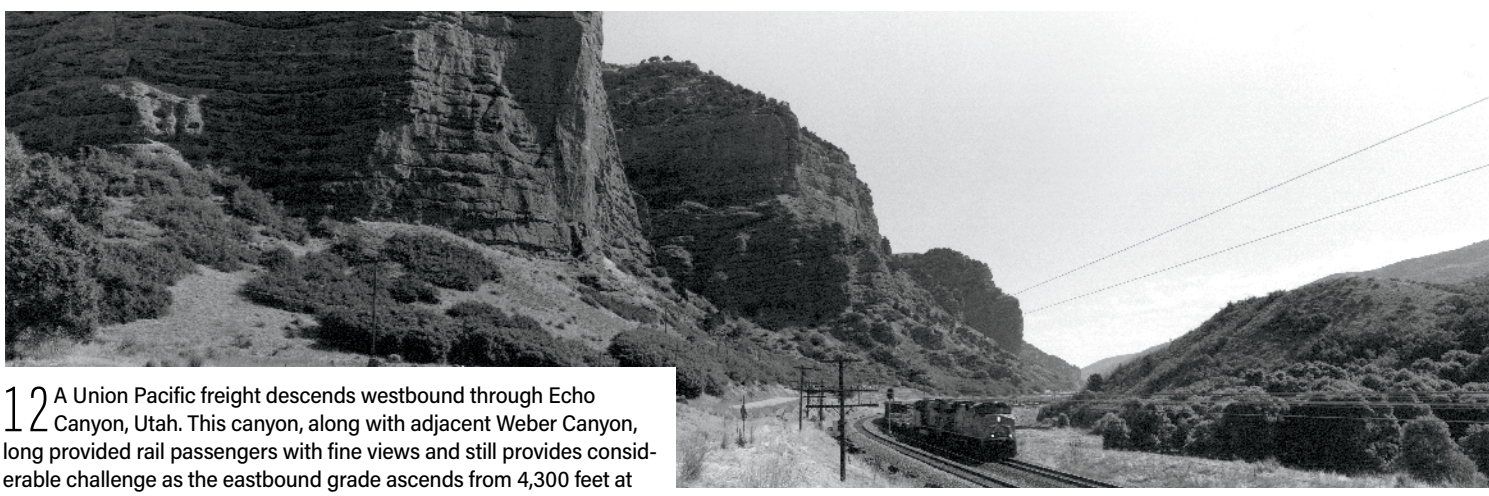


10 At the Golden Spike National Historic Site, a Park Service ranger guides visitors through the events of May 10, 1869, when the two railroads completed the transcontinental railroad. On telegraphed news of the last spike, bells rang and cannons sounded across the country, and within the day freight and passengers began moving across the nation. Some historians suggest this was the most important event in the American West in the 19th century. Replicas of Union Pacific No. 119 and the Central Pacific's *Jupiter* run most days between May and September.

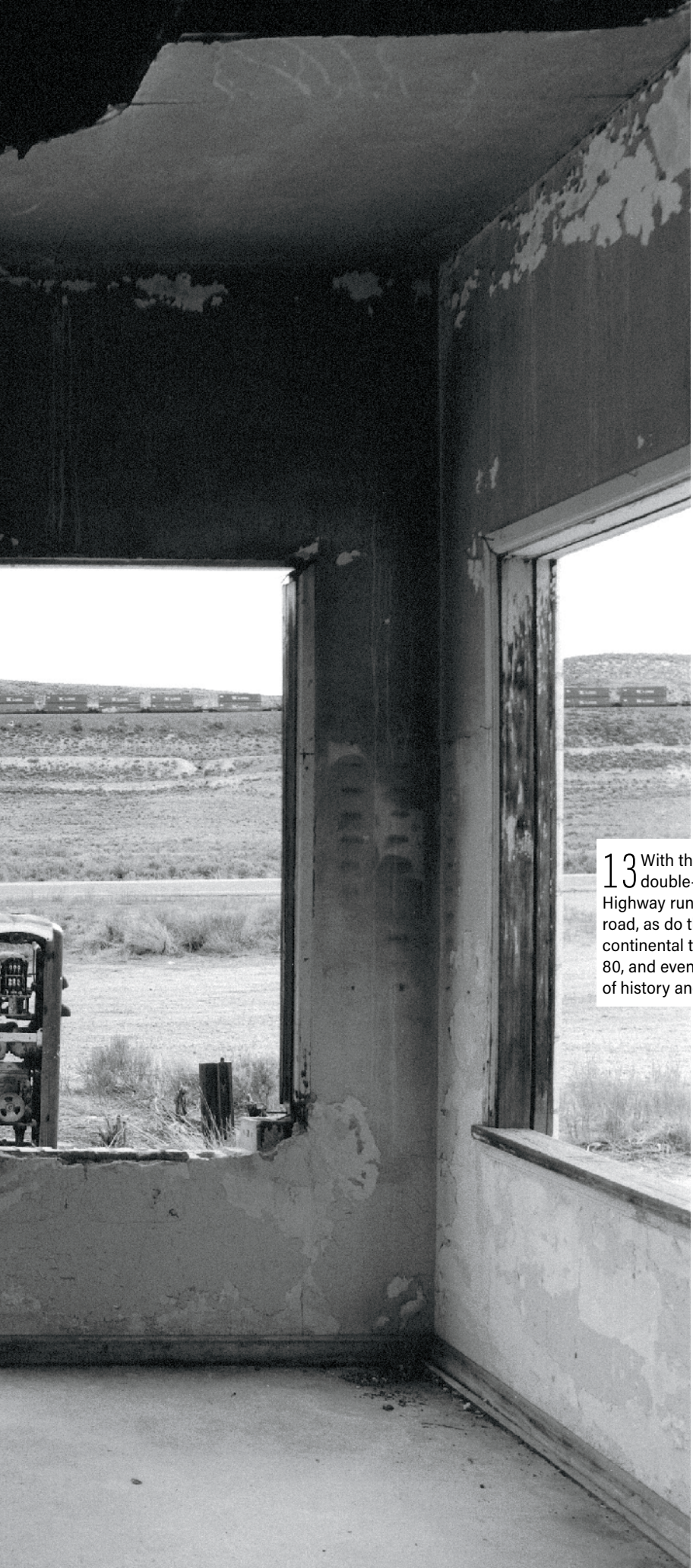




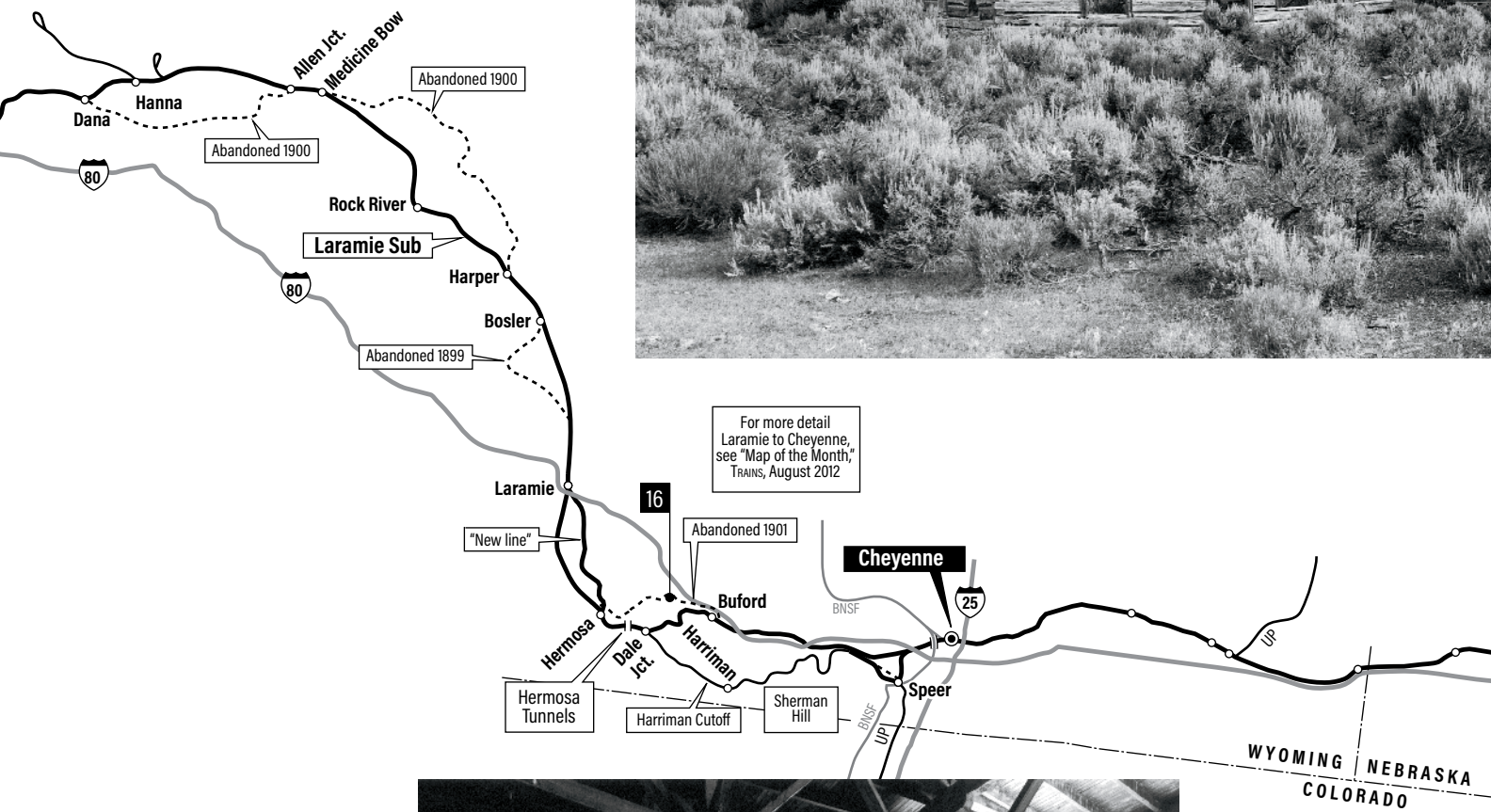
11 As construction crews of the Union Pacific and the Central Pacific raced toward each other, the government was slow to designate where the railroads would meet. Advance grading crews built past each other, leading to miles of redundant and parallel embankments. Here, the Central Pacific piled up the Big Fill (right) and the Union Pacific built an enormous trestle, the end embankments of which are visible at left.

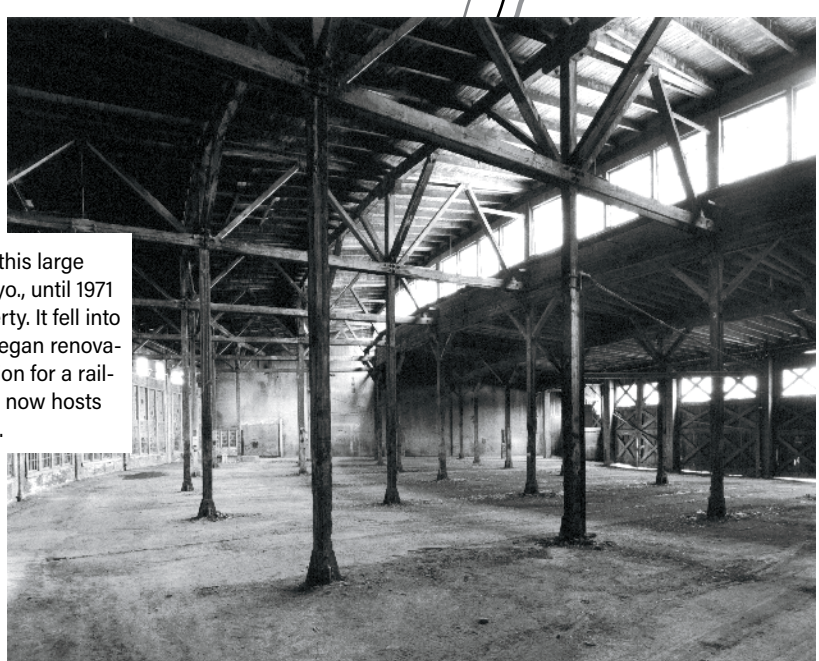


12 A Union Pacific freight descends westbound through Echo Canyon, Utah. This canyon, along with adjacent Weber Canyon, long provided rail passengers with fine views and still provides considerable challenge as the eastbound grade ascends from 4,300 feet at Ogden to 6,750 feet at Evanston. With no Amtrak service on this section, travelers must rely on the view from adjacent Interstates 80 and 84.

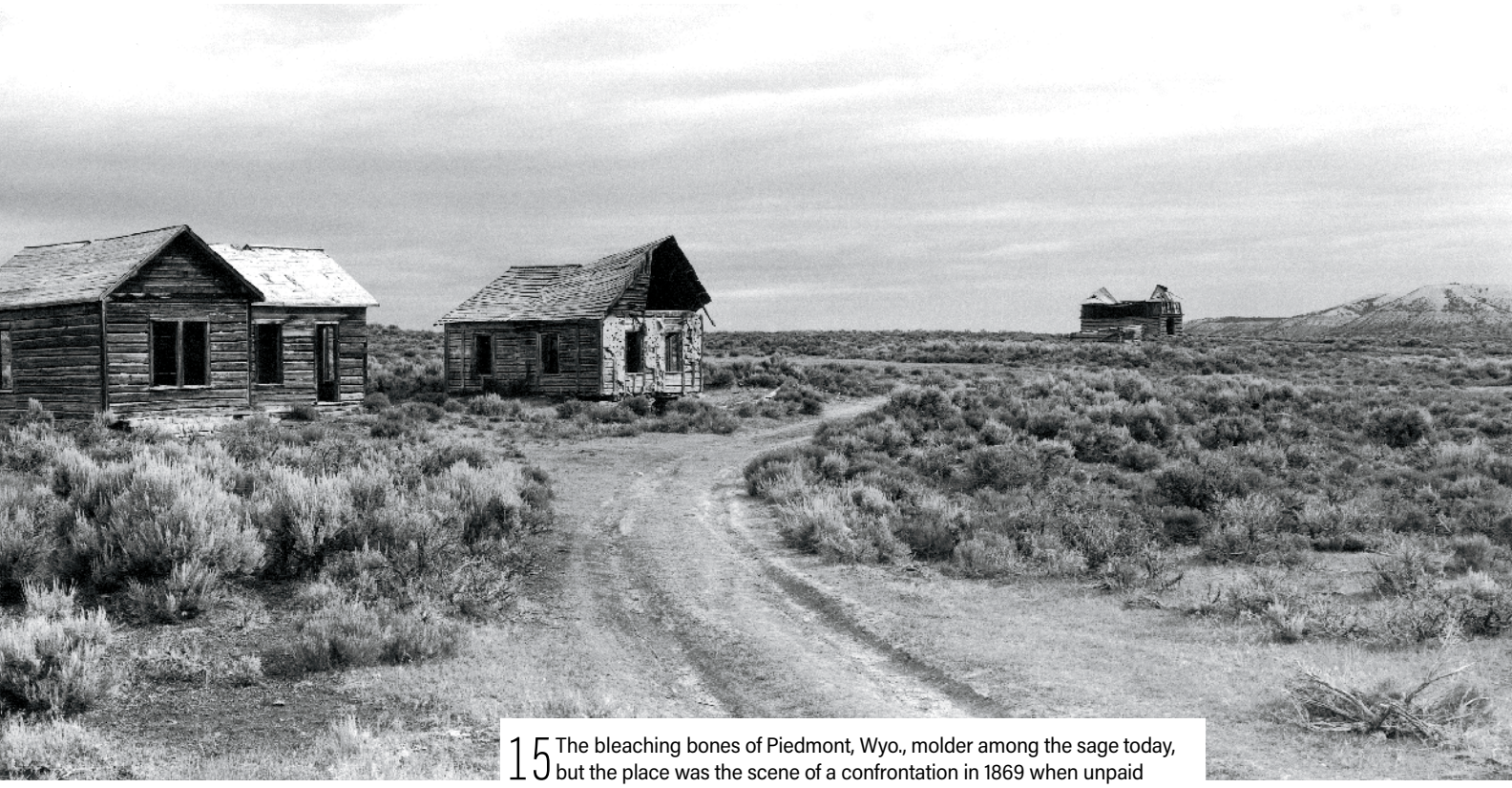


13 With the Lincoln Highway in the middle distance, an eastbound double-stack train descends into Green River, Wyo. The Lincoln Highway runs roughly parallel to the original transcontinental railroad, as do the California Trail, the Pony Express route, the first transcontinental telegraph, the early transcontinental airmail, Interstate 80, and even a modern air traffic route in a great east-west corridor of history and transport.

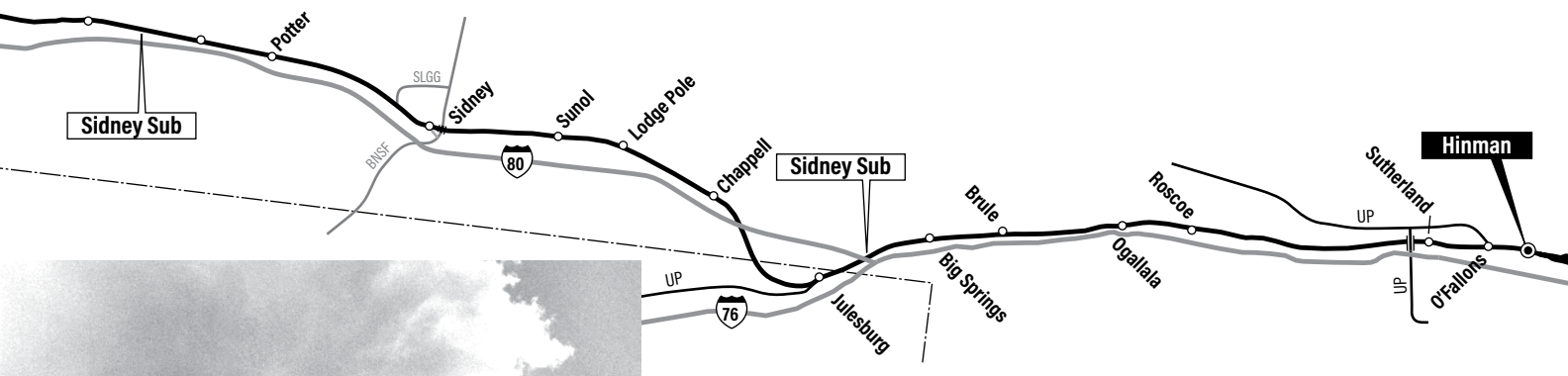


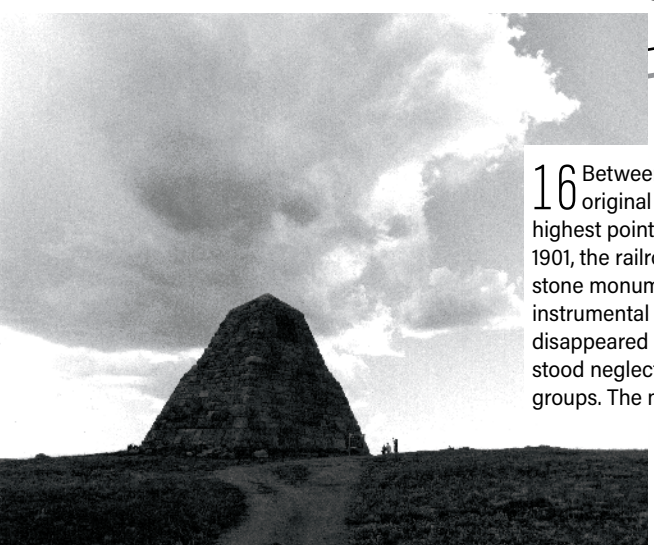


14 The Union Pacific operated this large roundhouse in Evanston, Wyo., until 1971 when the city acquired the property. It fell into disuse until 2007 when the city began renovation of a 22,000-square-foot section for a railroad-themed event center, which now hosts both public and private functions.



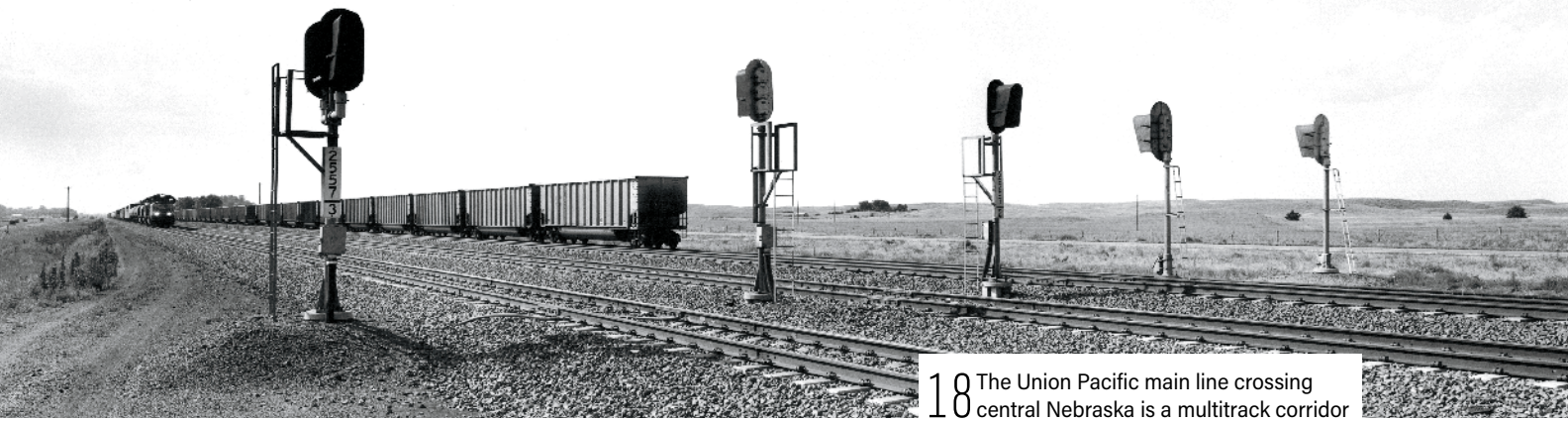
15 The bleaching bones of Piedmont, Wyo., molder among the sage today, but the place was the scene of a confrontation in 1869 when unpaid contract workers held up two Union Pacific trains of dignitaries on their way to the meeting of the rails at Promontory Summit. They were not released until payment was arranged. As a result of this delay and washed-out bridges ahead, the golden spike ceremony was two days later than scheduled.



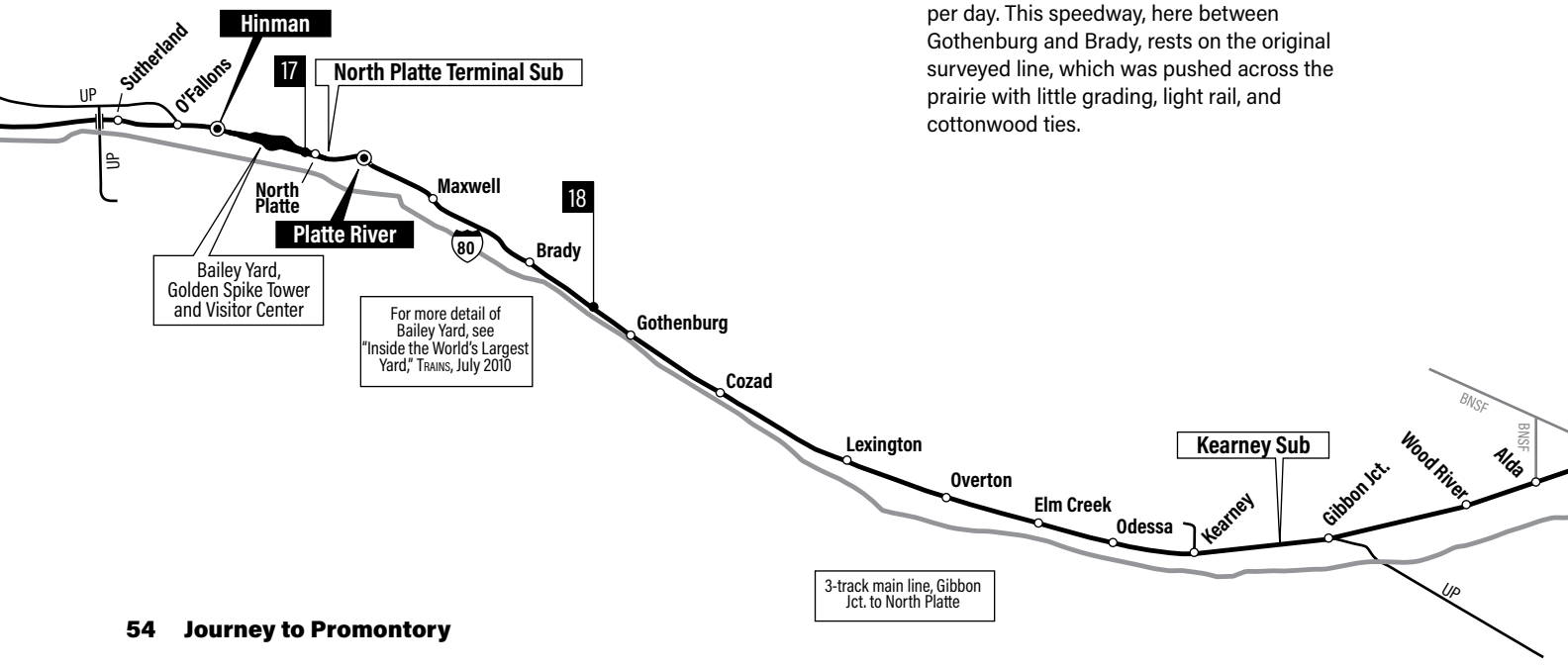


16 Between Cheyenne and Laramie, a few miles south of Interstate 80, the original Union Pacific line crossed Sherman Summit at 8,247 feet, the highest point on the transcontinental railroad. Before the line's relocation in 1901, the railroad commissioned H.H. Richardson to design a 60-foot-high stone monument to Oliver and Oakes Ames, shovel manufacturers who were instrumental in construction of the Union Pacific. The tiny town of Sherman disappeared soon after the tracks were moved, and the Ames Monument stood neglected and vandalized until recent restoration efforts by historical groups. The monument is now a state park.

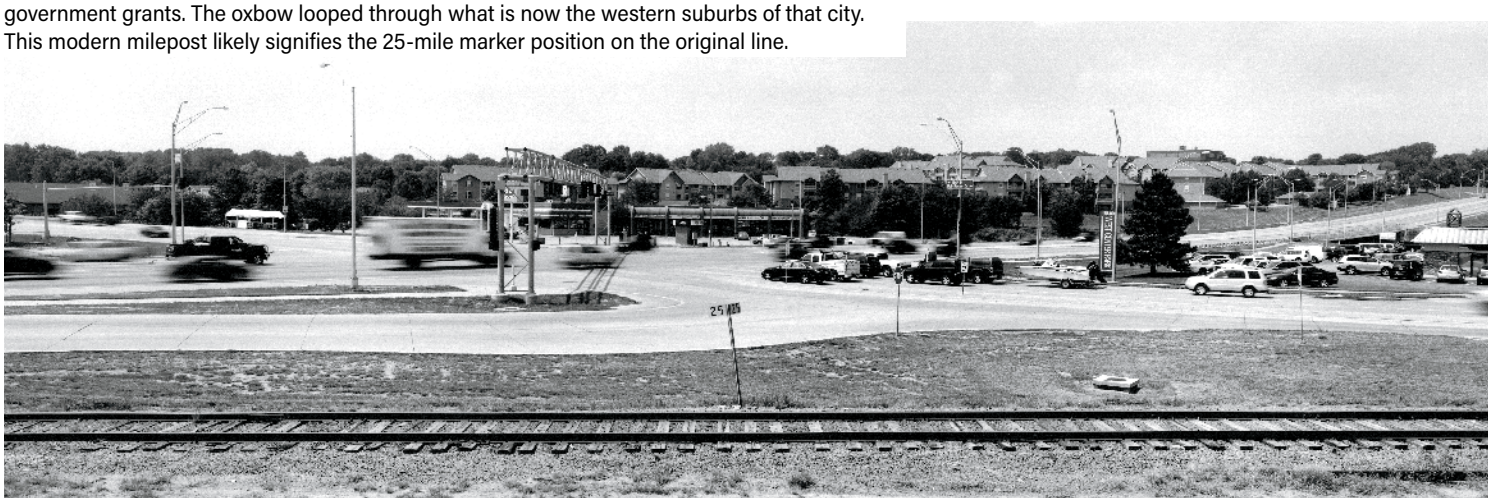
17 The east end of Bailey Yard in North Platte, Neb., is a fan of high-capacity tracks that lead to this 8-mile-long yard, said to be the largest in the world. North Platte was slated to be a major railroad town even as the original line was surveyed.

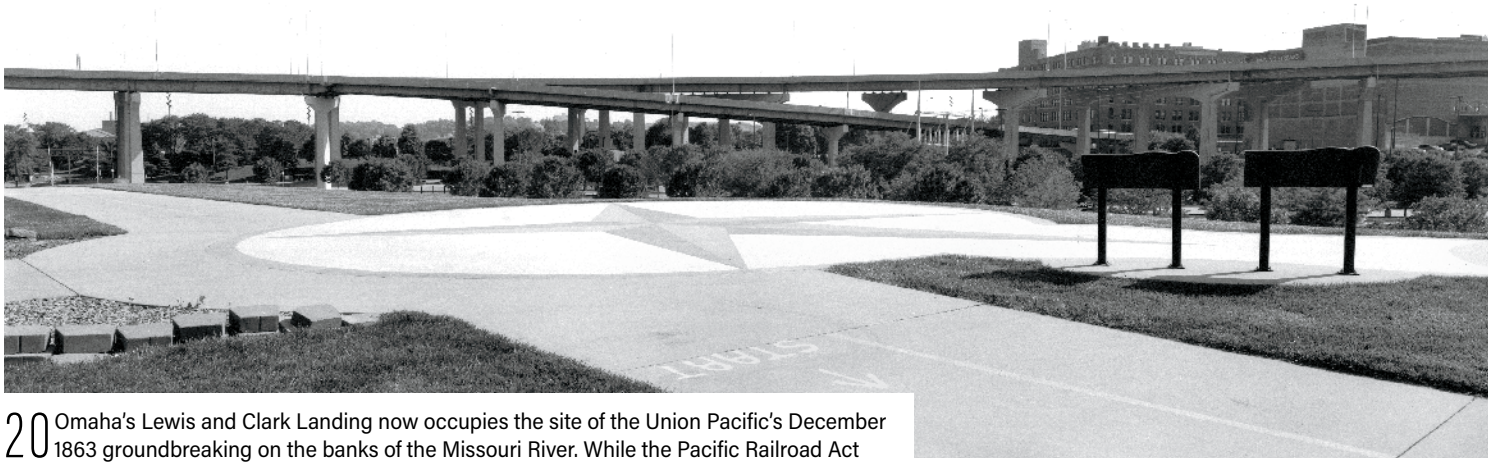


18 The Union Pacific main line crossing central Nebraska is a multitrack corridor of heavy welded rail, concrete ties, and high speed switches that can serve 100-plus trains per day. This speedway, here between Gothenburg and Brady, rests on the original surveyed line, which was pushed across the prairie with little grading, light rail, and cottonwood ties.

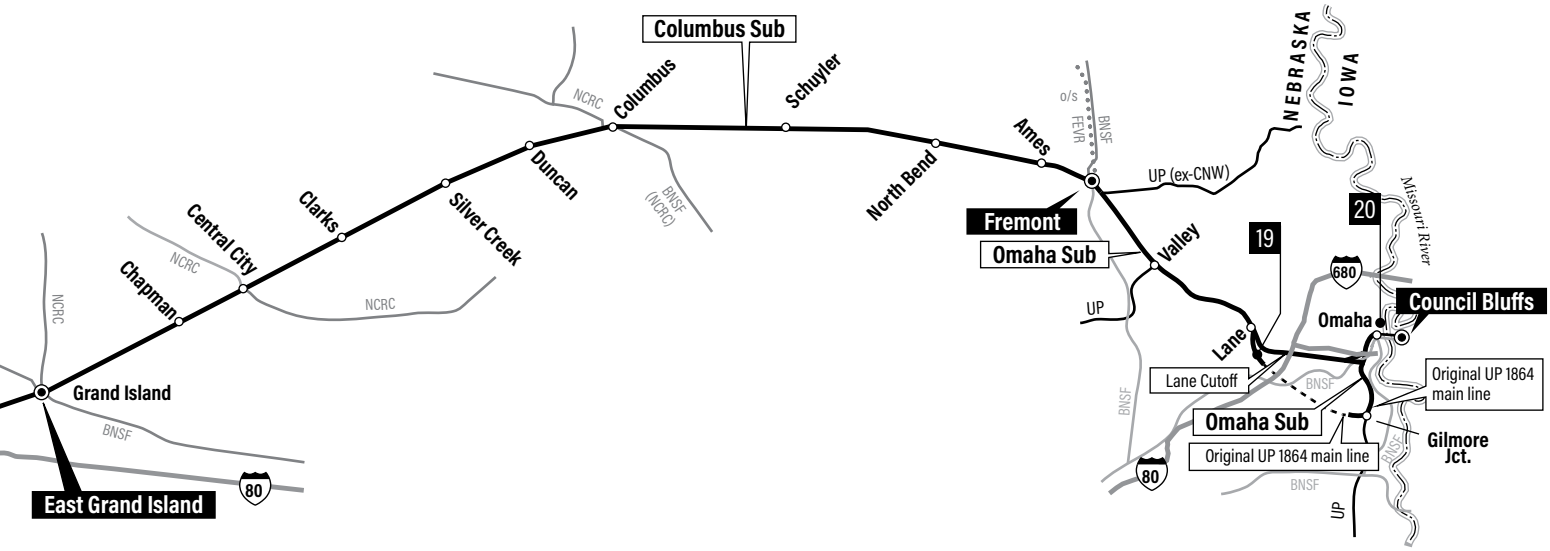


19 Instead of heading northwest out of Omaha toward the Platte River and the West, the original 1865 grade of the Union Pacific Railroad angled southeast, south, west, and then north in a 22-mile-long "oxbow." The reason? Partly to avoid the grading necessary for a route directly west out of the city, but also to quickly accumulate track mileage and the concomitant government grants. The oxbow looped through what is now the western suburbs of that city. This modern milepost likely signifies the 25-mile marker position on the original line.





20 Omaha's Lewis and Clark Landing now occupies the site of the Union Pacific's December 1863 groundbreaking on the banks of the Missouri River. While the Pacific Railroad Act determined the starting point in Council Bluffs, Iowa, it wasn't until 1872 that the Union Pacific completed the river bridge, and therefore the entire line. Though there is no mention here of the first work on the eastern portion of the railroad, it is fitting that the park honors the endurance of Thomas Jefferson's explorers who camped here going upriver in 1804.



PROMO

In a lonely desert setting, the epicenter of transcontinental railroad history awaits

Story and photos by Jim Wrinn

Lonely. Isolated. Desolate. Remote. The list of words to describe how this place — one of the (if not *the*) most sacred sites in American railroad history — feels is nowhere long enough.

To come here into the high desert is to be on a pilgrimage for a glimpse into the unending sagebrush, rocks, and nothingness that is Promontory Summit, Utah, the location where the first transcontinental railroad was completed.

This is a place that evokes questions into which we can only hope to get an insight. Consider this: If it feels that isolated now, imagine how Chinese and Irish construction workers felt 150 years ago when they were clearing a roadbed, laying gnarly rough-hewn ties, pounding misshapen spikes, and jockeying sticks of rail to make a way for the latest technological achievement, the iron horse. They must have felt like they had exited the map of humanity. Or fallen off the Earth. It would be the equivalent to the 1969 moon landing — putting people about as far away as you can to do an extraordinary deed, and do it well, despite adverse conditions.

Even the way the clouds move overhead in a swirling, lazy fashion, wrapping themselves around peaks and ridges, adds to the impression that this must be among the most inhospitable historic sites and tourist attractions in celebration of a major event in our national story. There are no fast-food restaurants crowding the parking lot,

no hotels flashing brightly lit signs, no miniature golf or ice cream stands.

The isolation is part illusion, for just across the ridge, at the foot of the abandoned Promontory grade, is the massive plant that produced solid fuel rocket motors for the space shuttle (with an estimated total 37 million hp) — an incredible leap ahead from the state-of-the-art 1869 4-4-0 (with its estimated 540 hp).

During a June 2018 visit, these thoughts and others compete for space in my head as I trudge along the dusty walking trail that was once the Central Pacific main line. Visions of workers digging cuts and hauling fill material with mules in this otherwise tranquil scene of undisturbed nature dominate my mind: This is brute strength and hard work personified.

Promontory today is a gentrified National Park Service Historic Site; the official name is Golden Spike. It comes complete with a visitor center, park rangers, 4-4-0 replicas in steam, and re-enactments

A replica plaque, above, marks the location where the last tie and last spike were placed. Below, a replica of Union Pacific 4-4-0 No. 119 steams toward the high-desert location where the two railroads became one at Promontory Summit, Utah, May 10, 1869.

ONTORY TODAY

Visitors in street clothes and re-enactors in period costumes, including some pulled from the audience, relive the last spike ceremony.

of the May 10, 1869, last spike ceremony. You can drive significant portions of the original right-of-way — yes, you can bounce along in your SUV at 20 mph and get a sense of what it was like in the cab of an American-type locomotive with evocative names like *Antelope* (the locomotive which was pulling Stanford's train bound for Promontory when it hit a tree in the Sierra and had to be taken off), *Juno*, and *Terrible* — and you can get out and walk, reflect, and ponder "the wedding of the rails" or "east meets west" as May 10, 1869, has been commonly referred to.

It wasn't always this way. For a few months after May 10, the two railroads interchanged here, until good sense prevailed and they moved the interchange to Ogden, with Central Pacific operating the Promontory stretch. There was even a roundhouse and a small town here for a few years. But

Locomotives of scrapper Hyman Michaels re-enact the nose-to-nose scene in 1942 as Promontory's tracks are removed. TRAINS collection

DRIVING THE REST OF THE RAILROAD

IF YOU COULD GO BACK IN TIME to 1869, or even any year between then and 1904, and get a feel for the first transcontinental railroad's route through the Utah desert, would you do it?

Of course you would. And even without rails, it is still possible to retrace a significant portion of the Central Pacific route through Utah's Box Elder County by motor vehicle.

The tracks have been gone since Southern Pacific removed the 55-mile Lucin-Kelton segment line in 1933 and the 120-mile Kelton-Corrine segment across Promontory in 1942.

Amazingly, a dirt and gravel Bureau of Land Management road called the Transcontinental Railroad Back Country Byway preserves 90 miles of the original Central Pacific grade between Lucin and Rozel, also known as Camp Victory — the place where workers stockpiled material for the final push eastward to reach Promontory. In the years after 1869, this was a busy railroad with 28 sidings, stations, and towns that saw up to 10 trains per day.

One village of 700, Kelton, was the start of a stagecoach line and important supply route for Idaho, Oregon, and other areas to the north and west. At Terrace, the station contained offices for Central Pacific's Salt Lake Division, and the town boasted 1,000 residents, a roundhouse, machine shop, and an eight-track yard, as well as hotels, a saloon, a library, and other businesses. Today, there are scant ruins at both.

For intrepid explorer types with plenty of time and patience, this drive can become a unique window into the past. I learned this first hand in June 2018 when Nicholas Parker and I set out in a rented SUV to explore the road. Our trek took us into salt marshes, along tall fills, and gave us the

as far as commemorating one of the biggest events in the nation's history, there was no marker here, nothing to note the event until Central Pacific successor Southern Pacific put up a modest monument in 1919.

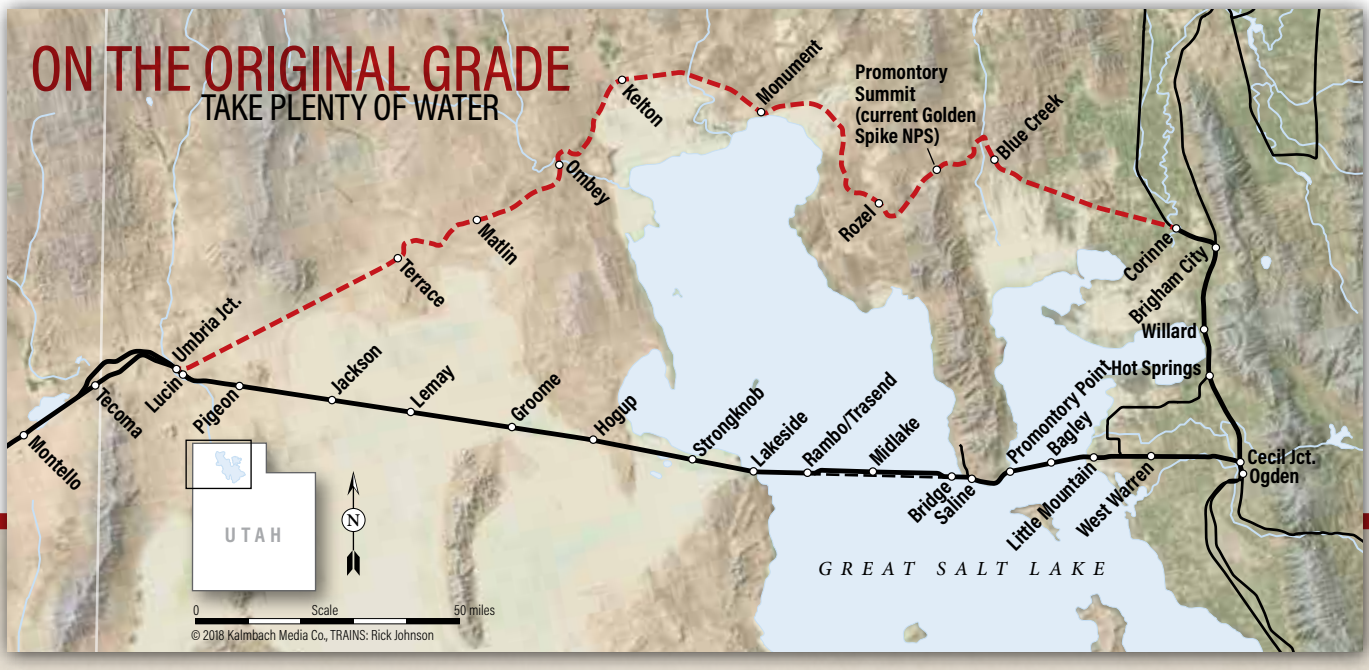
Indeed, in many ways, Promontory had been neglected and forgotten. SP bypassed it in 1904 with the Lucin Cutoff across the Great Salt Lake, making the route an out-of-the-way, lightly used branch for farmers and cattlemen. It was of such little consequence that SP ripped it up in two pieces, with the first part removed in 1933. The rest was sacrificed in 1942 in support of World War II (with the rails going to military bases in Utah and Nevada).

But Promontory is too important in U.S. history to ignore. The iconic Andrew J. Russell image "East and West Shaking Hands at Laying of Last Rail," better known as the champagne photo (see pages 4-5), is one of the few railroad pictures that almost all Americans know. It has a place right up there with the photo of the Wright Brothers' first flight, or the attack on Pearl Harbor, or the Apollo moon landing. The event itself resounds with American daring, achievement, and swagger. It demands a place to commemorate where the golden spike was driven on that spring day, in front of an estimated 1,000 spectators, workers, and railroad officials.

After 38 years of lobbying by local resident and newspaper writer Bernice Gibbs Anderson, the site became part of the National Park Service on July 30, 1965, less than four years before the Golden Spike centennial. A rock-and-wood visitors center was completed in 1969, just in time for the centennial event that attracted 28,000 participants, including appearances by the vaunted Mormon Tabernacle Choir and famous western movie actor John Wayne.

It was another 20 years after acceptance into the park service before the replicas of

Details abound for those who pay attention at the Golden Spike National Historic Site. This replicates an 1869 UP switch stand.



chance to make out the foundations of homes at ghost towns along the line.

Some of the road is deeply rutted, and deep potholes bordering on small craters fill some stretches, so we were thankful for a high-ground-clearance vehicle. There is nothing along this route that resembles civilization, and it is many miles down side roads to reach the most modest of communities.

We drove from east to west, pausing often to leave the vehicle and explore the Bureau of Land Management's roadside markers placed at key points. They explain the construction of the railroad, its operation in this difficult place, and the lives of the people who lived in beautiful desolation.

While there is a welcoming sign on the east end, there are few directional signs along the way. But if you follow your instincts and don't get distracted (Locomotive Springs Road is not part of the route), you'll keep close to the grade if not right on it.

The payoffs are many.

We viewed miles of parallel grading by the UP that never saw the first crosstie or the first stick

Beginning 90 miles of sagebrush, ghost-town foundations, and rotting bridges, the Transcontinental Railroad Byway beckons the adventurous.

Continued on page 60

No. 119 makes a demonstration run at the Golden Spike National Historic Site. The coal-burning locomotive was built in California in the 1970s and placed into service in 1979.

the two locomotives, the Central Pacific *Jupiter* and Union Pacific No. 119, were commissioned, and another four years before they were placed into service on May 10, 1979. That completed the site. Today, some 60,000 visitors annually trek to this place, located 35 miles west of Brigham City, Utah.

The 2,735-acre site — which is under consideration for national park status (more on that later) — covers more than ground zero for the transcontinental railroad. It extends to the west to include the celebrated section of track where Central Pacific's mostly Chinese workforce completed 10 miles of track in one day. It extends to the east to incorporate the Promontory Mountains grade with its parallel cuts and fills, and the spectacular Big Fill, where Central Pacific built a massive fill next to Union Pacific's wooden bridge that was so flimsy it was only used for six weeks before the railroads agreed that the neighboring CP fill was the better way to go.

This is a sprawling site that fulfills expectations — standing in awe of two dazzling 4-4-0 replicas on display nose to nose, just the way the originals were in 1869, is what we all want to do. It also is an adventure to pose for a picture next to the "10 miles of track completed in 1 day sign" on the lonely driving tour west of Promontory or reverently walk to the Big Fill site.

One aspect of the site that engages visitors is the re-enactment of the last spike ceremony. It brings the story to life. The 20-to-30-minute presentation is given on May 10 and every summer Saturday by volunteers, park rangers, and good-humored audience members who are recruited (some say "railroaded") to fill minor parts.

Among the cast is Richard Felt, who has been with the production since the 1969 centennial event. He was 28 years old when he started by playing the part of Harvey Wilson Harkness, who presents the ceremonial spikes to the Central Pacific's Gov. Leland Stanford and to Union Pacific's Dr. Thomas Durant. He is the last active member of the centennial cast, and he looks forward to the 150th event with great enthusiasm.

"The 1969 re-enactment was the 100th anniversary, and they embellished the script, and there was an older man who couldn't memorize the new and longer script, so they got me," Felt says. "We were also having a beard-growing contest, and I was growing one, and the part they had open called for a man in a beard."

In the 50 years since, Felt has played

Continued from page 59

of rail laid on them.

We paused at Monument, a landmark location where Lone Rock stands in silent watch over the right-of-way.

We found graveyards at Kelton and Red Dome, foundations, and evidences of wye tracks and sidings. We passed stone culverts and short wooden bridges that tell of periodic flooding and drastic water-level changes.

We viewed a landscape that has changed little, if any, since March 1869, when work began in earnest on this section. Over the years, this was the domain of ranchers, wheat and sugar beet growers who called on the railroad to transport their products to market.

We also managed to get so lost west of Kelton that we drove to a place where we could see the 102-mile Lucin Cutoff, across the Great Salt Lake, that resulted in the line's abandonment by virtue of eliminating 40 miles of hill-climbing track.

Eventually, with the aid of GPS and a map, we meandered our way back to where we were supposed to be.

After opening and closing behind us a barbed-wire fence gate blocking the dirt road (this is still cattle-ranching land, despite the lack of water), we resumed tracing the CP right-of-way near Romala so that we could drive to our goal, Terrace, once a busy railroad center. It is hard to imagine what once was here: An entire railroad town that existed only until 1900 when the railroad relocated the facility to Nevada.

Driving the byway is an excellent way to get a better appreciation for the work that 10,000 Chinese laborers did to build the CP.

Here are some practical tips for those who want to drive here:

Bring food, water, and other essentials for what will likely be an all-day trek in the desert.

The BLM recommends a spare tire in case you find a spike

The Transcontinental Railroad Back Country Byway is a lonely dirt road north of the Great Salt Lake with few directional signs but many interpretive displays. This sign is on the western end of the route and is atypical of what you will find.

A replica of the Central Pacific *Jupiter* exudes steam and enthusiasm for visitors to the National Park Service site.

every part in the presentation, which can be done with as few as seven or eight members or as many as 15. He has most recently played Stanford.

The re-enactment began in 1947 to help commemorate the centennial of the Mormon migration to Utah, and has since become a tradition at Golden Spike. In the years following the 1969 centennial, the ceremony was recreated as many as five times a day, seven days a week. A tent city was created to replica the camp followers who tagged along with construction crews. With that, the clanging of a blacksmith, the smell of biscuits baking, and the raucous piano playing and laughter in a saloon became part of the scene. After the replica steam locomotives came, the focus changed, and the tent city faded away. But not the re-enactment ceremony.

"A lot of people are interested in trains," Felt says. "A lot of people are interested in history; and a lot of people are interested in their own history — we have a lot of Chinese people who come out to honor their ancestors, and the Mormons do, too; they did a lot of grading through Utah. We get a lot of people who point out relatives in Russell's famous picture."

As with so many volunteer activities

A handful of short bridges and culverts remain, unmaintained now for better than 80 years. They are slowly crumbling in the desert.

that washes to the surface after all of these years.

Prepare for the weather, as summer temperatures often exceed 100 degrees and winter weather sees frequent below-zero readings.

Make sure your vehicle has high ground clearance and a full tank of gas.

Expect that you won't have cell service for much of the day.

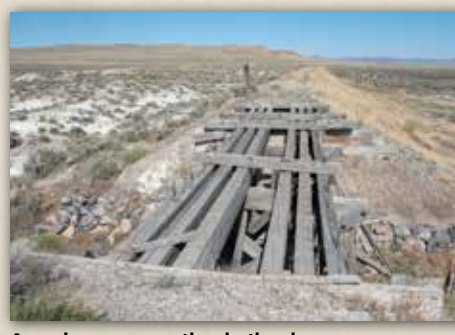
Be ready to stop often to read interpretive signs placed at important locations.

Bring a GPS unit.

Trestles have been bypassed, so they require minor detours that require the driver to be alert.

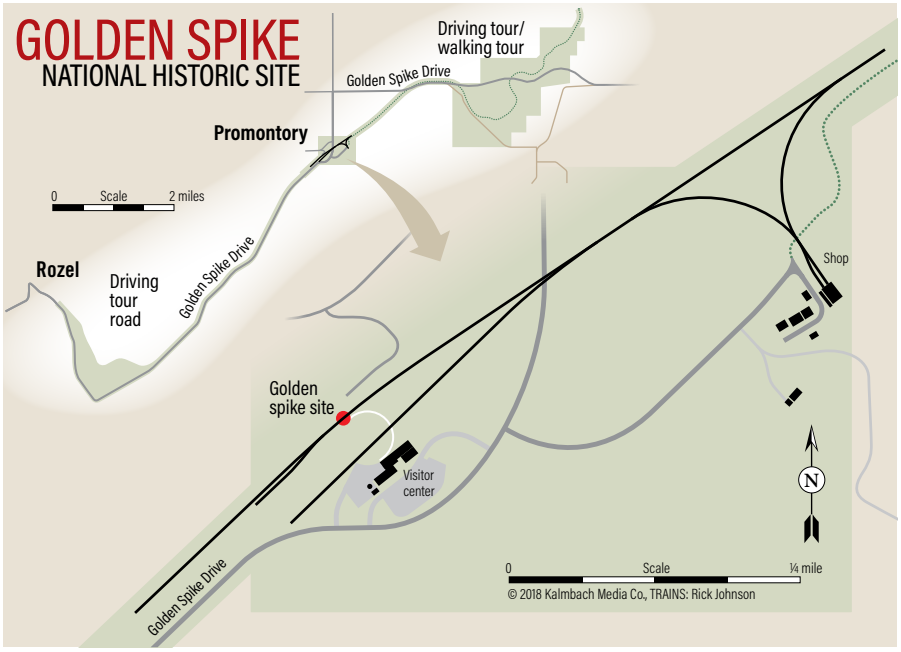
The byway is not an enjoyable experience for everyone. But for those with a keen sense of adventure and for those who don't care if they get a little mud on the tires and are cut off from 21st century America for the better part of a day, it will be a memorable time reliving the past when the Central Pacific made its way across the vast and lonely desert.

Few have seen the sights you'll see, and many of the relics you will find — the bridges and culverts on the route — are slowly fading away as time and the elements take their toll. Vandals and other people are also hard on this place. In one case, in the early 2000s, a rancher tore down a bridge and used its wood to build a corral, which is now gone itself. Many of the Bureau of Land Management's interpretive signs have been defaced or used for target practice. Go if you get the chance. Go to Promontory, see the 4-4-0 replicas, but wander into the desert and contemplate a time 150 years ago when the railroad was new. — *Jim Wrinn*



Amazing preservation in the desert: short bridges remain, their massive timbers keeping them alive to tell of the original route.

JOIN US FOR A 3-HOUR RIDE ON THE BACK COUNTRY BYWAY AT TRAINSMAG.COM



that are demanding of personal time, recruiting young people to ensure the future of the re-enactment is critical. "That is a worry," Felt says. He is hopeful the 150th anniversary will enthuse a new generation.

The May 10, 2019, presentation will be special, Felt says. "We considered this past May as our dress rehearsal for next year," he says. "We practiced every Monday for two months and added some to the introduction and conclusion," which will include an antique camera on a tripod with flash powder. It will be used to set up a recreation of Russell's famous champagne picture before the engines are pulled together.

"We've cheated a little; in the end we have Stanford and Durant shaking hands. In the picture, it's [Chief Engineer Samuel] Montague from the CP, but we don't have a Montague in our re-enactment."

And that brings us to 2019's celebration and beyond.

At press time, plans were still in preparation for events on Friday, May 10, 2019, and the ensuing weekend. The re-enactment will be key, as will entertainment, locomotive demonstrations, and food vendors (normally, there is no food available at the site). Plans also were underway to have remote parking and shuttle service with an expected attendance over the weekend of as many as 50,000. For a historic site that gets only slightly more visitors than that in an entire year, it will be an overwhelming weekend, and numerous elected officials and other dignitaries are expected to attend.

But that is still ahead, and before that something significant may happen to the site. Before the big party in May 2019, U.S. Rep. Bob Bishop from Brigham City, hopes Congress will pass legislation to designate Golden Spike as a National Park, moving it up from a historic site. The designation doesn't provide more money for the site in Box Elder County, which Bishop represents. But it does elevate its status, and should result in increases in visitation.

His legislation also creates the Transcontinental Railroad Network to place emphasis on this and other sites important to the story of the first railroad across the West. Bishop, a former high school history teacher who said his ancestors arrived by foot and by train in the late 19th century, tells TRAINS that also he would like to announce plans for a new, larger visitor center next May 10.

He appreciates the importance of the site: "It was estimated at the end of the Civil War that the people of the nation would degenerate into violence and conflagration. The transcontinental railroad was the catalyst that allowed our nation to rise above this. It united a divided country. It was the beginning of modern transportation in the United States. It moved us forward."

That message is one that you'll hear echoed if you ask park rangers on site why Promontory is important. It is not just a railroad story or a chapter in the westward expansion of the U.S., they will tell you. It is

A modern shop is home to the crown jewels of the National Park Service site at Promontory. Note the smoke hoods over each stack.

THE JUPITER AND THE 119 LIVE ON

REPLICAS GENERALLY aren't lovable locomotives. They lack character, authenticity, and the knowledge by the viewer that a few nuts and bolts, and maybe a boiler course or a frame member, were actually on hand back in the day — that they had actually come this way before when history was being made. The Central Pacific *Jupiter* and Union Pacific No. 119 replicas at the Golden Spike National Historic Site amazingly have the right feel. They can draw in casual visitors and create belief in railroad enthusiasts alike. Their presence animates an otherwise passive national historic site.

The first thing that jumps out about the 1979 replicas are their bright colors. They are far from black, which we associate as the primary color of most steam locomotives in the first half of the 20th century. They are also not the dingy machines shown in the 2011-2016 television drama series about the transcontinental railroad, "Hell on Wheels." The truth is that the TV show got it badly wrong, although the park service messed up, too, when the agency commissioned the locomotives.

These living and moving works of art are painted as best as can be interpreted in close to what they were in the late 1860s. Both were red from 1979 until 1993, when additional research showed that the *Jupiter* was actually a deep shade of blue.

The locomotives are true to their inspirations in many ways. With the exception of modern lifting injectors as a method of adding water to the boiler, they are mechanically like the engines they

LEARN MORE ABOUT THE JUPITER AND NO. 119 WITH VIDEO AT TRAINSMAG.COM

Volunteer re-enactors, portraying Central Pacific's Leland Stanford and UP's Dr. Thomas Durant, shake hands during the presentation.

represent. The *Jupiter,* coming from the west where wood was plentiful, typically burns lodge pole pine and other soft woods as available (photos on May 10, 1869, show it with a load of juniper wood, which is found locally). No. 119, coming from the east where coal was more available, burns black diamonds from the same southwest Colorado mine that supplies remnants of the Rio Grande narrow gauge. The locomotives call a modern shop home (and a General Electric 25-ton diesel is on hand to move them when they are dead).

The one thing that is missing is a train: There are no replica coaches or freight cars at Promontory. Therefore, missing is one experience that many visitors expect when they arrive: A ride.

Over the years, there have been proposals to relay track on the Promontory grade toward Corrine, Utah, where Union Pacific's last active section of the route terminates. But there is no current effort to make this happen. For now, the replicas will roll solo, living the lives of beloved superstar impersonators. — *Jim Wrinn*

A typical day for the Promontory crew: Far left, wooding up Jupiter's tender. Near left, Facility Manager Richard Carroll lights off No. 119's coal fire. Above, after throwing a switch, Cole Chisam joins Carroll in *Jupiter*'s cab, and another day begins with a replica of an 1868 locomotive.

With this spike, the Pacific Railroad will be completed. A re-enactor holds up a replica of the Golden Spike to the applause of the crowd waiting, just as in 1869, to see the railroad finished.

both of those things, but Promontory and the transcontinental railroad are also the physical connections for the country's re-unification after a bitter conflict, a truly epic and inspiring event that brought together the country from one shore to the other.

Promontory today is where that story is best told. Stand here on a gentle summer day and watch as families, vacationers, and adventurers from across the nation and around the world trickle in and take their seats to watch the re-enactment ceremony.

Watch their faces as they take in the shape, the beauty, and the glitz of the *Jupiter* and No. 119. Share with them the moment when the locomotives come together just as we've all seen in Russell's photo. Take a deep breath together as a re-enactor raises the golden spike high before placing it into the replica laurel tie. That's when the realization hits you: Railroading was made to change people's lives for the better, and it did just that at this very spot 150 years ago. A few taps with the sledgehammers, and the telegrapher taps out a simple message: "Done!"

For the latest information about transcontinental railroad 150th anniversary events and activities at Promontory and in other locations in Utah and across the West, go to TrainsMag.com*; Utah's Spike 150 Commission at* spike150.org*; Union Pacific Railroad at* www.up.com/goldenspike*; as well as Ogden Union Station at* www.theunionstation.org.

THE DRIVING TOUR

EVERYONE WANTS TO STAND at the spot where the Golden Spike marked the completion of the first transcontinental railroad. That's an easy stroll from the parking lot, through the visitor center, and out to the tracks, not more than 50 yards. The driving tour and the Big Fill Trail are nice complements to the Golden Spike National Historic Site. The east and west driving tours are exciting detours and provide glimpses into different aspects of the construction.

The eastern tour takes visitors onto the Central Pacific grade descending with massive loops from the Promontory Mountains into the Great Salt Lake Basin. It provides a look at the roadbed that was the Central Pacific main line from January 1870 to 1904 when the Lucin Cutoff was built and the Promontory line became a secondary branch.

It also shows how Central Pacific and Union Pacific graders built past each other in their race to see who could build the most

Two parallel grades greet visitors to Promontory — evidence that Central Pacific and UP grading crews passed each other for miles.

line and, of course, win hefty federal grants. The Golden Spike National Historic Site estimates that some 250 miles of parallel grade — but no actual track — was built between Echo, Utah, and Wells, Nev., in sections that were not contiguous. Why did they do it? Says NPS: "There was a fierce competition between the two railroad companies for subsidy bonds and land grants. For each mile of track laid the government paid 20 square miles of land and

A lonely place for railroading's great moment: The switch is lined for No. 119 to make its grand entrance at the Golden Spike celebration.

issued subsidy bonds worth many thousands of dollars."

The east driving tour also offers a look into the final cut that UP had to dig to reach Promontory days before the planned completion ceremony of May 8.

For the more adventuresome, the east driving tour is a starting point for the Big Fill Trail, where UP built a massive bridge fast and cheap that was used for only six weeks before the two railroad companies decided to use the better CP fill that was adjacent.

The west driving tour begins where the Transcontinental Back Country Byway ends and includes the famous 10-mile section of track built by mostly Chinese and a smaller number of Irish immigrant laborers in one day on April 22, 1869. A replica of the sign marking the accomplishment is placed at the easternmost end of the section.

Journeying to Promontory is, for the person who loves railroading and American history, a deeply moving experience not unlike a pilgrimage to a religious shrine. The Golden Spike site is an inspirational place known for its ceremonial importance. Standing next to the "10 Miles of Track Laid in One Day" sign or on the hillside at the Big Trestle site offers glimpses into the physical difficulties and daunting challenges of construction work. They are the foundations of Promontory and should be appreciated, as well. — *Jim Wrinn*

Chinese and Irish immigrants made history by finishing 10 miles of track at this spot.

A great empty gulf marks the spot where UP hastily built a wood trestle to reach Promontory Summit. It was only used for six weeks.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Ever-evolving Union Pacific faces more change 150 years after Promontory

by Bill Stephens

A westbound Union Pacific passes milepost 403 near Sidney, Neb., under a spectacular sunrise. It's 5:43 a.m. on July 11, 2008, and Cheyenne, Wyo., is 100 miles ahead. Mike Danneman

As Yogi Berra once said, "You can observe a lot by just watching." So it is in Hermosa, Wyo., where an eastbound Union Pacific merchandise train grinds its way up the west slope of Sherman Hill behind an ES44AC and an SD70M. Two-thirds of the train's consist passes by before an SD70ACe, tucked between covered hoppers, roars past — at precisely the same time a westbound stack train glides downgrade. After the trains clear, you notice that on ranchland no more than 300 yards behind you, traces of the original transcontinental railroad route are still visible: The telltale sign of a fill here, a shallow cut there.

What would ol' Yogi observe here?

Well, for starters, where legendary Big Boys once put the power of two 4-8-4s under the command of a single crew, UP relies on distributed power to lift trains over the summit of the Overland Route. UP helped pioneer widespread use of distributed power two decades ago, and today moves nearly 60 percent of its tonnage with horsepower spread through trains to save fuel and improve safety.

For another, there's UP's 156-year history of not standing still. The UP of 1901 fielded mechanized equipment to build a new Sherman Hill route; track crews wielding hand tools in 1868 would have loved such technology on their backbreaking race toward Promontory Summit. The new line reduced the grade from Laramie to Hermosa by more than half, to just 0.82 percent, and included the first bore of the Hermosa Tunnels. Some 52 years later — and 2 miles east of where you're standing — UP built the Harriman Cutoff from Dale Junction to Cheyenne, 46 miles of third track that eased the westbound ruling grade to 0.82 percent from 1.55 percent. And in the mid-1970s, UP added a second main alongside the 1901 line from Laramie to Hermosa.

It's all part of a UP tradition of continuous improvement, something that's inescapable today at the railroad's headquarters at 1400 Douglas St. in Omaha. Video monitors in the 19-story Union Pacific Center flash various operating metrics — from on-time arrivals and terminal dwell to switching cost per car and average train speed — and compare the current snapshot to longer-term goals. They serve as a constant reminder that you can always do better.

Like the rest of the railroad industry, UP will have to do a lot better in the years to come. Disruptive technology in trucking, including platooning and autonomous operation, threatens to poach a third or more of rail traffic. And railroads aren't yet able to provide an Amazon-like experience, where customers can place an order with one click, schedule the shipment, and track it to destination in real time. "The world's changing pretty dramatically. We all see it," CEO Lance Fritz said at the railroad's Investor Day in May 2018.

UP is facing these challenges head on.

First, it's adopting a new operating plan based on the principles of Precision Scheduled Railroading. It's a complex task with a simple goal: Make the railroad more reliable after being mired in an operational and service rut for more than a year. Changes include shifting the focus from moving trains to moving cars, minimizing terminal dwell and car handling, blending unit-train traffic into the merchandise network, and balancing train movements by direction and day of week to improve utilization of locomotives, cars, and crews.

Second, UP is adopting an array of technology that will make it more customer friendly, increase automation and productivity, smooth operations, and improve safety and efficiency. Executives are looking to the day when one person — and perhaps no one — will occupy the cab of a lead unit climbing Sherman Hill or rolling along any other line under the protection of positive train control.

Meanwhile, UP is banking on three growth opportunities that represent low-hanging fruit today: Converting business from road to rail amid tight truck capacity, snagging more perishables traffic, and tapping the boom in Gulf Coast plastics and petrochemical traffic.

Fittingly, as UP nears the 150th anniversary of the driving of the Golden Spike, much of this traffic flows over the transcontinental railroad that changed America forever. "All parts of our franchise really do traverse today's Overland Route," Scott Moore, UP's chief administrative officer, tells TRAINS. "One hundred and fifty years later, Union Pacific is still pushing the envelope. What can we do to make rail more efficient? To make rail more environmentally friendly? To make rail more competitive in the industry? All those things need to happen now."

Trains travel three different lines on Sherman Hill — the original main line, Borie Cutoff, and Harriman Cutoff — on June 12, 2015. The train in the foreground includes UP's Southern Pacific heritage unit. TRAINS: David Lassen

C45ACCTE No. 7906 leads a westbound stack train out of 787-foot tunnel No. 5 (formerly No. 2, from 1869) and over the eastbound main and 1,223-foot tunnel No. 6, from 1916, at spectacular but rarely seen Curvo, Utah. TRAINS visited the remote location with UP permission. TRAINS: Jim Wrinn

Show me the money

By many measures, UP is the titan of the railroad industry. It's tops in route-miles, number of employees, and the size of its locomotive fleet. Its merchandise network is far and away the biggest in railroading. And to handle it all, UP boasts more hump yards than any other railroad, including the world's largest classification yard in North Platte, Neb.

Financially, UP leads the pack in terms of operating income and generating piles of cash. What's more, by virtue of its 32,122 miles of track that blanket the West, UP owns the distinct competitive advantage of being able to reach virtually every major market via its own rails.

Yet two things are conspicuously absent from Omaha's leaderboard: Total volume carried and traffic growth. More volume polishes the rails of western rival BNSF Railway annually, putting UP firmly in the No. 2 spot. UP trails the industry average in volume growth and badly lags BNSF. In fact, since the Great Recession ended, BNSF's traffic is up 12 percent, while UP's is down almost 3 percent.

Among industry analysts, these trends have raised more than a few eyebrows.

"Our biggest long-term concern with Union Pacific has been a lack of volume growth outside of intermodal," says Bascome Majors, a senior analyst with Susquehanna Financial Group.

"Union Pacific continues to mystify me — widely acknowledged to have the best franchise in freight railroading, with an OR already in the mid-60s, historically good tech savvy, and most of all a strong culture buttressed by a glorious history — and clearly smart leadership and a revived marketing department," says independent analyst Anthony B. Hatch of ABH Consulting. Despite all this, Hatch notes, UP has fallen behind on volume and price gains, while spending less than the industry average on capital expenses over the past few years.

If you think this has alarm bells ringing at UP headquarters, you'd be wrong.

Executives say volume is not as important as profitability. "What we really focus on is generating industry-best operating income and cash — which we do," Fritz told investors and Wall Street analysts in May.

Glance at Class I figures for average revenue per carload, and you'll find UP's name at the top of the list. In fact, UP takes in 16 percent more revenue per carload than BNSF. So when BNSF undercuts UP's pricing on coal and intermodal — and gains market share as a result — that's OK with Omaha. "We don't necessarily manage the business for market share. I don't look at market share as the sole indicator of winning," Fritz says.

What UP does look at is playing only where it can win. "Typically if we're losing share, it's because we're making a decision that whatever it takes to secure the business in that particular segment ... is either not attractive to us from a price perspective or a margin perspective or both," Fritz explains.

Ultimately, UP executives say this is not really about UP vs. BNSF. Trucks are UP's biggest competitor. And there's plenty of opportunity to covert business from the highway to the railroad. UP seems increasingly confident that it can do just that — and at profit levels that meet its targets. Containers riding UP intermodal trains are carrying more auto parts, for example, that used to move by truck. Better still for UP is traffic previously pulled by Peterbilts or Kenworths — from lumber to steel pipe — that is finding its way into the carload network. "All of those cars have a beautiful profitability to them," former Chief Operating Officer Cam Scott says. "The strength and beauty of the Union Pacific network lies squarely in that manifest network."

C-c-c-cold Connect

UP sees perishables traffic as a growth engine. Reefer traffic will not add up to hundreds of thousands of loads per year, but it is a market that the railroad can crack by offering new services that expand the type of commodities it can haul.

In January 2017, UP purchased Railex, the refrigerated food and beverage logistics provider that filled reefers for a decade. UP dubbed it Cold Connect and increased service to five days per week, up from three. The reefer trains rate high-priority Z-symbol status and depart Tuesday through Saturday from terminals in Delano, Calif., and Wallula, Wash. They unload at the UP terminal in Rotterdam, N.Y., outside Albany, Sunday night through Thursday night.

The Wallula Cold Connect train also picks up loads of potatoes, onions, and butter in Pocatello, Idaho, from the Eastern Idaho Railroad, a Watco short line. Watco's reefers are interchanged with Norfolk Southern at Chicago, then ride intermodal trains to Bethlehem, Pa. "It is an

A manifest train heads west through Oak Park, Ill. UP reaches virtually every major market in the Midwest and West. TRAINS: David Lassen

enormously innovative product. This is truly modal conversion from truck," says Stefan Loeb, Watco's chief commercial officer. "The service has been phenomenal, even in tough weather conditions."

UP's California and Washington Cold Connect trains combine in Wyoming for the trip to Chicago, where Midwest loads are set off and the train is handed to CSX Transportation for the run to Rotterdam. From there, trucks deliver produce to grocery stores and food distributors in the Northeast and New England.

In a way, the reefer service is a blast from the past with a modern twist. The reefers often carry less-than-carload shipments for multiple customers, while UP's Loup Logistics subsidiary provides shippers with real-time GPS-based tracking visibility on each pallet, whether it's on the train, a truck, or in the warehouse.

With door-to-door delivery in seven or eight days, depending on origin, the Cold Connect service has been better suited for traditional reefer-car commodities such as hearty vegetables plus canned goods, cheese, wine, and beer. But that's changing. It takes a truck two days longer to make a coast-to-coast perishables run thanks to the 2017 electronic logbook requirement that enforces truckers' hours of service rules. And that makes reefer-car service more competitive. "With the changes in the trucking market, we feel significant opportunity remains in the fresh produce markets," says Brad Thrasher, UP's vice president of marketing and sales for agriculture products. "This network is not only fast enough to open up opportunities to handle the more perishable products that don't traditionally move by rail, but it also provides a faster and more reliable ride to our traditional customers that is attracting growth from them."

Union Pacific considers trucks, rather than other railroads, to be its primary competition. This westbound stack train, featuring one of UP's "Arrowedge" streamlining devices atop the first well, is passing the competition on Interstate 80 in Utah's Echo Canyon. TRAINS: Jim Wrinn

The opportunity is there, as UP has less than a 5-percent share of produce departing the West Coast. UP is eyeing new terminals in Arizona, Texas, Illinois, Georgia, Florida, and Mexico. And the railroad in 2018 placed an order for 1,000 new reefer cars. UP won't say how many of those cars are for fleet expansion and how many will merely replace cars that will be retired. But it's a significant investment and a sign that UP is serious about perishables traffic.

Plastics boom

The crown jewel in UP's carload business — and a major reason why it's able to have higher operating income than BNSF despite lower overall volume — is chemical traffic. UP hauls more than a million chemical carloads a year, more than 40 percent better than the No. 2 railroad, Canadian National.

More than half of UP's chemical loads originate or terminate in Texas. Already growing, UP's chemical traffic is gaining momentum amid booming plastics production. In anticipation of exporting plastics to Asia, South America, and Europe, more than 20 new or expanded plastics plants are opening, under construction, or on the drawing board across North America. The growth is concentrated on the Gulf Coast. It's all fueled by fracking and the glut of cheap natural gas that's the feedstock for plastics production. Exports of polyethylene, the most common type of plastic found in everything from dashboards to keyboards, are expected to double by 2022, with half of the shipments bound for China.

"There is huge share potential in chemicals as well as the biggest market growth

THE UNION PACIFIC TODAY

Western rival BNSF handles more freight volume than Union Pacific, but UP sees income as the more significant measure. A BNSF coal empty passes over UP's Sidney local at Sidney, Neb. Chip Sherman

story in generations," Hatch says. How huge? It will be measured in tens of thousands of carloads, says Kenny Rocker, UP's executive vice president of marketing and sales. Consider that the Katoen Natie plastics-packaging facility, next to UP's intermodal terminal in Dallas, opened in October with 250,000 square feet of warehouse space. It's expandable to 2.5 million square feet — the size of 43 football fields.

The facility is part of UP's "Dallas to Dock" program, which aims to solve a problem: Gulf Coast ports can't handle plastics export volumes and even if they could, they don't have enough empty containers. Under Dallas to Dock, UP hauls hoppers of plastics from Gulf Coast chemical plants to Dallas, where the pellets are packaged, stuffed into a surplus of empty containers, and loaded onto intermodal trains bound for the ports of Los Angeles and Houston, plus East Coast ports via interchange.

New hump for Texas

The spike in plastics, petrochemical, and energy-related traffic — think steel pipe, frac sand, and other commodities that support drilling rigs — is part of a rising tide of business that threatens to flood UP's network in Texas and Louisiana.

Near-record manifest volume on the Gulf Coast was among the reasons for a systemwide slowdown that began in the middle of 2017 and lingered for more than a year. Also contributing to a stubborn drop in average train speed and a rise in terminal dwell were the impact of Hurricane Harvey and historic flooding that followed, crew shortages in some areas, and a glitchy roll-out of positive train control. It didn't help that customers put more cars on the system as UP slowed down. The extra cars only added to the congestion and further slowed transit times.

If you looked at the systemwide map at the Harriman Dispatching Center in Omaha in June 2018, Texas stood out: Lone Star state lines were red, indicating congestion, amid a sea of green virtually everywhere else. For the next four years, UP will focus its capacity expansion projects on the Gulf Coast, including additional sidings, double track, and power switches on lines in Texas and within the Houston terminal area,

along with new and expanded storage-in-transit yards for petrochemical and plastics producers in Livonia, La., and at Angleton Yard, south of Houston.

The centerpiece of it all is Brazos Yard, the new classification facility being built on a 1,875-acre site near Hearne, Texas, at the junction of seven UP main lines. The routes radiate to Houston, Dallas/Fort Worth, and Austin, as well as to gateways to Mexico and major interchanges such as Memphis, St. Louis, and Chicago.

Brazos will be UP's 15th hump yard and the first built in a generation. And at $550 million, it also will be the largest single investment in the railroad's history. When Brazos opens early in 2020, it will relieve pressure on regional yards throughout Texas and Louisiana, reduce car miles, and give UP more flexibility on interchange traffic bound for Mexico and Eastern railroads.

Initially, Brazos will be able to classify 1,300 cars per day. But potential expansion to a 70-track bowl, up from 40, will enable the yard to process 2,300 cars per day, the most for a single-hump yard in North America.

Hump yards may be out of fashion in light of the late CEO E. Hunter Harrison's idling of humps on CSX Transportation, Canadian Pacific, and Canadian National. But a hump in the right place and with enough volume remains the best way to switch cars, UP officials insist. "Brazos will be our lowest-cost yard and by a substantial amount," says Tom Haley, vice president for network planning and operations.

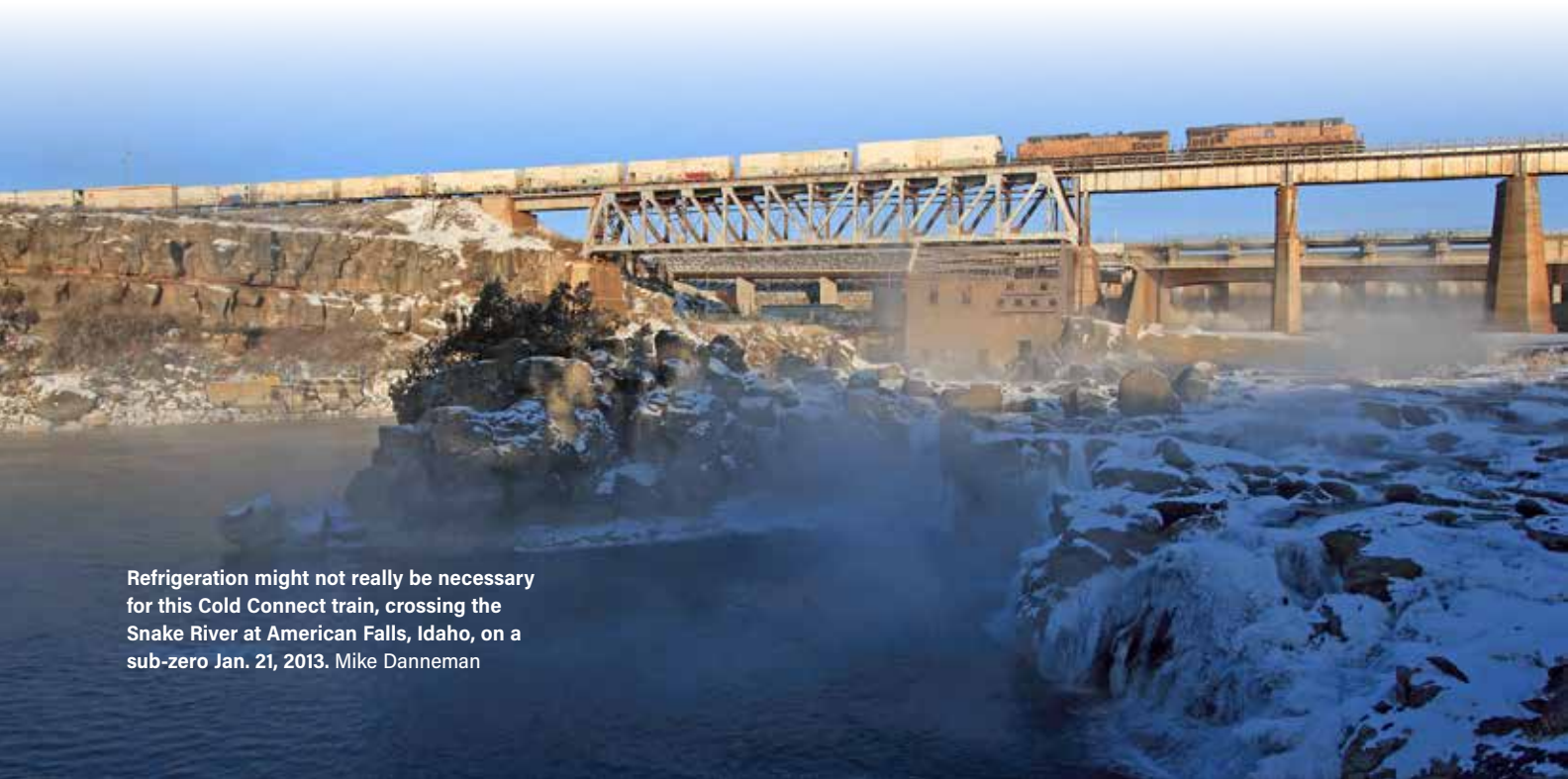
Brazos will feature gentler turnouts and three sets of retarders, up from two at other UP humps, that will speed the classification process. Receiving and departure tracks will be built to handle today's long trains. And most yard operations, including at the hump and trim, will be performed by remote-control locomotives.

UP sees growth opportunities in its Cold Connect service. Here, eastbound ZDLGRP (Delano, Calif., to Green River, Wyo., Perishables) crosses Donner Pass at East Norden, Calif., on Aug. 26, 2017. In Wyoming, it will be combined with a train from the Pacific Northwest. Patrick Dirden

Smoothing service

When the alarm wakes Ruben Lopez each workday, he rolls over, grabs the iPad off his nightstand, and remotely checks the "Big Board" at the Harriman Dispatching Center. "It tells you how the railroad's running," Lopez, a West Point graduate who serves as one of the directors of the dispatching center, tells TRAINS. "It gives you a real snapshot of what's going on. Then I look at what's called 'trains held,' which is any train ... that's stopped for whatever reason: maybe a crew, maybe a locomotive, maybe waiting to get on the BN, maybe for maintenance of way."

If UP executives have their way, there will be fewer operational headaches for Lopez and the 500-strong team of dispatchers who work in the Harriman Center. A big reason is the rollout of Unified Plan 2020, UP's version of Precision Scheduled Railroading that was launched on Oct. 1. One of the hallmarks of the concept is moving the same amount of tonnage on longer trains. That means fewer trains



Refrigeration might not really be necessary for this Cold Connect train, crossing the Snake River at American Falls, Idaho, on a sub-zero Jan. 21, 2013. Mike Danneman

moving across the railroad at any one time, which makes the entire system more fluid. Having a goal of operating closer to schedule every day helps, too.

Thus far it's clear that UP's approach — which Hatch has dubbed PSR 2.0 — is far different than the way Harrison brought change to three Class I railroads. "So far, PSR has only been implemented in a revolutionary, go-for-broke manner," Hatch says. Harrison, who literally wrote the book on Precision Scheduled Railroading, introduced his operating model rapidly and while thoroughly changing the culture of each railroad. The swift and deep changes created months of service problems, prompted shipper complaints, and attracted increased scrutiny from federal regulators. Eventually, each railroad became more reliable and profitable — but not before alienating everyone but shareholders, Hatch says.

UP is determined to avoid service disruptions. It is methodically introducing operating changes in three regional phases that started with its Mid-America Corridor linking the Midwest and Gulf Coast, followed by the Sunset Route between Southern California, Texas, and Chicago. It aims to have the new transportation plan running systemwide by the middle of 2019. In November, federal regulators praised UP's smooth rollout of operational changes, noting that shippers had not complained about service. Connecting railroads reported no problems with interchange. And cars were moving faster across UP as train speeds inched up and dwell slowly sank, even as traffic rose.

It remains to be seen if UP's more measured approach can produce the same financial results as the Harrison-led transformations, which also involved everything from labor agreements and freight rates to the engineering and mechanical departments. "There has been some speculation of what we are doing is a light version of PSR or that UP is not fully committed to making the changes necessary to achieve PSR benefits," Tom Lischer, executive vice president of operations, told analysts and investors in October. "I can assure you that is not the case."

Outside of the move toward Precision Scheduled Railroading, UP is taking steps to weed out delays caused by things like locomotive and freight-car failures and track and signal problems. When one train is forced to stop, delays typically cascade down the line. "Removing variability has the double benefit of improving velocity and making service more reliable," says Haley, the network planning and operations vice president.

To reduce the number of things that throw sand in the gears, UP is combining data analytics with problem-solving tools. The entire railroad has been sliced into 5-mile sections, allowing computer power

Plastics and chemicals are at the heart of UP's carload business. Here, MotivePower MP20GP UPY 2108 brings a northbound chemical local under the Englewood Yard hump on the Houston Belt & Terminal East Belt main line on March 16, 2012. Matthew Holman

and brain power to pore over data, pinpoint potential trouble spots, and seek the root causes of problems. So far the effort has produced results as varied as preventing washouts and reducing the number of trains stalling on heavy grades.

UP aims to eliminate a mind-boggling 28,000 hours of delays annually by speeding up tie-replacement projects. How? UP is building 80-car tie trains to automatically distribute ties along 3,300 miles of annual track projects. Faster tie-installation machines are on the drawing board. Plus, dedicated scrap-tie trains pick up old ties in days, rather than weeks.

UP also is putting up-to-the-minute information in the hands of its crews and 10,000 customers. Car inspectors are beginning to tote mobile devices where they can log problems as they find them, which speeds repairs and, ultimately, train departures. Yard and local crews can see in real time when customers order or release cars, enabling them to respond more quickly to changes in shippers' orders.

UP's SmartETA program, rolled out in summer 2018, gives far more accurate arrival times for trains. It uses machine learning to analyze GPS data taken from the PTC system aboard locomotives, then spits out arrival estimates. Customers can check this information and better plan their supply chains. The operations department, meanwhile, is using the backbone of this system to create more accurate crew-calling times.

The rising tide of business continues to be a challenge for Union Pacific's network in Texas and Louisiana. On March 28, 2012, train KLTAT (Lathrop-Atlanta Intermodal) heads east over White Oak Bayou in downtown Houston. Matthew Holman

Cars are shoved over the hump at Houston's Englewood Yard. At a time when other railroads are eliminating humps, UP is building its 15th, Brazos Yard, in central Texas. Tom Kline

Bow to the past

For all its focus on technology, UP enthusiastically embraces its past. And it does so on a scale and with a fervor that no other Class I matches. It rosters a steam locomotive — 4-8-4 No. 844 — that has never been retired since Alco delivered it in 1944. The 844's stablemates at the Cheyenne roundhouse include Challenger 4-6-6-4 No. 3985, which has had an active excursion career, and Big Boy No. 4014, which UP's steam crew is meticulously rebuilding to help celebrate the 150th anniversary of the Golden Spike.

No one thought a 4-8-8-4 would ever steam again. But UP has never been one to shy away from big projects. "Union Pacific has a history of doing big things, from building the railroad to the days of Harriman to what we did in both world wars," Moore says. "Restoring the Big Boy is just the latest chapter and finding that big thing."

UP also gives smaller, everyday nods to its heritage. The Harriman Dispatching Center, for example, is a technological marvel housed in a brick freight house that dates to 1891. You enter the cavernous dispatching room from what was the platform where boxcars were loaded and unloaded. The dispatchers sit below you, at roughly track level. Despite heavy interior modifications that include 24-inch thick concrete walls designed to withstand disasters, the Harriman Center outwardly retains its historic appearance, right down to the vintage shield logos that still proclaim Union Pacific System as "The Overland Route." A few blocks away, the employee cafeteria at the railroad's headquarters sports logos of fallen flags that were a part of UP's acquisition binge in the 1980s and '90s.

UP's Harriman Dispatching Center is housed in a former Omaha freight house dating to 1891. Union Pacific

You can get a feel for the sweep of the railroad's history at the Union Pacific Railroad Museum in Council Bluffs, Iowa, just across the Missouri River from Omaha. It doesn't own a single piece of rolling stock, which is unusual for a rail museum. "We're very much a history museum. We're interpreting the history of the West," says Patricia LaBounty, a UP employee who is the museum curator. And it pulls it off in a way that appeals to both fans and visitors who couldn't tell a 4-4-0 from a 4-12-2.

Council Bluffs is significant because it became milepost 0 of the Overland Route. The museum exhibits trace the development of the transcontinental railroad from initial route surveys and Abraham Lincoln's signing of the Pacific Rail Act to construction and the Golden Spike ceremony. Artifacts in the collection include silver and furniture from Lincoln's personal railcar, Grenville Dodge's surveying tools, shovels and picks used to build the line, and one of the spikes hammered home in Promontory.

The timeline continues with exhibits on the heyday of passenger trains like UP's *City of San Francisco*, how the railroad helped win World War II, and advances in railroad technology over the years. The exhibits culminate with a focus on the UP of today — including the only place you can take the throttle in a full-scale positive train control simulator.

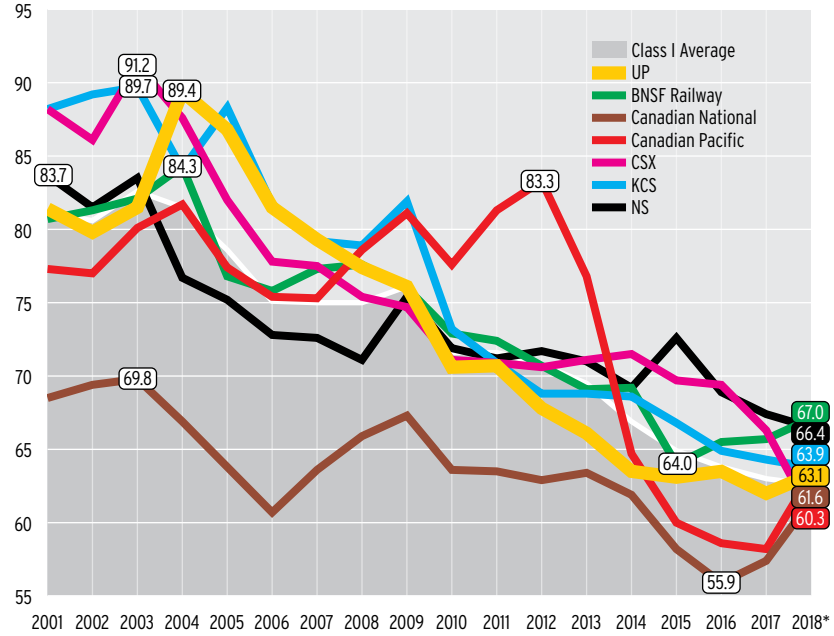
UP's historical efforts extend online, too, like the Great Race to Promontory timeline and other features on the railroad's website. And what other railroad offers a cellphone ringtone? You can get it at: www.up.com/aboutup/funstuff/ringtones/

In an era of belt-tightening, it's fair to ask why UP devotes this much attention to history. Moore, a history buff who once gave his staff copies of Stephen Ambrose's book on the transcontinental railroad, "Nothing Like it in the World," puts it this way: "Well for one, Abraham Lincoln, by his own signature, creates you. That gives you a pretty good sense of history. And so knowing that, knowing our place in America's history, we've always maintained and tried to find a way to get back to that. And one of those things is our steam program. ... We have spent much time and money over the years making sure that steam program is there for railfans of the past and, more important, railfans of the future. That tremendous power of a steam locomotive is absolutely fascinating to all ages and that's why we go out and show it around the country."

Vital then and now

Today's Overland Route, which in 1869 tied Sacramento, Calif., to the national rail network via Council Bluffs, remains as important as ever. "It's still a vital transportation link," Moore says, painting a picture of UP's busiest main, the triple track between North Platte and Gibbon, Neb., that sees 80-plus trains per day, from 70-mph

OPERATING RATIOS, 2001-18*



*2018 figures through Sept. 30

Z-trains to coal drags.

Take the elevator to the observation deck of the Golden Spike Tower in North Platte and you can see this river of commerce and what it takes to keep it flowing, from Bailey Yard's twin humps to the diesel shop and servicing facilities. Pick your adjective for Bailey — huge, mammoth, sprawling, gigantic — and it will fall short, somehow failing to grasp the scale of the world's largest classification yard.

Just about every commodity UP handles rolls along the Overland Route across the flatlands of Nebraska, and all of it funnels through North Platte: International containers double-stacked at West Coast ports and domestic intermodal boxes filled with consumer goods. Automobiles and Midwestern grain. Coal from the Powder River Basin in Wyoming. Lumber from the Pacific Northwest. Frac sand from Wisconsin. Perishables from the West Coast.

The transcontinental railroad is an intertwined story of the growth of a nation and a railroad. The route formed UP's historic spine from Council Bluffs to Ogden, Utah, and has expanded alongside the West that it helped settle and develop. By the early 20th century, it had sprouted branches to the Pacific Northwest and Southern California, which connect with Midwest markets and Eastern gateways via Chicago, St. Louis, and Memphis.

The entire route has been Armour Yellow since UP's 1996 acquisition of Southern Pacific, whose predecessor, the Central Pacific, built east from Sacramento, over the Sierras, and across the forbidding desert of Nevada until meeting UP at Promontory. Today the Overland Route is one of four major corridors in UP's go-everywhere network, the others being the I-5 from the Pacific Northwest to California, the Sunset Route, and the Mid-America.

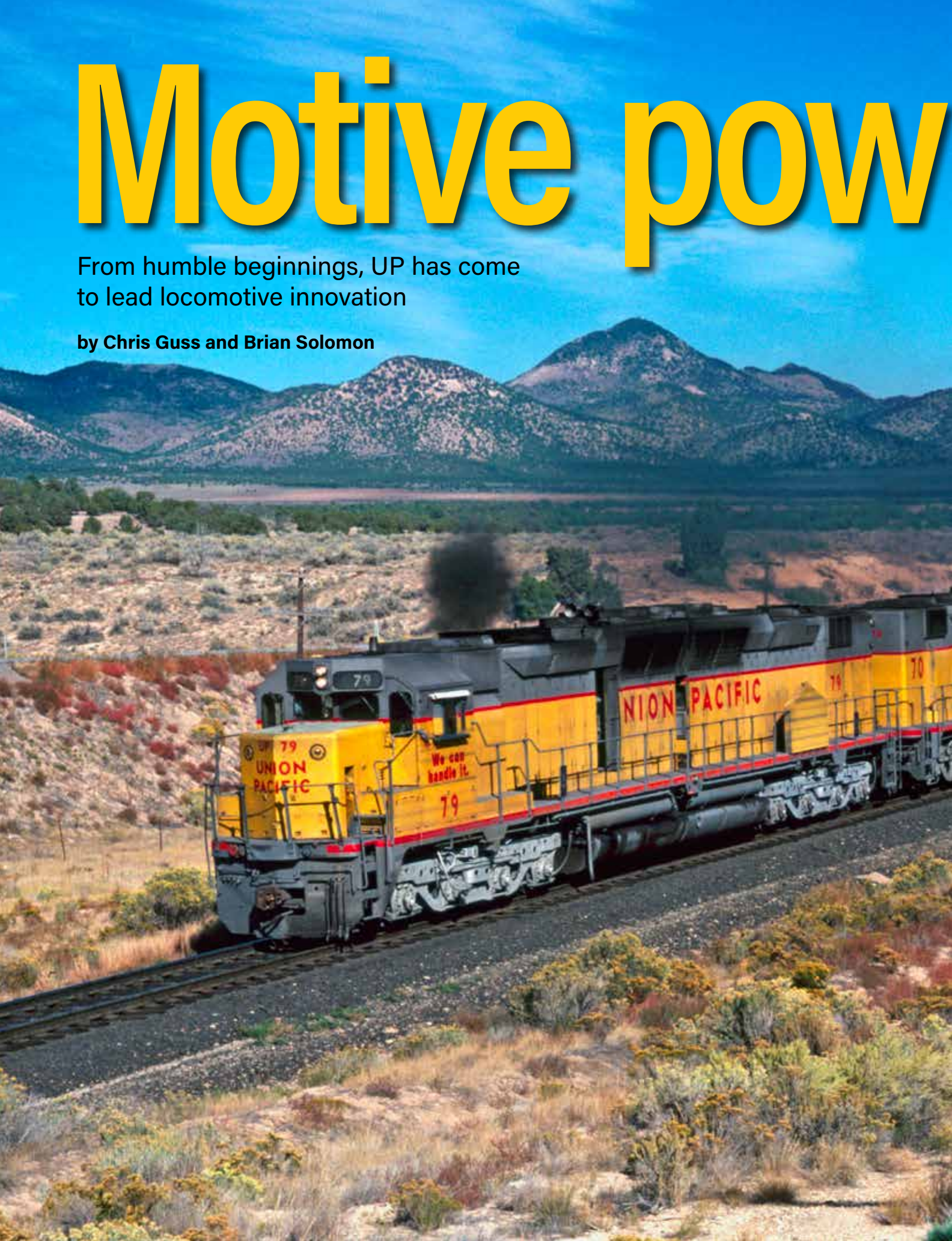
Most railroads had humble beginnings, with modest goals of connecting a town or two. Not Union Pacific. Born of Lincoln's signature, it still has the swagger that comes from being part of an audacious plan to tame a continent and fulfill Manifest Destiny. Perhaps it's fitting, then, that UP is the biggest railroad in North America. "When the vision of your company is building America, that's a pretty bold statement," Moore says. "In the case of Union Pacific, we actually did it and we're continuing to do it."

Three tracks, no waiting: As the sun sets on Feb. 8, 2007, an eastbound UP freight hustles across the high plains toward West Rawlins, Wyo. Mike Danneman

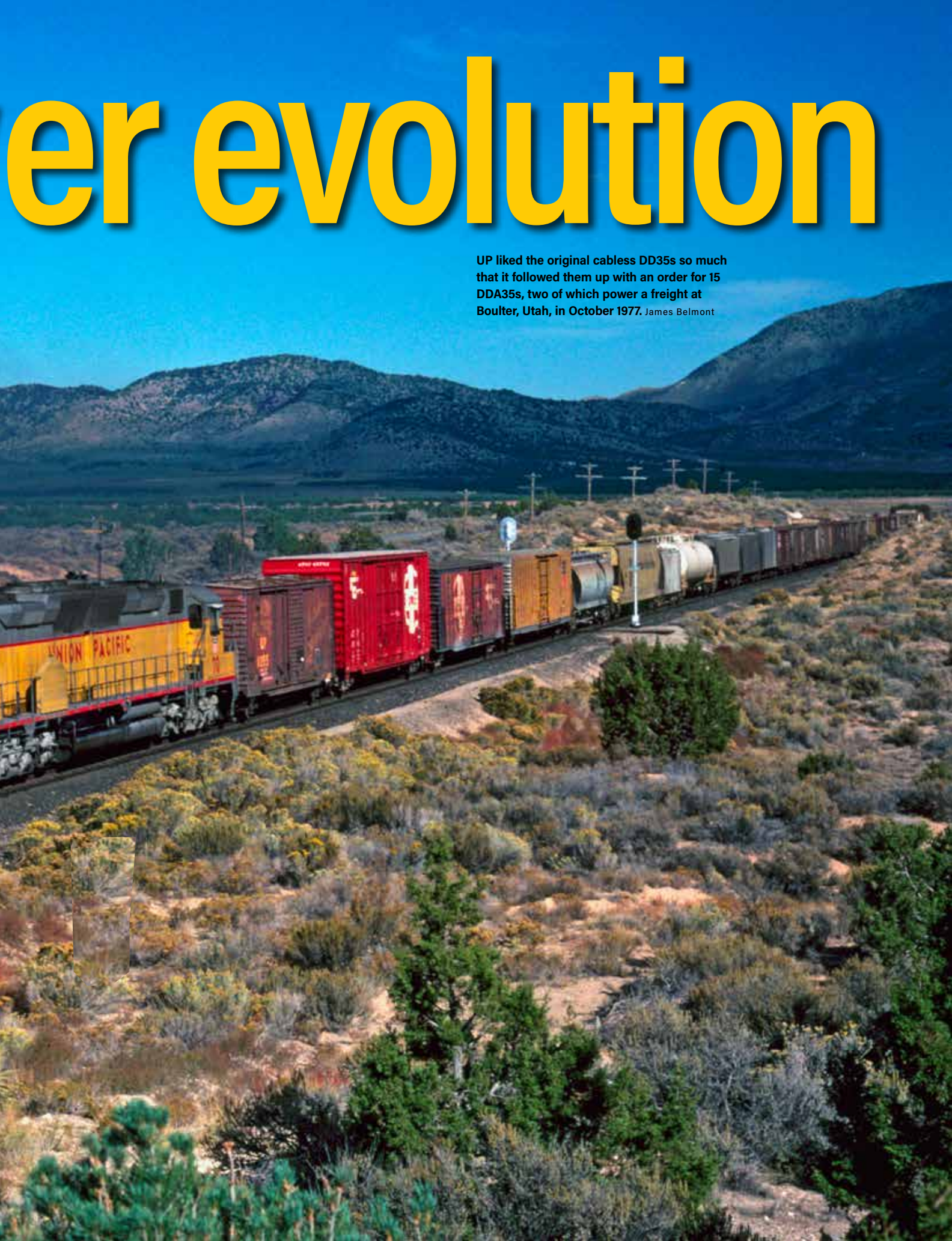
Motive pow

From humble beginnings, UP has come to lead locomotive innovation

by Chris Guss and Brian Solomon



er evolution



UP liked the original cabless DD35s so much that it followed them up with an order for 15 DDA35s, two of which power a freight at Boulter, Utah, in October 1977. James Belmont

UP 2-8-8-0 No. 3527 leads 4-6-6-4 No. 3934 west out of the Burnt River Canyon near Durkee, Ore., in July 1939 with train No. 17, the *Portland Rose*. Two photos, Henry R. Griffiths

A 4-12-2, a wheel arrangement unique to the Union Pacific, starts up Medbury Hill just west of Hammett, Idaho, in October 1957. The freight train has 75 cars and two 2-8-2s pushing.

Union Pacific's motive power fleet has always been fascinating. From its massive, modern steam power to some of the country's earliest use of diesel-electric locomotives, the railroad has been on motive power's cutting edge. Its innovation in design and technology has helped the entire railroad industry haul more tonnage greater distances with better reliability. Like any innovator, it has experienced failures and missteps along the way, but learning from these challenges allowed Union Pacific to become one of the leaders in locomotive technology.

UP's list of locomotive designs, improvements, and technological advances are impressive: from the 4-12-2 Union Pacific types, Big Boys, M-10000 streamliner, steam-, gas-, and coal-powered turbines, and double diesels to more modern developments such as A.C. traction, 6,000-hp

Gas-turbine-electric No. 2 hustles a freight east through Archer, Wyo., in October 1958. The 8,500-hp set was the newest such technology on the railroad at the time. Stan Kistler

locomotives, and gensets.

Although Union Pacific late-era steam is famous for some of the world's most extreme locomotives, the railroad's early engines were humble, ordinary machines, noteworthy only as typical, common American designs. UP freight locomotives ultimately reached dramatic proportions as part of the railroad's desire to handle an enormous and ever-swelling tide of freight across the vast West, uninhibited by physical constraints that limited most other railroads. Today, UP is best known for its 4-8-4s, Challengers, and Big Boys. It should also be recalled for many other types, including unusual compound Atlantics, 2-8-8-0 Mallet articulateds, and three-cylinder 4-12-2s, which labored for decades hauling revenue trains.

Early icons

Union Pacific's 19th-century steam is epitomized by No. 119, famous for its role at Promontory on May 10, 1869. It's an ironic twist that this common 4-4-0 came to represent the railroad, only because it was on hand; the exemplary machine that UP had planned to exhibit that day was unable to reach the meeting point in time for the Golden Spike ceremony. Yet this 1868 product of the Rogers Locomotive Works was more or less typical of early UP steam power, which in turn was representative of engines on American railroads. While it had its share of oddities, UP largely moved trains with 4-4-0s and 4-6-0s.

Considering the abnormally large locomotives for which Union Pacific became famous in the 20th century, what seems noteworthy in retrospect was the relatively ordinary proportions of engines that dominated its road fleet before World War I.

Beginning in 1890, UP embraced non-articulated compound types using various arrangements of high- and low-pressure cylinders to obtain greater thermal efficiency through double expansion of steam. Significantly, these used less water to perform the same work, especially important considering the railroad's operations across arid terrain where obtaining water posed continual challenges. UP first bought Schenectady's two-cylinder cross compound 2-8-0s that used an asymmetrical arrangement with the high- and low-pressure cylinders located on opposite sides of the engine. Later, UP bought many Baldwin four-cylinder Vauclain compounds, with pairs of high- and low-pressure cylinders on each side of the boiler. After World War I, it abandoned the non-articulated compound concept, largely because maintenance of more complex equipment negated cost advantages of compounding.

Production diesel models unique to Union Pacific
- Alco/GE 4500 GTEL turbine
- GE 8500 GTEL turbine
- EMD GP30B
- EMD SD24B
- EMD DD35A
- EMD DDA40X
- GE U50C

E.H. Harriman took control of UP in 1898, and ushered in an era of standardization that coincided with the rapid growth of locomotive design and the introduction of larger wheel arrangements. Harriman's strategy to improve the

railroad included massive investment in larger modern locomotives.

For passenger service, UP bought 4-4-2 Atlantics (both compound and conventionally arranged) and 4-6-2 Pacifics. Initially, it assigned Atlantics to level territory for faster operation, with Pacifics working graded routes.

Harriman's standardized design practices expanded in 1907, when the Union Pacific Equipment Association was assigned responsibility for ordering most new power for Harriman's railroads, including UP's affiliated properties and Southern Pacific. In the Harriman era, more powerful 2-8-0s were purchased for freight, and the 2-8-2 Mikado began to emerge as a new standard road-freight hauler. Harriman died in 1909, but his policies lived on and only effectively ended when the courts forced break up of UP and SP in the teens. Many Harriman standard engines continued to serve UP (and SP) through the end of steam in the 1950s.

UP's timid foray into the Mallet articulated compounds of the early 20th century was a prelude to the massive locomotives it bought a generation later. In 1909, Union Pacific purchased six huge Baldwin 2-8-8-2s for heavy freight work. A decade later UP sampled Alco-built 2-8-8-0s and ultimately acquired 70 such locomotives. These moved mainline freights across UP's Wyoming grades, among other duties. Among UP's heavy freight locomotives were 185 2-10-2s, known as simply Two-Ten-Twos to avoid any allusion to the railroad's competitor, Santa Fe, for which the type was more commonly known.

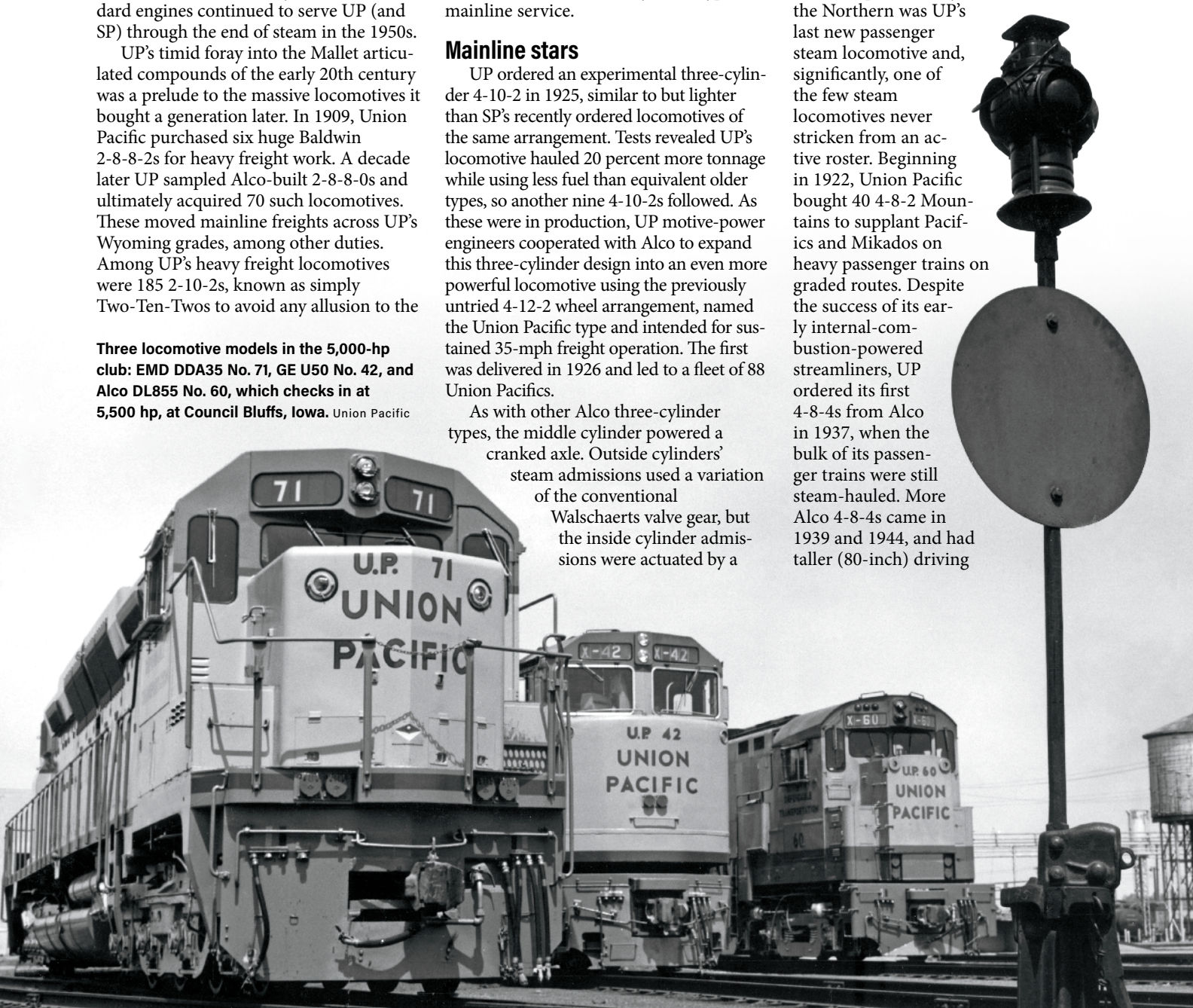
The Mallets were powerful but ponderously slow, and by the mid-1920s, UP desired freight engines that were both powerful and relatively fast. Alco offered an innovative solution in the form of a modern three-cylinder, non-articulated locomotive. This was an equivalent development to its competitor Lima's "Super-Power" steam, produced about at the same time to achieve the same goals. A high-capacity boiler supplied three cylinders, giving the engine six impulses instead of four, which increased tractive effort and starting torque to overcome some of the physical limits imposed by reciprocating parts. UP pushed the concept to the limit, ordering what became not only the largest and most powerful examples, but also the biggest fleet and the longest lived of American three-cylinder types in mainline service.

Mainline stars

UP ordered an experimental three-cylinder 4-10-2 in 1925, similar to but lighter than SP's recently ordered locomotives of the same arrangement. Tests revealed UP's locomotive hauled 20 percent more tonnage while using less fuel than equivalent older types, so another nine 4-10-2s followed. As these were in production, UP motive-power engineers cooperated with Alco to expand this three-cylinder design into an even more powerful locomotive using the previously untried 4-12-2 wheel arrangement, named the Union Pacific type and intended for sustained 35-mph freight operation. The first was delivered in 1926 and led to a fleet of 88 Union Pacifics.

As with other Alco three-cylinder types, the middle cylinder powered a cranked axle. Outside cylinders' steam admissions used a variation of the conventional Walschaerts valve gear, but the inside cylinder admissions were actuated by a conjugated valve gear that derived valve motion from the outside cylinder's piston valves. This had recently been developed by London & North Eastern's Sir Nigel Gresley, and later applied to LNER's *Mallard*, the British streamlined speedster famed for its 126-mph sprint. On the 4-12-2, actuated central cylinder steam admissions are through an arrangement of external levers at the front of the locomotive. The 4-12-2's exceptionally long wheelbase (30 feet, 8 inches) required lateral-motion devices on the first and last driving axles to enable the locomotive to negotiate tighter curves. The ultimate success of Alco's three-cylinder locomotives has been debated, yet UP operated its 4-12-2s in mainline service for the better part of three decades, a respectable career for any locomotive.

For decades, Union Pacific's 4-8-4 No. 844 has served as the railroad's public face. The product of years of refinement, the Northern was UP's last new passenger steam locomotive and, significantly, one of the few steam locomotives never stricken from an active roster. Beginning in 1922, Union Pacific bought 40 4-8-2 Mountains to supplant Pacifics and Mikados on heavy passenger trains on graded routes. Despite the success of its early internal-combustion-powered streamliners, UP ordered its first 4-8-4s from Alco in 1937, when the bulk of its passenger trains were still steam-hauled. More Alco 4-8-4s came in 1939 and 1944, and had taller (80-inch) driving



Three locomotive models in the 5,000-hp club: EMD DDA35 No. 71, GE U50 No. 42, and Alco DL855 No. 60, which checks in at 5,500 hp, at Council Bluffs, Iowa. Union Pacific

GP9 No. 299 was built for passenger service in 1954, but spent its last years hauling freight. Here, it leads a U30C and two DD35s at Provo, Utah, in October 1976. James Belmont

wheels, placing them among America's fastest steam locomotives. Designed for 90 mph, period reports indicate they exceeded 110 mph on occasions. Equally significant was the 800s' ability to run 15,000 miles per month.

Union Pacific's 4-12-2 set the stage for even larger freight engines. The output of the 4-12-2 made it a desirable freight hauler, but it was limited by its long wheelbase and mechanical complexity. In the mid-1930s, UP's mechanical engineers worked with Alco on design of a new four-cylinder articulated using the previously untried 4-6-6-4 wheel arrangement. Unlike the Mallet compounds, the 4-6-6-4 was an articulated type designed with high-pressure steam to all cylinders to give the locomotive greater power and a maximum of 80 mph. Named the Challenger, the first was delivered in 1936. To enable greater stability at higher speeds, the locomotive employed an advanced four-wheel leading truck and superior weight distribution between forward and rear sets of driving wheels. Later UP Challengers were more powerful and featured superior suspension using what Alco called its "Lever Principle."

Growing transcontinental freight traffic in the late 1930s, combined with UP's desire to minimize double-heading heavy freights on the Wasatch grades east of Ogden, led UP and Alco to expand the successful qualities of its 4-6-6-4s into a specialized super steam locomotive that could rival the output of EMD's recently introduced FT freight diesel. So was born the famous 4-8-8-4 Big Boy. The first arrived at Council Bluffs, Iowa, in September 1941.

Like its little brother, Big Boy was intended for power and speed; this was not a slow machine and was capable of hitting 70 mph. But the sheer size of the machine has captured the public imagination. Ultimately, the railroad bought 25 Big Boys, a comparatively small fleet among the legions of 2-8-0s, 2-8-2s, and other more moderately proportioned workhorses.

In their heyday, the Big Boys worked between Ogden and Cheyenne, and less frequently between Cheyenne and Denver. In their final years they were made famous by photographers who captured their majesty on Wyoming's Sherman Hill. Although their service lives were cut short by advances in diesel- and gas-turbine power, eight Big Boys survived scrapping, and No. 4014 is being prepared to return to service in 2019, nearly 60 years since the last of its kind was retired.

Early diesels

Conversion to diesel came early for Union Pacific, with the first delivered in the early 1930s for passenger service inside the M-series articulated streamliners. By the late 1930s, conventional passenger locomotives followed with EMD's soon-to-be-popular, six-axle E series of passenger locomotives. Union Pacific bought several different models, from the E2 to the final model produced, the E9. The first freight diesel-electrics arrived in 1940 in the form of 15 NW2 switchers.

Union Pacific B units
- GP9B (125)
- GP30B (40)
- DD35 (27)
- SD24B (45)
- C855B (1)
- SD40-2 (16; A unit, trail-only)
- C30-7 (3; A unit, trail-only)

Additional six-axle and four-axle passenger power arrived later from EMD, Alco, and Fairbanks-Morse. During this period, Union Pacific sampled diesel locomotives for switching while continuing to build and buy big steam for its mainline freights. It wasn't until the mid-to-late 1940s that Union Pacific began the switch from steam to diesel in earnest, purchasing locomotives from the era's four builders, EMD, Alco, Baldwin, and Fairbanks-Morse.

The early low-horsepower diesels, compared to the powerful steam engines

Three EMDs with five total prime movers handle a westbound trailer train at Dale Junction, Wyo., in October 1982. The lead and trailing units are UP's iconic DDA40X. Bruce D. Barrett

producing about 6,000 hp while plying the main line, caused the railroad to look to alternative locomotive designs to provide greater horsepower than the manufacturers were offering. Starting in the late 1930s, builders such as GE and Alco/GE offered steam- and later gas-turbines. Other builders offered high-horsepower options with varying degrees of success. Fairbanks-Morse delivered several A-B-A sets of its Erie-built locomotives while Baldwin secured, then lost, an order for its DR12-8-1500/2 "Centipede."

The 1950s saw the end of steam on Union Pacific as hundreds of new locomotives arrived, from lowly end-cab switchers to huge gas-turbines. These came from EMD, Alco/GE, General Electric, and to a lesser extent, Alco. Union Pacific also pioneered the use of turbochargers on EMD locomotives in the 1950s, installing several different turbochargers on its GP9s and GP9Bs in-house and receiving modified GP9s from EMD with their own turbo design. This program would last into the 1960s and lead to EMD offering its customers turbos on future locomotive models.

The 1960s would see the introduction of the double-diesel concept on Union Pacific, as the railroad challenged builders to design and build three-unit, 15,000-hp locomotive sets. EMD, GE, and Alco all produced competing sets; only the first two received further double-diesel orders from UP. General Electric also began selling its own line of locomotives to UP in the 1960s, while the railroad helped test EMD's new 645 engine, destined to replace the older 567 engine that had reached its practical limits.

The increasing use of run-though power on trains during the 1960s was one of the catalysts for the company to begin standardizing locomotive models. Standardization would increase in earnest in the 1970s. The last of the double diesels arrived alongside what would become the backbone of the fleet — hundreds of six-axle locomotives from EMD and GE, beginning with the SD40 and U30C, then with their successors, the SD40-2 and C30-7.

Beginning in the late 1970s through the 1990s, Union Pacific would experiment with alternative prime movers, repowering General Electric and EMD locomotives with Sulzer and Caterpillar engines. None of these tests yielded conversions beyond the initial test locomotives. The 1980s and 1990s saw Union Pacific's roster swell with the inclusion of thousands of locomotives from its merger partners. Union Pacific received its first A.C.-traction locomotives in 1994; these would eventually come to dominate the main line in all types of service.

The 1990s also saw Morrison-Knudsen natural-gas switch engines; the development of 6,000-hp locomotives from EMD and GE; and the reintroduction of radio-controlled locomotives, labeled "distributed power." In the 2000s, Union Pacific also

A westbound freight with three six-axle General Electric units departs Nampa, Idaho, in August 1983. At left, an EMD SD40-2 awaits its turn for track. Mark Hinsdale

looked to its smaller-locomotive needs. The Green Goat battery-hybrid was introduced, along with the development and purchase of hundreds of genset locomotives deployed across the system. Caterpillar prime movers once again were placed inside Union Pacific locomotives, this time along with new equipment to address the increasing need for emissions control that went into effect beginning in 2000.

Union Pacific's road fleet would be transformed in the 2000s with almost 1,500 new SD70M locomotives arriving, along with continuing purchases of A.C. locomotives assigned almost exclusively to bulk service systemwide. The railroad ended its purchasing of six-axle D.C. road locomotives when the last SD70M was delivered, opting to buy only A.C. locomotives for road service starting in 2005.

In the current decade, UP was the first customer to purchase the SD70ACe-T4 from Progress Rail and was slated to be the launch customer for the GP22T4, Progress Rail's Caterpillar-powered intermediate locomotive meeting the latest Tier 4-emissions standards, in late 2018.

Merger mania

Starting in the early 1980s, mergers had a profound effect on Union Pacific's locomotive roster. From new models to additional locomotives to bolster the standardization begun in the early 1970s, these additions shaped what would become the template for UP's fleet today. The first round of mergers in 1982 brought Missouri Pacific and Western Pacific's motive power fleets into Union Pacific. Missouri Pacific would provide more than 1,500 locomotives to the roster while the Western Pacific fleet numbered less than 150. These additions more than doubled the UP roster overnight. They also further bolstered UP's fleet standardization that began in the early 1970s, with Missouri Pacific providing hundreds of SD40-2s, GP38-2s, and GP15-1s, models that continue to operate today in modified or unmodified forms. Subsequent mergers began in 1988 with the Missouri-Kansas-Texas and its handful of units.

The Union Pacific roster would hover about 3,000 units from the early 1980s to the mid-1990s, when the inclusion of the Chicago & North Western and Southern Pacific rosters swelled the fleet to more than 6,000 locomotives, reaching almost 7,000 by the end of the 1990s.

These two additions brought UP to a breaking point in terms of available road numbers. The railroad had to find a way to create space for future acquisitions and created a new reporting mark, UPY, which stands for Union Pacific Yard. This reporting mark became the new home for locomotives predominately used in yard service. The first units to receive UPY reporting marks appeared in December 1999, and initially encompassed more than 600 four- and six-axle units initially.

The movement to UPY reporting marks was part of a larger plan to reorganize the remaining locomotives with UP reporting marks to make room for a 1,000-unit order for SD70Ms that the company was to begin receiving in early 2000. This multi-year renumbering plan would begin in fall 1999 and encompass 668 units selected to receive UPY reporting marks and more than 3,000 road locomotives with UP reporting marks to be renumbered.

Double-diesel units, quantity, and service life
- DD35 (27) 1964-1981
- DDA35 (15) 1965-1981
- DDA40X (47) 1969-1985
- C855A (2) 1964-1970
- C855B (1) 1964-1970
- U50 (23) 1963-1977
- U50C (40) 1969-1978

Several hundred units acquired via mergers were not part of the overall renumbering plan; most were models that didn't fit with the overall fleet due to age or other factors, or units without features that were standard on most Union Pacific locomotives — for example, a portion of Missouri Pacific's fleet of SD40-2s, most of which were built without dynamic braking systems. A majority of the units were renumbered vinyl patches while some received their new number during repainting. Almost 20 years after this project began, a handful of Union Pacific locomo-

The executive Es, led by No. 951, cross the Mississippi River at St. Paul, Minn., in September 1999. The units have been repowered with EMD 645s, making them into streamlined GP38-2s.

In June 2000, a trio of new 6,000-hp SD90MAC-Hs are parked next to a convertible SD9043MAC built two years earlier. No. 8248 is still on UP's roster today, renumbered to No. 3772.

tives still operate with UP patches over paint from their predecessor company.

One of UP's most visible active locomotive groups is the massive SD70M order built by EMD and delivered in the early 2000s. Union Pacific's original order was for 200 such units, but additional orders swelled the total to 1,427 by the time the last locomotive was finally delivered in 2004. The SD70M total would grow slightly with the inclusion of 25 SD70Ms from Southern Pacific, bringing the final count to 1,452.

Looking for a high-reliability locomotive, Union Pacific chose to order its SD70Ms using Southern Pacific's specification. This passed on many options popular at the time, such as electronic air brakes and distributed power, and saved on engineering costs. This would stay true for the majority of the order. There were some changes, with EMD introducing a single Functionality Integrated Railroad Electronics screen (FIRE) on 16 SD70Ms in late 2002 and early 2003. This screen incorporated many of the engine control displays onto a single screen, with the locomotive retaining analog gauges for the pneumatic air brakes. The final 105 SD70Ms Nos. 5127-5231 would come with production FIRE screens installed.

The landmark SD70M order would reintroduce use of the winged medallion, known casually as wings, on the locomotive nose. Union Pacific first used this emblem on the nose of locomotives beginning in 1939 and continued to use it on full-width carbody locomotives until 1963. The SD70M also saw a slight change in the upper red band of the paint scheme, with a Z-shaped design added behind the cab. Three SD70Ms were also the first to carry a large American flag decal, an addition introduced in late 2001 and expanded throughout the fleet.

The race to 6,000 hp

The horsepower race took a big leap in the early 1990s when Union Pacific began working with EMD and GE to produce a 6,000-hp, single-engine locomotive. As in the double-diesel era, motivations included the ability to reduce the number of units

Tier 4-compliant EMD SD70ACe-T4 No. 3025 leads a coal train at Racine, Wis. The model joined the UP roster in 2016 and is among the road's newest power. Three photos, Chris Guss

per train, and lower maintenance costs from replacing two older 3,000-hp locomotives with one 6,000-hp unit or three 4,000-hp units with two 6,000-hp locomotives.

In response, EMD would produce the SD90MAC-H locomotive featuring a GM16V265H engine, the first from EMD to incorporate a four-cycle design. GE would build the AC6000CW with a 7HDL16 engine built in conjunction with German engine builder Duetz-MWM. Each engine would be housed in a newly designed carbody, with massive radiator sections to keep the new engine and related components cool. Both builders constructed 'convertible' versions of their locomotives for Union Pacific while the new engines were being finalized, with GE's existing 4,400-hp and EMD's existing 4,300-hp prime movers installed. The plan for the convertibles was to swap out the smaller engines with 6,000-hp prime movers when they became available. Union Pacific ordered 309 convertible EMDs with a SD9043AC model designation and 106 convertible GEs with an C6044AC model designation.

Delivery of regular production 6,000-hp locomotives began in summer 1996, with GE delivering 80 C60AC locomotives and EMD 62 SD90AC locomotives. Overall, the reliability of these locomotives was not nearly as high as Union Pacific needed, and no additional units were ordered from EMD or GE. The convertible locomotives retained their as-built configuration, never receiving their planned 6,000-hp prime movers. The fleet of 80 C60ACs was eventually downgraded to convertibles as well, replacing their 6,000-hp engine with a 4,400-hp engine, with the locomotive model changed to C6044AC. The EMD fleet of SD90ACs was not as fortunate; all were retired by 2008.

Through the years, management philosophies have changed, often bringing new and innovative locomotive concepts that shaped the motive power fleet. The railroad's quest for large high-horsepower locomotives, both steam and diesel, was unmatched in scale and variety.

The era of small-to-moderate fleets of various diesel road locomotive models eventually gave way to a simplified number of locomotive types, the largest of which would eventually number in the thousands. Today, Union Pacific's fleet is as modern as ever. With over half of UP's locomotives now propelled by A.C. traction, the era of D.C. dominance has come to an end. Even today, Union Pacific continues to take bold first steps in technology that few other railroads attempt in the constant drive for the next groundbreaking concept in locomotive evolution. T

Locomotives added from predecessor railroads

- Chicago & North Western, 776 (1995)
- Missouri-Kansas-Texas, 237 (1988)
- Missouri Pacific, 1,588 (1982)
- Southern Pacific, 2,391 (1996)
- Western Pacific, 145 (1982)

Keepers of

UP's Heritage fleet uses big steam to burnish the company's image

by Hayley Enoch

Caring for one mainline steam locomotive is a huge undertaking, whether it's a volunteer group or a professional organization. So consider the Union Pacific Heritage Fleet. For decades, it has fielded two mainline steam locomotives, and it's on schedule to complete one of the most notable restorations in railroad preservation history — returning a Big Boy locomotive to steam — by the 150th anniversary of the completion of the first transcontinental railroad in May 2019.

The heritage fleet is unique among U.S. Class I railroads. While other major railroads have used locomotives from volunteer groups and nonprofit museums for excursions and public-relations events, UP is the only U.S. railroad to keep a vestige of the steam era on its roster as a corporate goodwill ambassador. Think about 4-8-4 No. 844 as UP's version of the Goodyear blimp — a roving symbol of a proud company that is unmistakable in any venue.

Headquarters for UP steam in 2019 is Cheyenne, Wyo. Here, the growl of the dynamic braking system and the gunshot cracks of slack running in and out on the main line of the original transcontinental railroad provide the background sounds to the restoration work at the steam shop.

This is where the Great Plains and the Rocky Mountains meet, a territory that gives locomotives a chance to stretch their legs and flex their muscles.

The *Cheyenne Frontier Days* train rolls north from Denver to Cheyenne, Wyo., at Platteville, Colo., on July 21, 2018. On the point: 4-8-4 No. 844 and veterans' salute diesel SD70AH No. 1943. TRAINS: Jim Wrinn

the flame

Everywhere UP's heritage fleet travels, crowds gather to see them. This is No. 844 at Lawrence, Kan., in October 2016. The locomotives visit select locations on the UP system for display and to participate in special events with on-line communities. Roy Inman

For all of the computerization and trip optimization designed into modern diesel road power, this is still unforgiving and untamed territory, a place that demands engineers display real skill to get a train and its cargo over Sherman Hill and safely delivered to points to the west and east.

Considering the extent to which Wyoming challenges contemporary railroad operations, it should come as no surprise that it took brawny steam locomotives to conquer this punishing territory and similar terrain farther to the west. Each of the three locomotives in the UP fleet, No. 844, 4-6-6-4 No. 3985, and 4-8-8-4 No. 4014, was designed to move increasingly heavy freight loads and faster passenger trains over the mountains. To many, the three classes represent the highest evolution of steam locomotive technology in the Western United States.

No. 844 holds a special and sacred distinction among American steam locomotives. Built in 1944 and designed to pull fast passenger and freight trains, it has never been retired. The Northern kicked off service as UP's heritage showpiece in 1960 and has been the backbone of the operation ever since. The 844 is lithe and light on its feet for an engine of its size, and cuts a stately profile that is instantly recognizable among surviving steam locomotives.

The heritage fleet's second addition, articulated Challenger-class No. 3985, was restored to operation by employees and then embraced by the company in 1981. The wheel arrangement earned its nickname

A view of No. 844's cab during a Nov. 16, 2016, run between Lawrence, Kan., and Kansas City shows fireman Kirt Clark, left, and engineer Ed Dickens.

after the first batch of 3900s, delivered from manufacturer Alco in 1936, proved themselves up to the challenge of ascending steep grades of the Wasatch Mountains in Utah during break-in testing in 1936. The Challengers bucked the trend of adding more wheels in an attempt to wrestle more power out of articulated locomotives, and instead relied upon precise engineering and well-balanced components. The results produced a locomotive that could move high volumes of cargo up steep grades at a brisk pace. No. 3985 is currently stored out of service.

The most recent and most celebrated addition is No. 4014. Locomotive designers from UP and Alco improved upon the Challenger class and added two more sets of drivers to produce locomotives that could climb the steepest grades in the West without a helper. The result was the vaunted Big Boy, often held up as the most impressive class of engines ever committed to American rails. Its 25 members each produced 7,000 hp, 135,375 pounds of tractive effort, and were capable of moving a freight train uphill at speeds up to 70 mph. Eight Big Boy locomotives survive, scattered across the United States. None has run since July 1959.

In 2013, UP announced its acquisition of No. 4014 from the Rail Giants Museum in Pomona, Calif., near Los Angeles with the intent to perform a full mechanical restoration. Of the survivors, it was in the best mechanical shape.

Steam locomotion is a demanding technology in the best of circumstances. This is especially true with machines as complex and as demanding of resources as late-generation locomotives, and even more so when an organization takes on the care of not one, but three such machines. The care and restoration of these three locomotives falls upon the shoulders of Ed Dickens, senior manager of UP heritage operations since 2011. The engines have left him and the Heritage Fleet crew few spare moments for the better part of a decade. After a massive effort to move the dead No. 4014 almost 1,300 miles from California to Wyoming, UP announced that not only would it be restoring the Big Boy, but that No. 844 would also undergo a thorough rehabilitation that would see it out of service for an extended period. No. 3985 is also slated for such an overhaul, but it is prioritized behind Nos. 844 and 4014.

For years, the whistles on the UP were silenced, but No. 844 returned strong, triumphant, and looking new on 2016's annual Frontier Days train. The quality of the rehabilitation and the locomotive's flawless performance exemplified the steam shop's work.

Any doubts about the steam crew's ability to produce were quieted when No. 844 returned to the 2016 train, and when it subsequently carried out two long trips: To cross the Mississippi River at Memphis later that fall, and to commemorate the anniversary of the Boise, Idaho, train station in 2017. Completing No. 4014 by May 2019 is ambitious, but doable, for an organization that has already overhauled one steam locomotive.

The steam shop crew pauses during work on No. 4014. From left, Troy Plagge, Ed Dickens, Austin Barker, Kirt Clark, Jimmy Thompson, Bruce Kirk, Ted Schulte, and Garland Baker pose with drivers and parts from Big Boy No. 4014 in June 2018. Three photos, TRAINS: Jim Wrinn

"There were those that traveled to the shop and saw everything in a state of disassembly, which from the outside is disheartening," Dickens says. "But when you're here every day, and you see the reassembly, it goes together quickly."

UP's rapid progress rehabilitating the engines is in large part because the heritage program is an official piece of the railroad's operations, not subcontracted to a museum or a volunteer effort. That does not mean, as Dickens has frequently noted in public seminars, that the heritage program has an unlimited budget to lavish on steam operations. But a steady source of funding means the heritage program's employees are able to use their working hours restoring the locomotives. They are free from the responsibility of fundraising, grant writing, negotiating permission to access tracks, and managing public awareness campaigns — activities that, for members of other organizations, take time and effort away from the hands-on activities of repairing a locomotive and building up boiler pressure.

The heritage program employs eight individuals. They are drawn from diverse backgrounds and represent a wide variety of technical specialties, from machining to welding to boilermaking to computer-assisted drawing. This full-time workforce also means that among the operators of surviving locomotives, the UP shop comes the closest to operating in a manner consistent with the way repairs were carried out during the steam era. Then, if an engine was needed at a specific time and place, shop crews simply found a way to make it appear there.

The shop crew does not cut corners in performing their repairs, as was sometimes a necessity for their forebears, who were hard-pressed to get locomotives back to pulling paid freight. The steam crew's view is that this would be inappropriate for a modern steam operation. But it shares the same creative spirit in finding ways to carry out a repair that seems impossible, or to make easier the execution of repetitive or difficult tasks. During No. 844's rehabilitation, the crew devised and built a tool to help cut off staybolt caps, which was deployed again for boiler work on No. 4014. Later, the shop crew built its own dies when it came time to flange new parts for the firebox.

"Every component of that boiler has to be 100 percent," Dickens says. "This isn't a project where you look at something and you say 'I think that will be good enough.' That statement should not be uttered in the context of a 300 [pounds per square-inch] pressure vessel."

The crew has even gone so far as to seek out and restore near-obsolete tools from the steam era. In one company video update, Dickens demonstrated a cylinder boring machine that, returned to functional condition, allowed the crew to machine the inside of No. 4014's front engine cylinders to a perfect 24-inch diameter. Such a level of precision would have been difficult to achieve with modern methods and tools.

These specialized tools also allow the heritage crew to perform almost all work in-house. There is less time wasted as parts are transferred back and forth, and fewer tasks delayed while waiting for a subcontractor to finish components. Only a few select tasks, such as casting specialized parts like the exhaust steam nozzle and turning the locomotives' wheels, have been outsourced.

Dickens says that before repairs began, he and the rest of the steam crew put a great deal of thought into what needed to be done, and in what order it should be carried out to make the process as easy as possible. Dickens says he intends the work performed during these overhauls to last about 30 years.

Coming attractions: Big Boy No. 4014, stripped to the bone, gets firebox work at UP's steam shop in Cheyenne, Wyo. The holy grail of steam locomotive restorations, when this locomotive is completed in May 2019 it will shout loud about UP's commitment to its history. TRAINS: Jim Wrinn

To that end, the crew has elected to repair or replace many components that still have years of life, but have incurred enough wear that they are likely to break down before the three-decade benchmark arrives.

Performing repairs while the locomotives are disassembled is particularly important in the case of No. 4014 and, eventually, No. 3985. By the time they were designed, locomotives were reaching proportions that pushed the limit of what is physically possible to place on the rails. Since locomotives could no longer be made bigger, designers compensated by making the components of the Challenger and Big Boy fit as densely within the frame as possible.

This allowed the building of steam locomotives of sufficient strength to meet the demands of traffic during World War II and in the post-war consumerism boom. But that density is a challenge for repairs and maintenance. Many small parts that would be accessible on other classes can only be reached and removed when the engine is fully disassembled. Dickens cites the Big Boy's lubrication and oil-delivery mechanisms as an example. The system features pumps, hundreds of feet of copper piping to deliver oil, mechanically complex lubricators, and numerous splitters where one delivery pipe branches off into two or more pipes. Many of the parts will be unreachable after the locomotive is put back together, so it's now or never to repair parts that stand a chance of breaking down in five or 10 years.

"Some of the splitters are in points that are very difficult to access," Dickens says, "so now is the time to get those fit up and design everything in a way that will give us many, many years of good service."

Such preventative tasks increase the overall amount of work to bring the engines back to serviceable condition. Dickens says that the sheer scope of the work can sometimes be daunting. That's especially true when so much is repetitive, physically demanding, and imperative to perform correctly the first time.

"We talk about [restoration of the 4014] in terms of milestones," Dickens says. "We look at those big milestones and break them up into subprojects. When you are working on a big project like this, it is important not to get hung up on the overall scope."

The heritage program's focus on meeting an exacting standard has practical ramifications that go beyond creating a high-quality repair that will offer years of service. During the course of extended tours of the vast UP system, some of which may take the locomotives thousands of miles from the home base in Cheyenne, the heritage crew needs to be able to count on the machinery to function as intended. A breakdown could clog a main line and delay revenue-generating trains, or miss an event in which the locomotive is the central player.

Even so, the crew plans for the possibility of a remote breakdown. Every steam tour includes a range-extending auxiliary water tender, and a tool car that features a mobile machine shop and provides a place for the crew to ride. The tool car carries machinery and spare parts to address all but the most severe breakdowns. The best-case scenario, of course, is to repair and maintain the three locomotives in such good condition that breakdowns are unlikely to occur.

As with any train, taking to the main line involves a certain degree of unpredictability. At any moment, the train could strike vehicles lingering on grade crossings, do damage to the tracks, or encounter bad weather.

UP's heritage crew has experience with how quickly an excursion can turn from normal to tragedy. While leading the Frontier Days train in July 2018, No. 844 struck and killed a woman standing on the tracks near Henderson, Colo. The crew made an emergency brake application but, with the train moving at about 60 mph, nothing could be done to avoid striking her.

The woman's death was ruled accidental by authorities, and the woman's husband and family members said they held no ill will toward the steam locomotive crew or the UP. The family had, in fact, enjoyed watching the excursion train come to and from Denver on many occasions — both the woman and her husband were employed at a business next to the tracks — and desired that the train would continue to run.

The heritage program works hard to close as many potentially unsafe gaps as possible surrounding its excursions. In general, the crew addresses safety of the public and themselves with the same overemphasis on detail as they do with mechanical repairs. Before any excursion, the crew contacts law enforcement agencies along the route to make them aware of the train's presence.

Safety is a top priority. Crew members use a tag-out system to keep track of who is working on the locomotive. When the train is on public display, the crew establishes a perimeter to prevent the public from wandering near live tracks. The company's public relations staff typically includes tips for safe photography with excursion press releases, and meets with law enforcement.

Taken together, this effort creates a program that is a living ambassador for the United States' technological history. There is a palpable excitement building in the shop as No. 4014's restoration concludes, one that grows as members of the public show support for the Big Boy's debut. "Not a day goes by when we don't get wonderful feedback from our teammates in Omaha," Dickens says. "The support that we enjoy, the energy that is building as we progress to the reassembly of the pieces is exciting to see."

As 2019 begins, the UP steam crew is set to make history by doing what many said could not be done: restoring a Big Boy to operation. Come May, when the crowds gather in Utah to celebrate the Golden Spike, UP's two operating steam ambassadors will be on hand: one an old and beloved friend to many, the other the big new kid on the block. Both are impressive for their size, power, and beauty. They and their crews are the living keepers of the flame of UP history, of steam locomotive history, of America. Long may they run. I


5809
5809

ALONG THE TRANSCON

SNOW-SLOWED TRAINS POSE ON DONNER PASS

Abundant snow caused a traffic jam for Union Pacific trains over California's Donner Pass on the former Central Pacific in January 2017. Here, UP C45ACCTE No. 5809 operates in distributed power mode at the rear of an eastbound train as UP SD70AH No. 8999 leads a west-bound train through a snow shed at Norden, Calif. Jake Miille

WHERE HISTORY REVERBERATES

Union Pacific SD70ACe No. 8648 leads a tank car train near Death's Rock in Echo Canyon, Utah, in July 2010. Richard Koenig

E-UNIT POWER

Union Pacific crews service E units at Salt Lake City for the *Butte Special* in March 1966. Richard Steinheimer

CLASSIC ARMOUR YELLOW WORKHORSES

Union Pacific SD60M No. 6213 works eastbound near Hermosa, Wyo., at Sherman Hill as it passes an eastbound intermodal train led by C40-8 No. 9198. Mark Hinsdale

F-FF-FANTASTIC F UNITS IN NEVADA

With five F7As and only one F7B, Southern Pacific F7 No. 6436 leads its train into the siding to meet a westbound train. The railroad worker from the westbound is prepared to give a roll-by inspection at Holborn, Nev., in April 1964. Steve Patterson

MIXED TRAIN ON THE PLAIN

As typed to a label on the back of a photo print by famed photographer Stan Kistler in 1958: "Union Pacific train #83, Grand Island to Ord, Neb., mixed train wheels thru rich Nebraska farm country with 2-8-0 428 on the point. October 28, 1958." Stan Kistler

CROSSROADS IN TIME

A portion of the first transcontinental railroad curves toward an eastbound Union Pacific train gliding on a 20th-century alignment near Bosler, Wyo., in September 2011. The original right-of-way was laid in 1868. Richard Koenig

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Fully immerse yourself in the experiences of the Chinese Railroad Workers.

For more information about the 150th Anniversary, visit Railroad150.org

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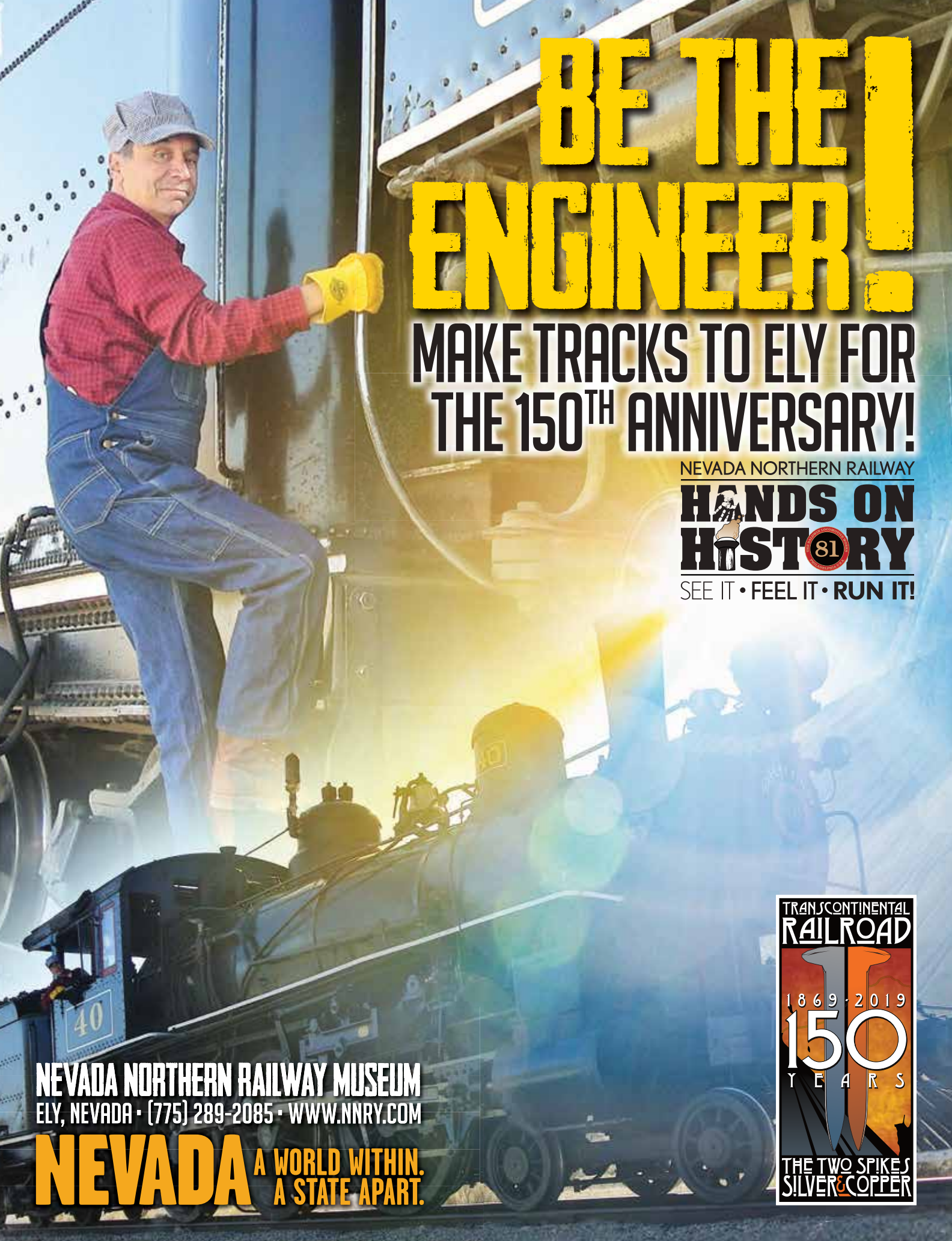
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