



STUDENT HANDOUT

The Transcontinental Railroad

Slide Set 1

Why build a railroad across the continent? 2

Slide Set 2

Who will build the railroad?..... 12

Slide Set 3

What was happening in the United States
prior to the building of the railroad? 14

Slide Set 4

Would you have liked to work on the Transcontinental Railroad?..... 18

Slide Set 5

Why did the Chinese workers strike? 27

Slide Set 6

How did the workers lay ten miles of track in one day? 29

Slide Set 7

Would you like to have attended “The Meeting of the Rails”? 31



Questions:

1. Why were businesses so anxious for the railroad to be built? (*identifying main ideas and supporting details; understanding visuals*)
2. How did people travel to the West prior to the railroad being built? (*identifying main ideas and supporting details; understanding visuals*)
3. Why did people want the transcontinental railroad to be built? (*main ideas/supporting details*)
4. How would building the railroad help the country? (*main ideas/supporting details*)
5. What challenges would there be in building a railroad through these mountains? How do you think they built the railroad when they didn't have the modern machinery that we have today? (*making inferences; understanding visuals*)

Slide 1

◀ Why build a railroad across the continent?

Abraham Lincoln had a dream; he wanted to build a railroad linking the nation from “sea to shining sea.” Since the early 1840s, people had been making the difficult trip from the East to the West in covered wagons pulled by horses or oxen. Families traveled for months under the most difficult circumstances. Many died along the way from sickness and accidents. Others traveled by ship, leaving the east coast of the United States for California, traveling around South America or disembarking at the Isthmus of Panama, traveling overland, and then taking a second ship to San Francisco. Coming through the Isthmus of Panama was dangerous too. Travelers often died from malaria or yellow fever before reaching their destinations. Getting to the West was dangerous and costly no matter how people traveled. Yet people came first for land and then for gold. Even though the gold rush was over, people wanted to come west, hoping to build a better life.



A wagon train headed to the West.



▶ Slide 1



Traveling through the Isthmus of Panama.

This video from the History Channel provides an overview of the Transcontinental Railroad.

<http://www.history.com/topics/inventions/transcontinental-railroad>

Runtime: 3:00

▶ Slide 2





Slide 2

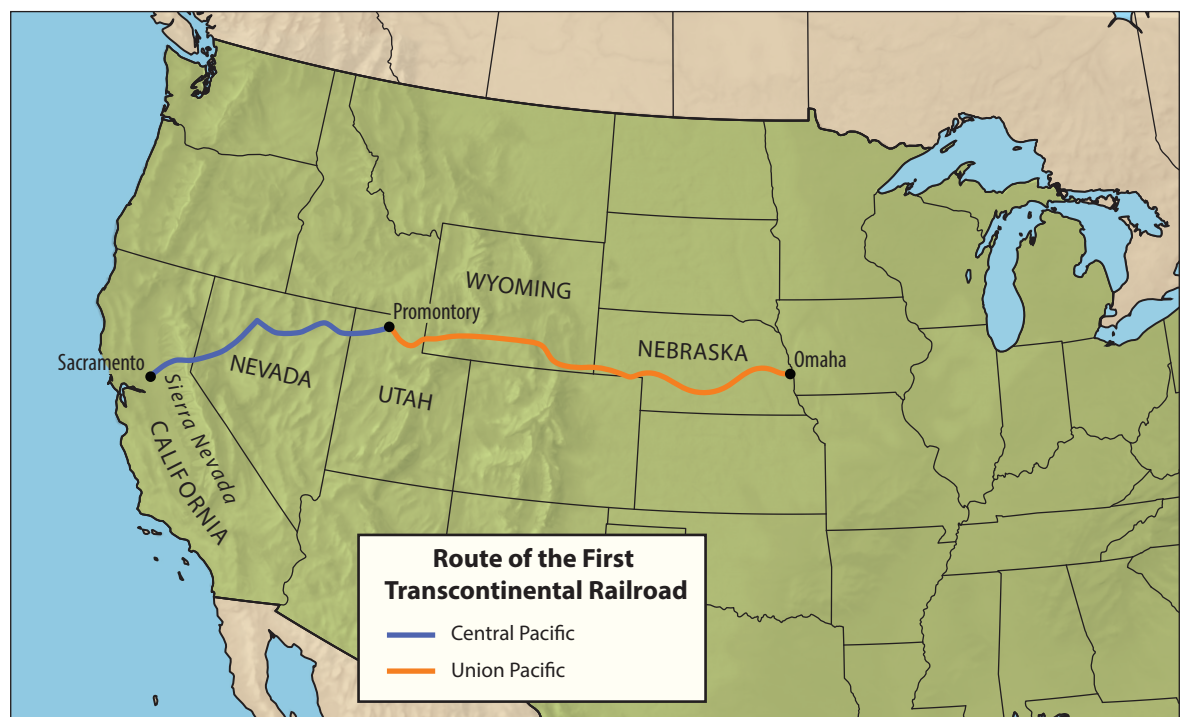
Like the “Iron Horse” article, people wanted to travel by railroad to the West—the journey would be faster and safer, and more and more people wanted to move west. People wanted the railroad to move goods from east to west and west to east—carrying things not easily obtained from one region of the country to the other. Businesses saw opportunities for making money, and they wanted the railroad built too.

In 1862, President Lincoln enthusiastically signed the Pacific Railroad Act—this meant the government would support the building of the railroad. While this was happening, the nation was at war—the Civil War. The war slowed the building of the railroad, and sadly Lincoln was assassinated in April of 1865, shortly after the Civil War. He never saw his dream of a transcontinental railroad built.

Slide 3

What was the major geographic obstacle in building the Transcontinental Railroad?

To raise money for the railroads, the government gave away land along the railroad to help pay for construction. The resources of timber, earth, stone, minerals, and metals could be used to pay for the railroad-building. The land could also be sold to help finance the railroad. Two railroads were to be built on this land: the Central Pacific Railroad from the west and the Union Pacific Railroad from the east. The plan was that the Union Pacific Railroad would build the tracks from Omaha, Nebraska, to Utah. The Central Pacific Railroad would build east from Sacramento, California. However, there was a major problem: the Sierra Nevada.





Why would these merchants want to finance the Central Pacific Railroad?

Engineers and surveyors believed it was impossible to build a railroad through the Sierra Nevada; they were too high, too steep and made of granite, a very hard rock to penetrate. However, a young surveyor by the name of Theodore Judah believed he had found a route through the mountains. Now he just had to convince others that his route was a good one. Four merchants in Sacramento desperately wanted to build the railroad, and Judah convinced them that his route would work. These merchants decided they would be the ones to do it, and so they took up the challenge of building the Central Pacific Railroad.



Leland Stanford, President of Central Pacific Railroad, CPRR; Collis Huntington, Vice President, CPRR; Mark Hopkins, Treasurer, CPRR; and Charles Crocker, Construction Supervisor, CPRR. These men were known as the Big Four, as they were instrumental in building the Central Pacific Railroad.



SET
1

Student Handout

Slide 5



Theodore Judah

Judah set out by ship for the East Coast; on the way through the Isthmus of Panama, he contracted yellow fever and died before the first track was laid. Nevertheless, his railroad route was approved, and the merchants began to make specific plans for the building of the Central Pacific Railroad, starting in Sacramento and heading east over the Sierra Nevada.



The Sierra Nevada.

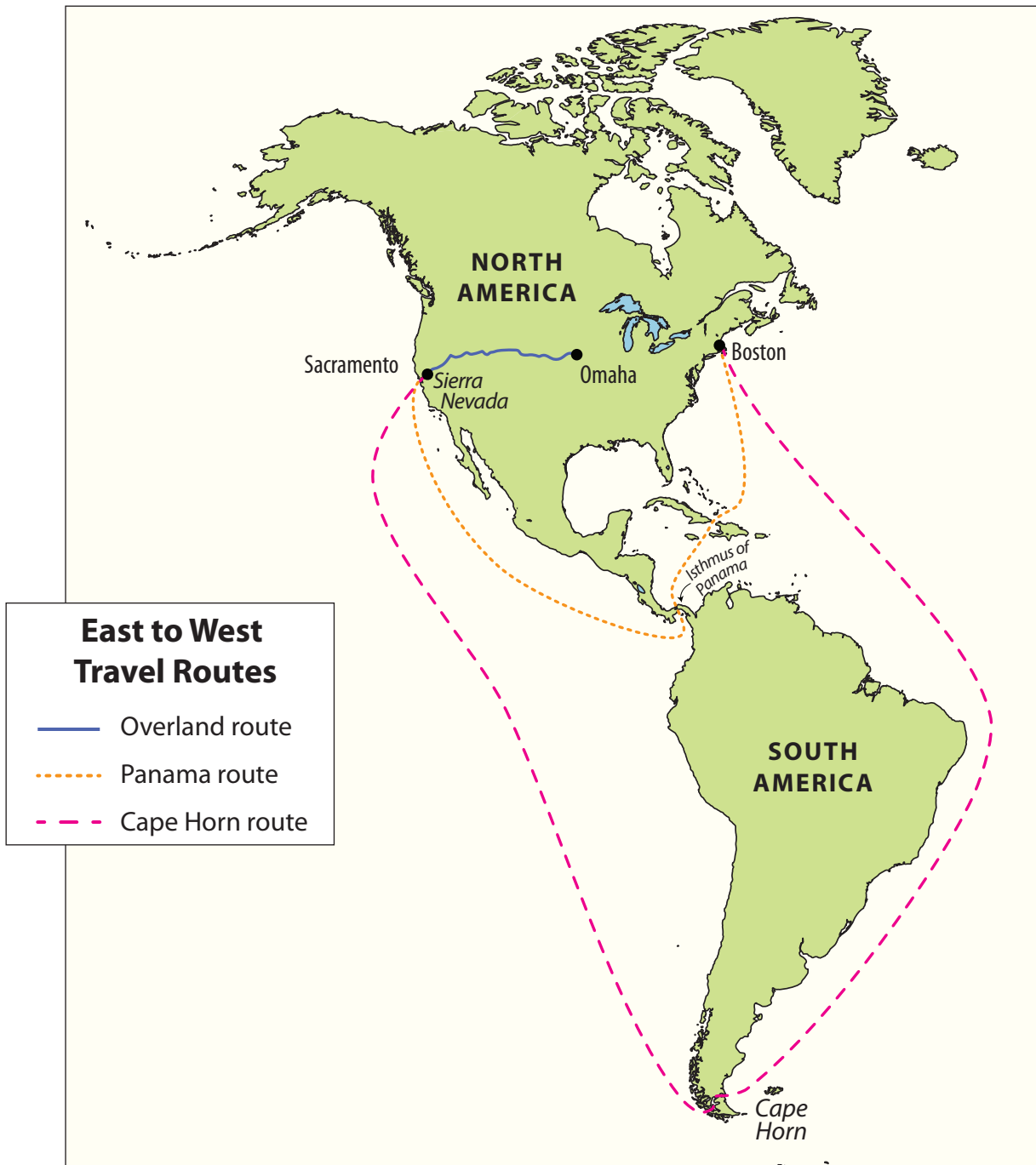
Source: Courtesy of California State Library.



And so the story begins. . . .



Slide 6





SET
1

Student Handout

Slide 7

What made the Sierra Nevada such a barrier to the railroad builders?





Important facts about building a railroad

**Slide 8**

- Trains must travel at a grade (slope) that allows them to pull a heavy load. Such a requirement means there must be switchbacks to allow the slope to be no greater than one foot ($\frac{1}{3}$ m) up for every 50 feet (15 m) across.
- The geographical setting of the Sierra Nevada made building the Transcontinental Railroad an engineering feat. The mountains are 400 miles (640 km) north-to-south and approximately 70 miles (110 km) across, east-to-west. The range's tallest peak, Mount Whitney, is 14,505 feet (4,421 m). The mountains are made of granite, an extremely hard rock to penetrate.

Facts about the route

**Slide 9**

- Fifteen tunnels were built through the Sierra Nevada.
- The Summit Tunnel was 7,017 feet (2,138 m) above sea level, 1,659 feet (506 m) long, and 124 feet (38 m) below the surface. It took two years to complete.
- In one 20-mile stretch, 11 tunnels were built.
- Thirty-five trestles and bridges were built through the mountains. (By 1877 many of these were replaced by being filled or changing the route.)
- Twenty-three snow sheds were built through the mountains.
- The Central Pacific Railroad was 690 miles (1,110 km) from Sacramento, California, to Promontory Point, Utah.
- The Union Pacific was 1,086 miles (1,748 km) from Omaha, Nebraska, to Promontory Point, Utah.



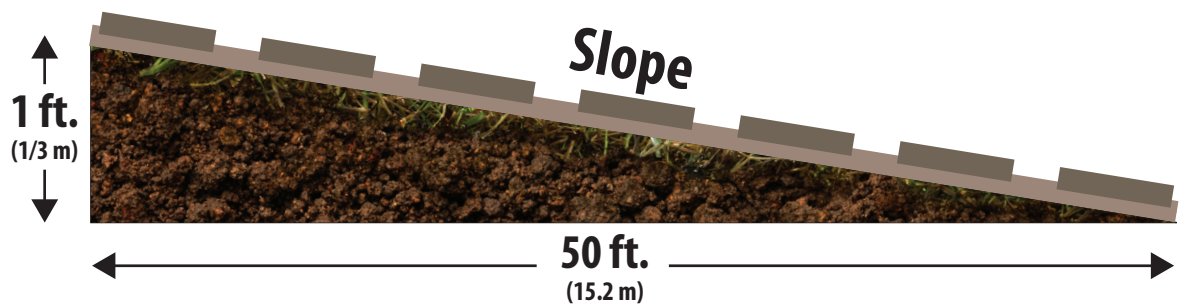
SET
1

Student Handout

Slide 10

How do trains travel over mountains?

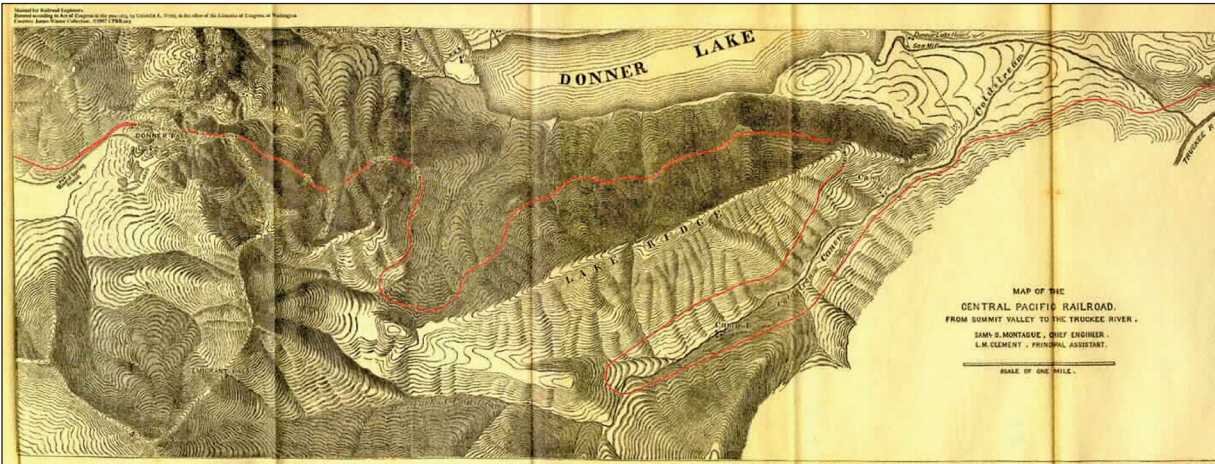
The Sierra Nevada presented a formidable barrier to the railroad. Some of the mountains are very steep. When the track is too steep, the train doesn't have enough power to climb the grade. Think about stairs. Every time you take a step forward you have to also take a step up. That's how you get from the first floor to the second. Trains don't take the stairs. They have to move on rails. But those rails can't be too steep. While we may be able to take one step up every time we take a step forward, trains need a gentler slope. For every foot they go up, they need to go forward at least 50 feet. Think about what that means for someone trying to find a way to lay railroad tracks through the mountains. Think about trying to find a path that gets you up and over a 7,000 foot (2,134 m) pass, the lowest one through the Sierra Nevada, but stays to the gentle slope or "grade" of 50 steps (1 step=1 foot) forward for every one step up. It means a lot of switchbacks.





Surveying the Route

Slide 11



Contour Map, Central Pacific Railroad from Summit Valley to the Truckee River.



Railroad engineers with surveyors' transits on tripods and measuring rods.

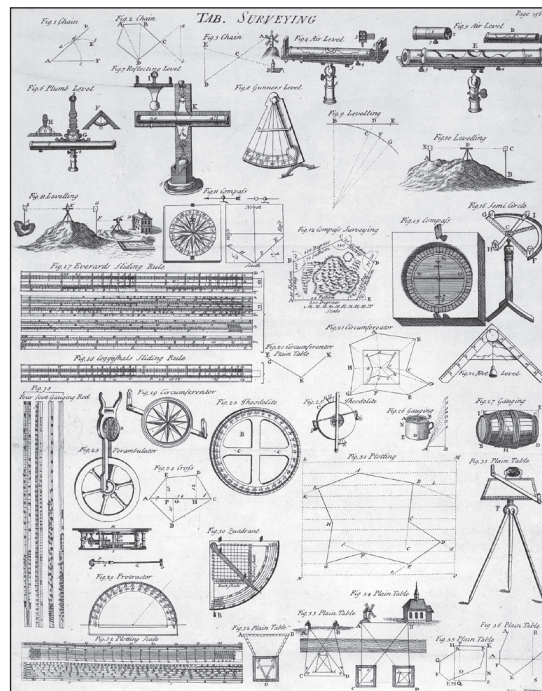


Table of Surveying, from the 1728 "Cyclopaedia."

Photo sources: (clockwise) **Map of the Central Pacific Railroad**. Vose, George L., *Manual for Railroad Engineers* (Boston: Lee & Shepard, 1883). **Tab. Surveying** (Public domain, via Wikimedia Commons). **Deadwood Central R.R. Engineer Corps** (Courtesy of Library of Congress).



Slide 1

Who will build the railroad?

The building of the railroad was done with muscle power. There were no machines at that time to level the ground, fill in ravines, cut down trees, dig tunnels, or build railroad trestles. Everything was done through backbreaking work. Black powder was used to blast for tunnels—dangerous work indeed. Handheld drills and sledgehammers were used to make holes in the rock deep enough to place the black powder. Granite is very hard, so the work was slow and tedious.

To accomplish the task of building the railroad, many workers were needed. It is estimated that 12,000 workers were needed for both the Central Pacific Railroad and the Union Pacific Railroad. The Union Pacific Railroad employed many Irish immigrants and veterans of the Civil War. The Central Pacific Railroad had difficulty finding workers. Workers would quit because the jobs were too difficult. Charles Crocker wanted to hire Chinese men, many who had come to California in search of gold, and others who were arriving from China because of famine and civil unrest. Hiring Chinese workers was controversial because of the prejudices of that time, but Crocker insisted, and his decision turned out to be an important one. The Chinese workers were hard working and reliable. In fact, Chinese workers were not only recruited from California but also from China to meet the demand for laborers to build the Central Pacific Railroad.

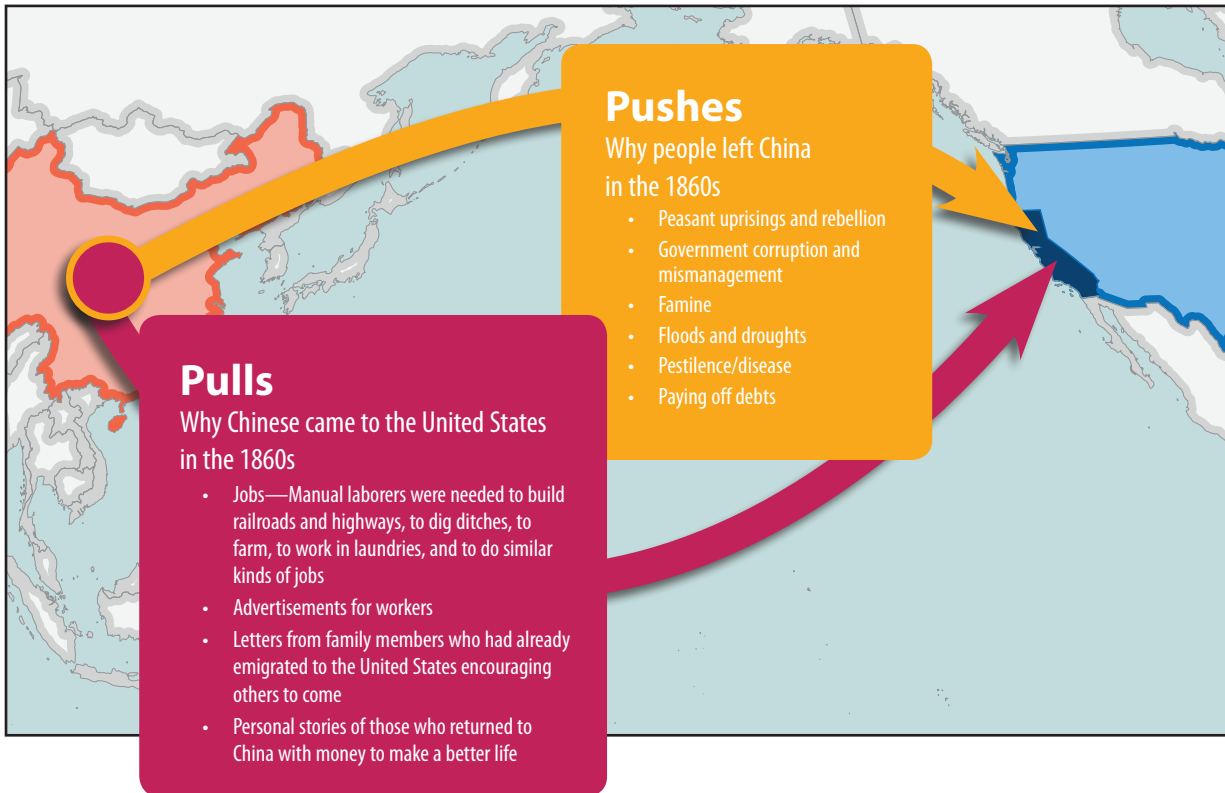


Charles Crocker



Why would Chinese men want to come to California?

► Slide 2



Why would Chinese men want to come to California?

► Slide 3



Chinese emigrants traveling in steerage to San Francisco on the Pacific Mail Steamship *Alaska*.

Photo source: "Views of Chinese," *Harper's Weekly*, April 29, 1876.



Questions:

1. How do you think these events affected the building of the Transcontinental Railroad? *(making inferences; connecting)*
2. How does communication and transportation impact everyday life? *(making inferences; connecting)*

Slide 1

What was happening in the United States prior to the building of the railroad?

Events of the time

1862

Pacific Railroad Act

This congressional act approved the building of the transcontinental railroad. The railroad would be built from the east (Omaha, Nebraska) and from the west (Sacramento, California). To help pay for the railroad, land owned by the government would be sold, as well as government bonds.

Slide 1

Homestead Act

The U.S. government wanted people to settle on uninhabited land, so the act provided that a homesteader could claim 160 acres if a home was built and crops were grown for at least five years. You had to be a citizen of the United States or intended to be a citizen and had not borne arms against the U.S. government. Often the lands considered to be uninhabited were hunting grounds or travel routes for the native people, causing conflicts among the homesteaders and those first inhabitants.





Events of the time *(continued)*

1865

The Civil War ends. On April 9, 1865, Confederate General Robert E. Lee surrendered, ending the Civil War.

► Slide 1

1867

The United States purchases Alaska

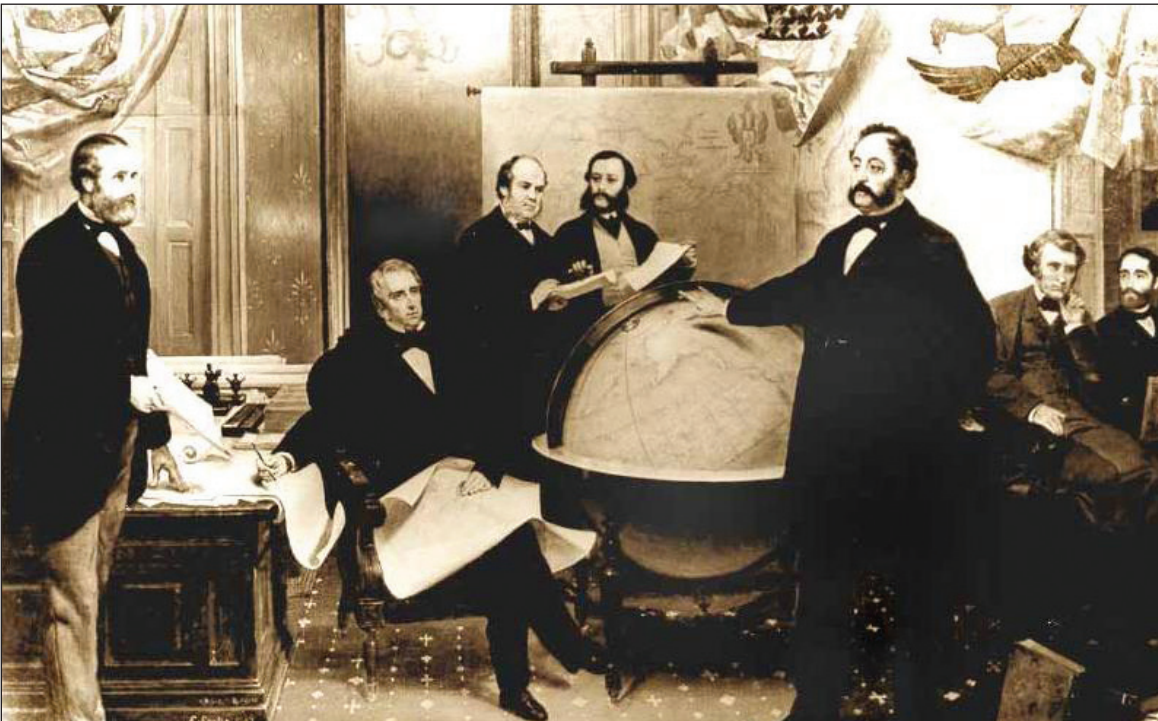
Russia sold Alaska to the United States for \$7.2 million. This ensured that the United States would control the Pacific Coast.

► Slide 2

The Medicine Lodge Treaty

Five tribes of Plains Indians—the Cheyenne, Arapaho, Kiowa, Apache, and Comanche—signed the Medicine Lodge Treaty with the U.S. government. The treaty opened up land for the building of the railroad and the settlement of homesteaders in the region of Kansas.

► Slide 2



Signing the Alaska Treaty of Cession.



Slide 3

Events of the time *(continued)*

1846

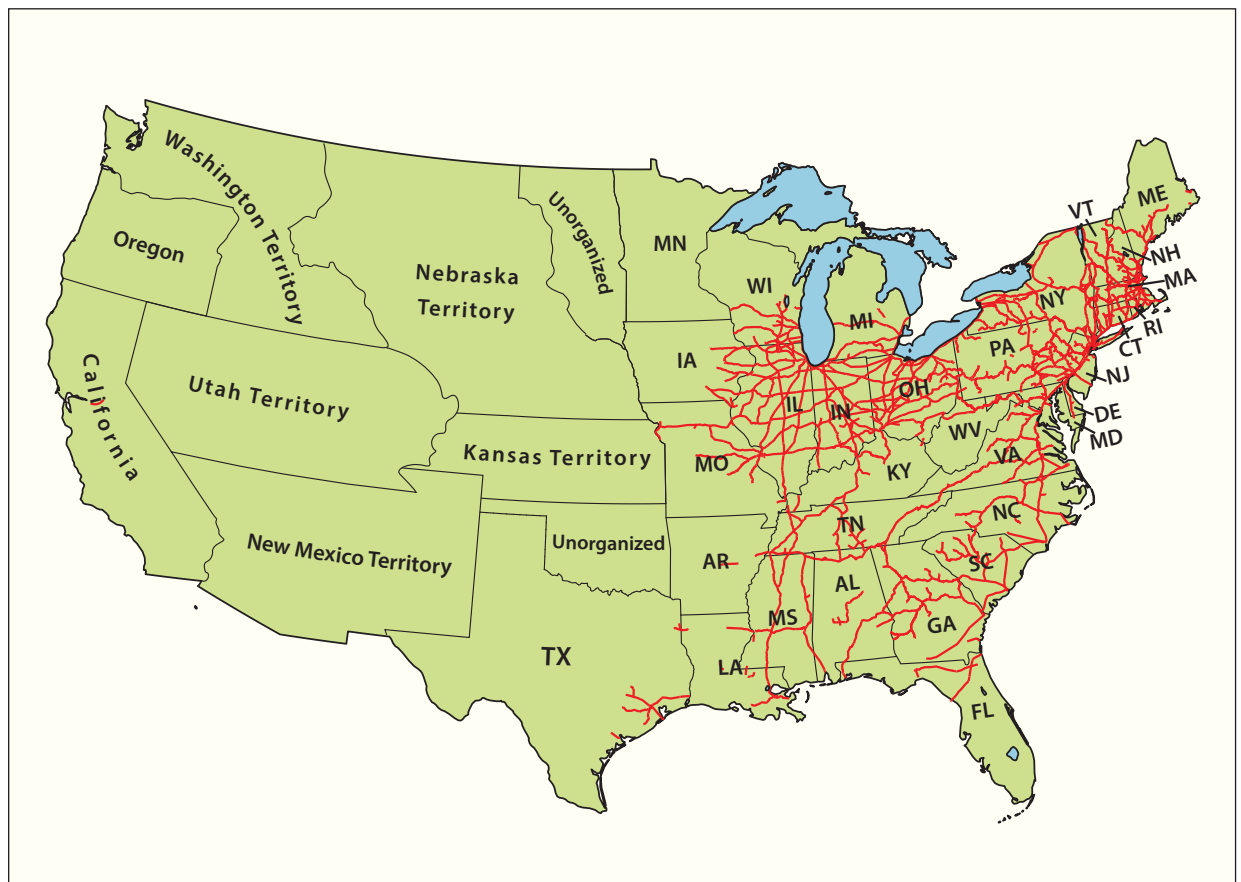
Pacific Mail Steamship Company

The Pacific Mail Steamship Company carried mail from the Isthmus of Panama to California. The California Gold Rush of 1849 made this business highly profitable as the population surged in California.

1860

Railroads

Prior to 1860, many railroads were operating in the East, South, and Midwest. These railroads served communities by transporting goods from one place to another. They played an important role in the economy of these regions.





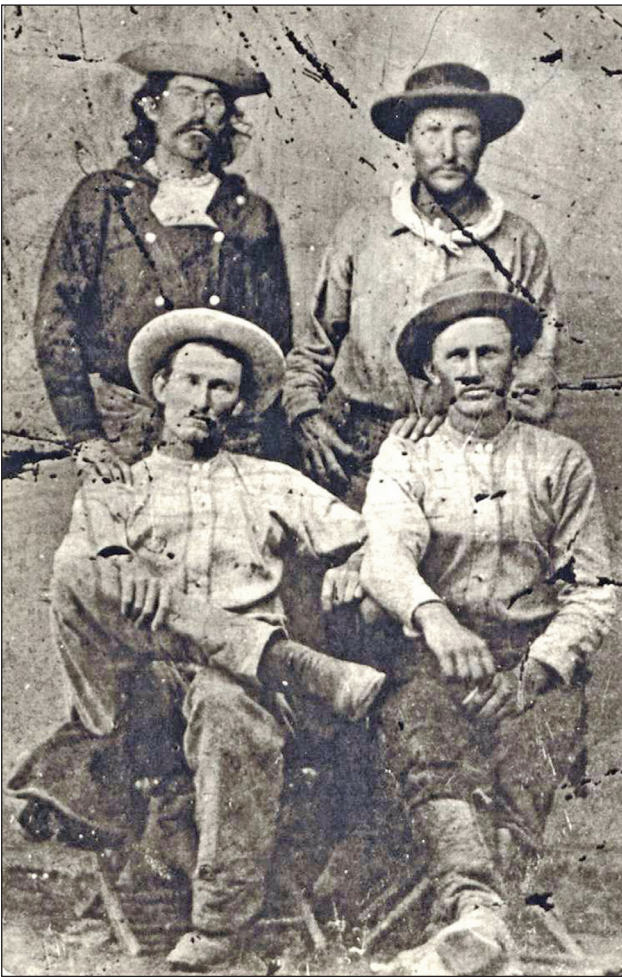
Events of the time *(continued)*

1860–1861

Pony Express

The Pony Express was a relay of horse riders who carried mail across a 2,000-mile trail from St. Joseph, Missouri, to Sacramento, California. It was a short-lived venture, as once the Pacific Telegraph Line was built there was no need for the Pony Express.

► Slide 4



Pony Express riders.



First westbound and eastbound mail.

1861

Pacific Telegraph Line is completed. The line made communication between the eastern and western United States fast and efficient.



Questions:

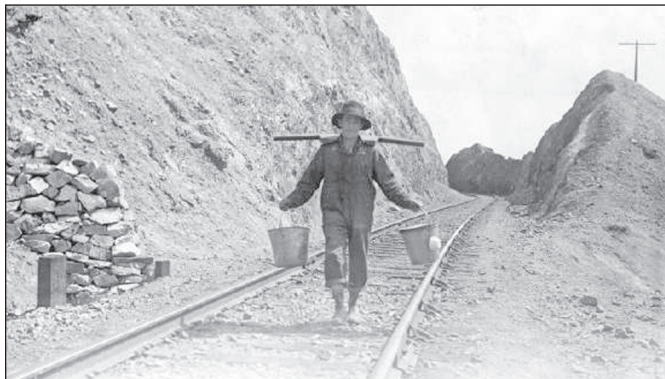
1. Notice the three kinds of snow sheds. Each one protected the railroad from snow. Why do you think there were three different models of snow sheds? (*making inferences; understanding visuals*)
2. What kind of jobs would be needed to build railroad trestles, snow sheds, and tunnels? What skills would you need to have? (*making inferences; understanding visuals*)
3. What dangers would workers encounter when building these structures? (*making inferences; understanding visuals*)
4. How did the weather affect the building of the railroad? (*main ideas/supporting details*)

Slide 1

◀ Would you have liked to work on the Transcontinental Railroad?



Chinese workers building the Loma Prieta Lumber Co.'s railroad, California, about 1885.



Chinese worker carrying materials for the railroad.



What were the jobs for building the railroad?

**Slide 2**

Surveying: The first task for building a railroad is to survey the route. Surveyors must be highly skilled mathematicians who understand geographic features such as location, elevation, and other characteristics of the terrain. Surveyors were charged with planning the route of the railroad.

Grading: These workers had to clear the path for the railroad tracks. This backbreaking work included clearing rocks and trees in the pathway for laying the tracks. In tunnels, the rocks and debris had to be carted away. Hills had to be leveled to create a gentle slope. Ravines had to be filled in. Remember, trains require a grade that is not too steep for the train—1 foot in height for every 50 feet in length.

Laying rail ties: On the roadbed, wooden ties were laid approximately 20 inches apart. The wooden ties were cut from trees in the Sierra Nevada and hauled to the roadbed.

Laying rails: These workers laid the rails. Each rail weighed about 560 pounds (254 kg) and was about 28 feet (about 17.5 m) long. Teamwork was essential. Horses pulled the wagons that carried the rails. Rails had to be precisely spaced parallel to each other. The rail gauge or the distance between the rails was 4 feet 8½ inches, so exact measuring was essential.

Hammerers: After the rails were laid, workers hammered the spikes to hold the rails in place.

Glossary of rail terms

**Slide 3**

Fishplate: a metal bar used to hold two rails together

Roadbed: the foundation for laying the tracks for the railroad

Rail gauge: the distance between the inner edges of the rails

Railroad tie: usually wood that was used under the rail to hold it in place; the tie was perpendicular to the rail

Spike: a large nail used to hold the rails to the ties

Trestle: wooden bridges used by the railroad



SET
4

Student Handout

Slide 3



The wooden railroad ties support the rails on the roadbed. Spikes hold the rails to the railroad ties.



Fishplate: a metal bar that is bolted to the ends of two rails to hold them together.



Fishplates are essential to the rails to keep them in place.



Railroad spike holds the rails in place. Notice the head of the spike is designed to hold the edge of the rail in place as it is secured to the railroad tie.



SET
4

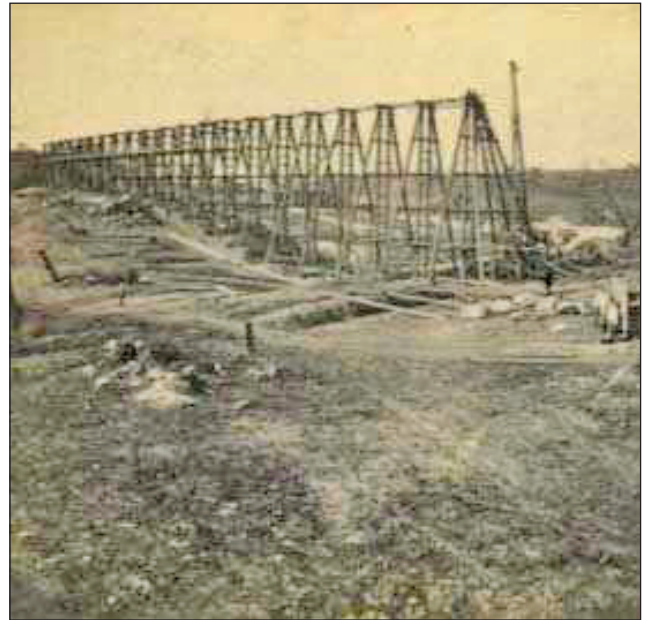
Student Handout

Slide 5

Building the railroad through the mountains presented lots of challenges. There were ravines to be crossed, and often they were too deep to be filled in with dirt and rock, so trestles had to be built. Imagine hauling rocks to make the roadbed flat so that the rails will be even and join the trestle. Poles held up the trestle. Holes had to be dug and wood nailed together to hold everything in place.



Workers hauling rock.



Building of a trestle.



Trestle bridge.



Tunnel work presented special challenges. The granite was so hard that it took a long time to chip away just a little rock. Workers used sledgehammers and picks to break the granite at the end of the tunnel. Then the rocks and rubble were loaded into a wheelbarrow and dumped outside the tunnel into a cart to be brought to a place where the roadbed needed to be filled in.



Summit Tunnel.



SET
4

Student Handout

Slide 7

Because of the heavy snowfall in the winter, snow sheds had to be built to protect the tracks and the trains from being buried in snow. Snow sheds presented special challenges because they had to be strong enough to withstand an avalanche as well as the heavy snow built up over the winter months.



Snow shed section.



Sometimes the railroad builders had to create a ledge for the roadbed on the side of the mountain so that the train could travel along the edge of the mountain. Rock had to be blasted away to make the ledge. Then, if there were a ravine, walls had to be built to hold the roadbed in place. Chinese workers would carry rocks to build a sturdy wall to support the roadbed and the weight of the train. Perching on the side of the mountain was dangerous, and if you were afraid of heights, you wouldn't be able to do this work.



Rock walls to support the railway.



Slide 9

What were the challenges of building the railroad?

Building the railroad through the mountains of the Sierra Nevada was dangerous. Remember that the roadbed had to be built on a gradual slope and with broad curves. The surveyors had to figure out how to build the railroad so that trains could go up and over the mountains. See the contour map in Content Slide Set 1, Slide 11.

Clearing roadbeds required that trees and other vegetation were removed and rocks and boulders hauled away. Trees were often hundreds of feet high, and felling the trees was dangerous work. Once the trees were felled, the timber was hauled to sawmills to be made into railroad ties and wood for building trestles and other structures. Then the tree stumps had to be removed. They were blasted out of the soil, leaving large holes to be filled. This work was done with wagons and carts hauling dirt and rocks to fill in the gigantic holes. Historian Stephen Ambrose explains in his book, *Nothing Like It in the World*, “One three-hundred-man gang spent a full ten workdays clearing a single mile of right-of-way.”*

Slide 10

Working in the Sierra Nevada in the winter was treacherous. There were 44 snowstorms during the winter of 1866–1867. Because there was so much snow, avalanches were ongoing threats.

*The Chinese lived practically entirely out of sight of the sky that winter, their shacks largely buried in snow. They dug chimneys and air shafts and lived by lantern light. They tunneled their way from the camps to the portal of the tunnel to work long, underground shifts. A remarkable labyrinth developed under the snow. The corridors in some cases were wide enough to allow two-horse sleds to move through freely, and were as much as 200 feet long. Through them, workmen travelled back and forth, digging, blasting, and removing the rubble.***

One of the fears was that a snow slide would bury workers, and in fact, such mishaps occurred. It was reported that one camp of Chinese workers was buried by snow and had to be dug out.

In one 13-day period there was 120 inches (3 m) of snow. The following year wasn't much better. In December 1867, unusual rain storms caused flooding, and in March 1868, a blizzard dumped 10 feet of snow in five days. Trestles were destroyed by avalanches, so indeed the work was dangerous and the temperatures well below freezing.

* Stephen E. Ambrose, *Nothing Like It in the World* (New York: Simon and Schuster, 2000), 157.

** Wesley S. Griswold, *A Work of Giants* (New York: McGraw-Hill, 1962), 191–92.



Questions:

1. What happened when the Chinese workers refused to work? (*main idea/supporting details*)
2. Do you think Crocker was a bully? Why or why not? (*making inferences; connecting*)

Why did the Chinese workers strike?

**Slide 1**

In June 1867, the Chinese workers decided among themselves to go on strike. They wanted more money and a shorter work day, and they refused to leave their camp on Monday morning and go to work. Although the Chinese workers wanted more money, there were rumors that the strike was influenced by the Union Pacific Railroad. If the Union Pacific Railroad could slow down the railroad building on the Central Pacific Railroad, that would make more money for the other railroad.

In the past, when strikes have occurred in other settings, they have always been accompanied by violence. This was not so for the Chinese workers. They stayed in their camps, mended their clothing, played cards, and waited. It was peaceful and quiet.





SET
5

Student Handout

Slide 2

To break the strike, food was stopped from coming into the Chinese camps, and the railroad bosses started to search for other workers to take the place of the Chinese.

Charles Crocker stopped food from being shipped into their camps. However, the Chinese workers had prepared for the strike and had stored up food. Crocker was not happy and threatened them with the loss of pay, refusing to increase it. In fact he told the Chinese workers that if they did not return to work by 6:00 a.m. on Monday morning, they would be fined.

On Monday morning at 6:00 a.m., they went back to work.

RAILROAD GAZETTEER. 53

SISSON, WALLACE & CO.
GENERAL AGENTS FOR
CHINESE LABOR,
Wholesale and Retail Dealers in
CHINESE GOODS,
GROCERIES,
PROVISIONS, LIQUORS, CLOTHING,
Hardware, Produce, Grain,
And all kinds of Family Supplies.

Well appointed Stores located on lines of Western Pacific, California and Oregon, and Central Pacific Railroads at
*Pleasanton, Chico, Truckee,
Winnemucca, Carlin, Toano,
and Corinne.*

We have furnished, and continue to furnish above Railroads with CHINESE LABOR, and are fully prepared to fill orders for this class of labor, in any part of the country.

Principal Office, No. 12 J Street, Sacramento.
San Francisco Office, No. 228 Clay St.

Photo source: Pacific Coast Railroad Gazetteer, no. 9 (Sacramento, CA: H.S. Crocker & Co., 1870)



How did the workers lay ten miles of track in one day?

There is nothing like a bet to motivate people to do crazy things, and this is just what happened when Charles Crocker boasted that his workers could lay ten miles of track in one day. That boast was made to show that the Central Pacific Railroad workers could outperform the Union Pacific Railroad workers, who had laid 7½ miles of track in one day—a major achievement. Imagine the amount of work it would take to accomplish such a feat, as most of the work was done by hand!

Vice President Durant of the Union Pacific believed that Crocker's boast was unsubstantiated. In fact, he believed that it would be impossible and bet \$10,000 it could not be done.

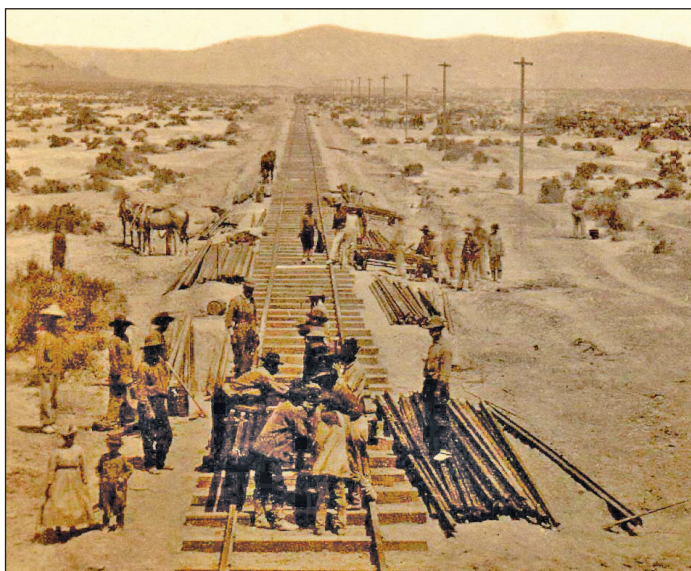
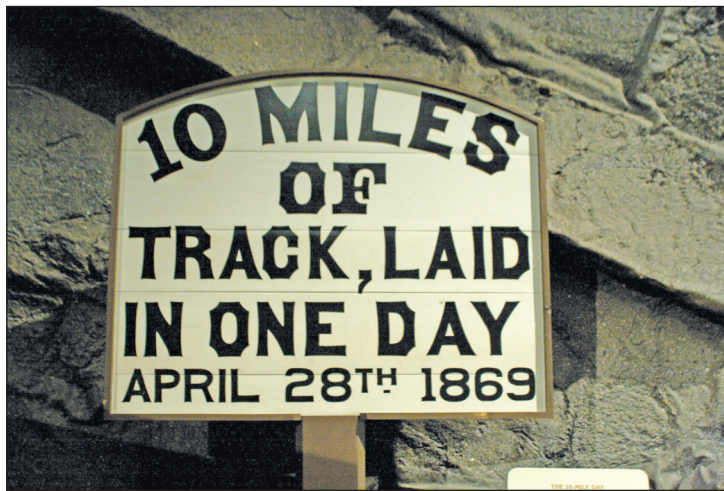


Photo credit: (top) © Marcin Wichary (CC BY-SA 2.0, via flickr.com). (bottom) Courtesy of the Bancroft Library, University of California, Berkeley



SET
6

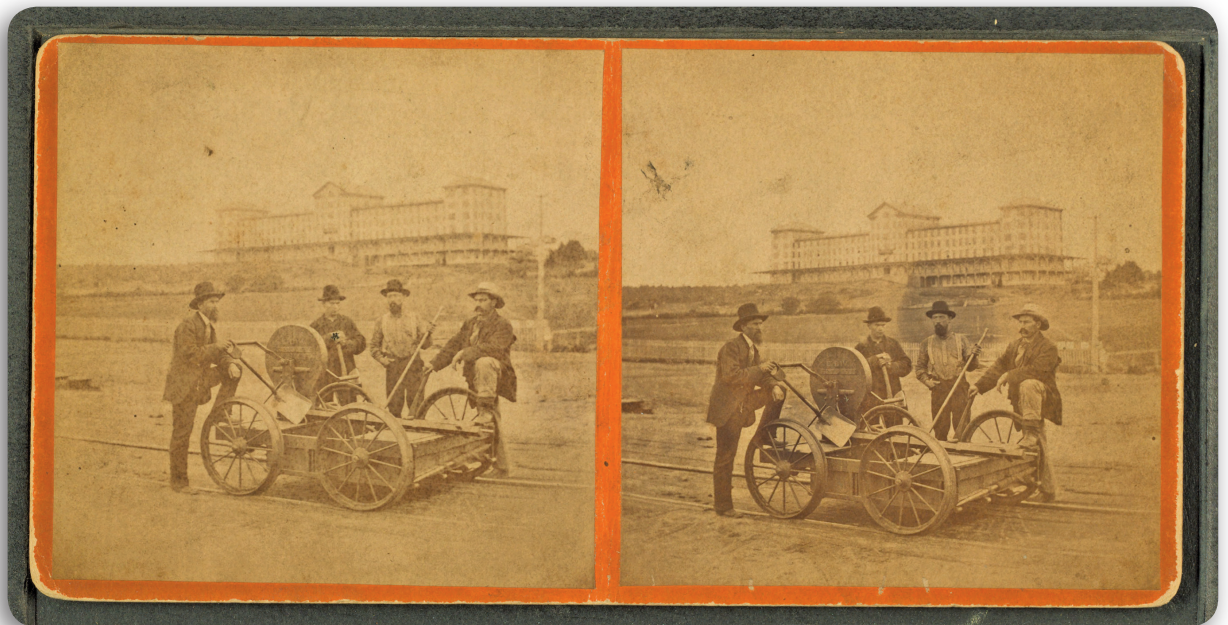
Student Handout

Slide 2

What actually happened?

Charles Crocker knew if he could have everything organized and ready, his workers could achieve the goal of laying ten miles of track in one day. To get ready for the race, the roadbed was graded and the railroad ties were put in place. The workers were organized, each with a particular job to do. The rails, fishplates, bolts, spikes, and other materials were organized too, ready to be used by the workers as each rail was put in place.

The workers were up early and at 7:00 a.m. they set to work. A train loaded with materials was brought to the starting point and unloaded. Then small handcars carried materials to the spot where they would be needed. Every worker knew his job and wanted to win the race. Workers took an hour for lunch and then returned to work. At 7:00 p.m., they finished their day, having laid 10 miles and 56 feet of rail. Charles Crocker won his bet!



Railroad handcar to carry supplies and workers along the railway.

Photo credit: Courtesy of the New York Public Library



Question:

Do you think the building of the Transcontinental Railroad was a remarkable feat? Why or why not? (*connecting*)

Would you like to have attended “The Meeting of the Rails”?

**Slide 1**

On May 10, 1869, the two railroads met, completing the route across the United States. This was a national event held at Promontory Summit, Utah, where the two railroads joined together. Originally, the celebration was scheduled for May 8, but the train coming on the Union Pacific Railroad was late. The Central Pacific passenger train, however, left Sacramento, California, on May 5 in anticipation of the celebration. Another train pulled two cars owned by Leland Stanford, who wanted to make this a very special event. His train had one car designed as a guesthouse with a kitchen, dining room, and sleeping accommodations for ten people. His second car carried food and drink for the celebration.

The ceremony was arranged for the two locomotives to face each other. Then workers from each railroad would carry the last rails and put them in place. T. P. Durant, the head of the Union Pacific Railroad, and Leland Stanford, the head of the Central Pacific Railroad, were to hammer in the golden spike. Both missed! Nevertheless, the spike was hammered in, and the historical record is not clear who actually finished the job. However when the job was done, the telegraph operator sent off the message coast to coast: “DONE! The last rail is laid! The last spike driven. The Pacific Railroad is completed.”*

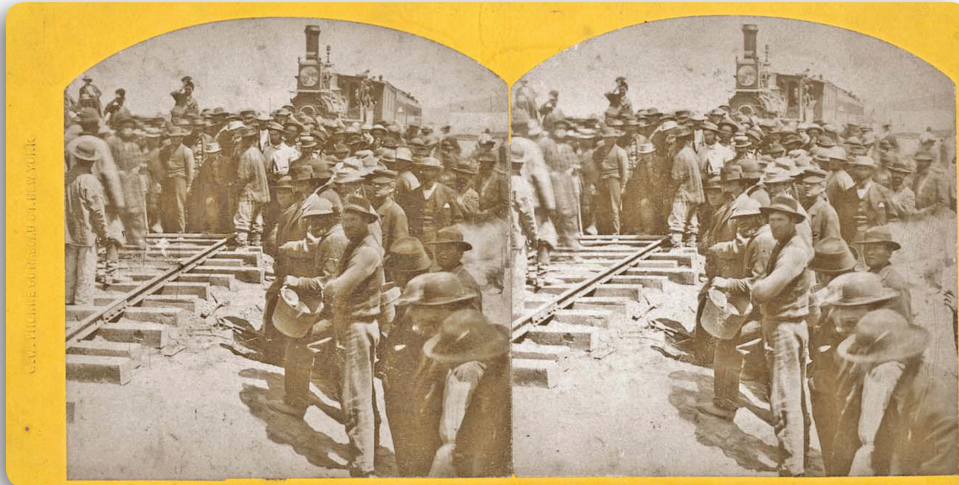
* Central Pacific Railroad Photograph History Museum, <http://cprh.org/Museum/Done!.html>



SET
7

Student Handout

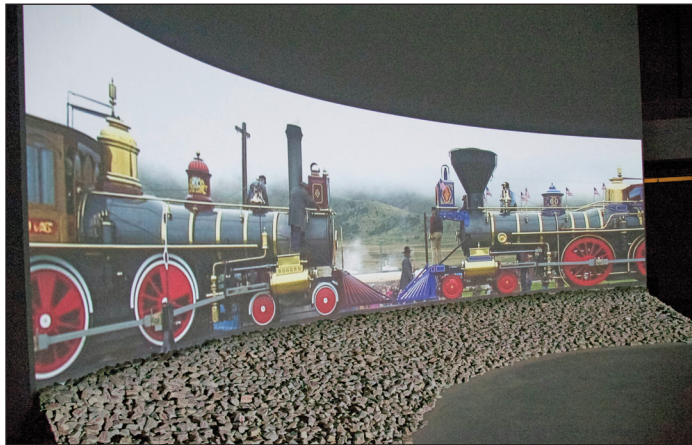
Slide 2



There were speeches, and celebrations, and food to enjoy. It was a memorable occasion with many people in attendance. No one knows for sure how many, but estimates range from 500–600 people. Celebrations happened in other places as well, as this was a joyous occasion for all of America. Today you can visit the Golden Spike National Historic Site and see a re-creation of the two steam locomotives coming together for this national event.

Golden Spike National Historic Site: <http://www.nps.gov/gosp/>

Slide 3



Artist Zhi Lin wanted to remember the Chinese workers, so he created artwork to honor their work. On each rock, a worker's name is written. Often stories of our history overlook important contributions of the people who helped make that history. In this artwork, the artist shines a light on the Chinese railroad workers and celebrates their amazing contribution.

Photo credits: **Slide 2.** Courtesy of the Phil Anderson Collection, A.J. Russell.

Slide 3. Courtesy of Artist Zhi Lin. "Chinaman's Chance" on Promontory Summit: Golden Spike Celebration, 12:30 PM, 10 May 1869.