

8

History-Social  
Science Standard  
8.12.1.



# Agricultural and Industrial Development in the United States (1877–1914)

## **California Education and the Environment Initiative**

Approved by the California State Board of Education, 2010

### **The Education and the Environment Initiative Curriculum is a cooperative endeavor of the following entities:**

California Environmental Protection Agency  
California Natural Resources Agency  
California State Board of Education  
California Department of Education  
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## **LESSON 1** California at the World's Fair of 1893

*California Connections: California at the 1893 World's Fair* ..... 2

## **LESSON 2** Growth of the Windy City

None required for this lesson.

## **LESSON 3** A Second Industrial Revolution

Exhibit 1: McCormick Reaper ..... 7  
Exhibit 2: Balloon Frame ..... 8  
Exhibit 3: Barbed Wire ..... 9  
Exhibit 4: Disassembly Line ..... 10  
Exhibit 5: Refrigerated Car ..... 11

## **LESSON 4** Technology Transforms Daily Life and Natural Systems

A Day in the Life of Joshua Sloth ..... 12  
Student Background on Technology's Effects on Natural Systems ..... 16

## **LESSON 5** As the Century Turned: Considering Causes and Effects

Station 1: Homestead Act of 1862 ..... 18  
Station 2: Pacific Railway Act of 1862 ..... 19  
Station 3: Internal Combustion Engine ..... 20  
Station 4: Deforestation of the American West ..... 21  
Station 5: Byproducts Industry ..... 22

# California at the 1893 World's Fair



Daniel Branch traveled by train to Chicago. As the president of the California State Board of Trade, he had an important mission to achieve at the 1893 World's Columbian Exposition. In his leather satchel, Branch carried pamphlets that described the many benefits of living in California.

Of course, the literature highlighted the state's beauty. It also touted California's incredible contributions in the areas of technology and agriculture. And it described the state's vast natural resources and its growing population.

The Board of Trade chose Branch as its head because he knew more about California agriculture than any other member. He also had a strong interest in horticulture. In fact, he had recently met Luther Burbank, who had developed hundreds of new varieties of plums and other fruits. Branch thought about the tremendous progress California had made in the last few years. The fair would make this progress visible to the world.

"Inspiring," thought Branch, looking out over Chicago's

Jackson Park. As the train approached the station, he could see hundreds of brilliant white buildings. He understood then why people called the fair "The White City." Branch left the train, moving onto the noisy platform. He paid 50 cents to enter the fairgrounds and made his way through the

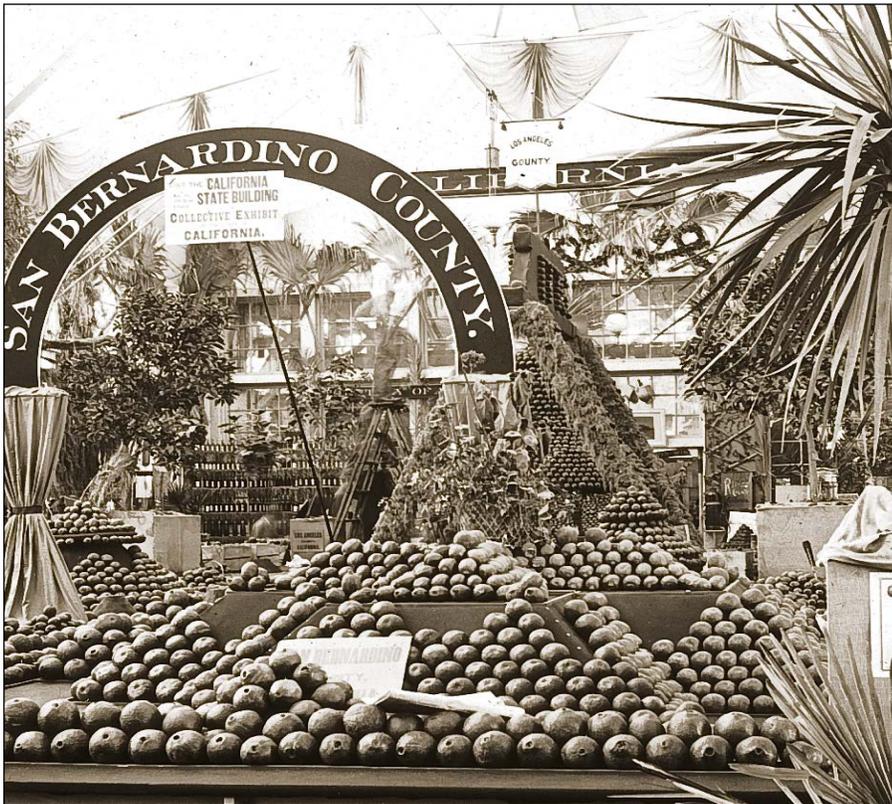
crowds to the Administration Building. The domed rotunda gleamed like the finest capitols of Europe. Beyond this was the Court of Honor, with its huge reflecting pool and gold statue of the Republic.

## A Stately Presence

Branch looked at his map. The fair had state buildings



Administration Building, World's Fair, 1893



California fruit display, World's Fair, 1893

and national exhibition halls. California had exhibits in both. In the U.S. Government Building, for example, was a gigantic California redwood tree. California also had displays in the National Fish and Fisheries Building, the Agriculture Building, the Horticulture Building, the Mines and Mining Building, and many others.

By far the most celebrated of all the state buildings was the one belonging to California. It looked like one of the California missions,

with arched adobe walls and red-tiled roofs. Inside, the space opened into a huge gallery with high ceilings. This gallery held full-sized palm, orange, and lemon trees; pine boughs; and lush native plants and grasses. Branch was amazed at how healthy the plants looked, so far from home.

Since California was a large state with many different climates, crops, and natural resources, it filled its building with exhibits from each of its 57 counties

(now 58 counties). Branch decided to visit the Southern Californian counties first, then the northern counties. He would end his tour with the counties in the Great Central Valley. Tomorrow he planned to hand out his pamphlets in front of the U.S. Government Building. He would talk to people about the benefits of moving to California.

### Touring “California”

Branch began with the Los Angeles County exhibit. At the entrance stood a huge globe, about 8 feet in diameter. Oranges—6,280 of them—covered the globe. A wire loop held each orange. Branch learned that workers replaced the oranges every 15 days to maintain their freshness.

Los Angeles County was obviously proud of its oranges. The Horticulture Building featured a 35-foot-high tower that contained more than 14,000 of them. Los Angeles County had also assembled a living orchard of orange and lemon trees, date palms, and native plants. Branch was amazed that the orchard had reached Chicago safely where

thousands of visitors could now enjoy them.

Santa Barbara County's exhibit had 2,000 quarts of olive oil. Ventura County's exhibit boasted the largest bean farm in the world. San Diego County offered a colorful display of fish, shellfish, shells, and stuffed waterfowl. Branch also visited San Luis Obispo County's exhibit, with its huge display of beans, peas, corn, wheat, rye, barley, oats, onions, rice, alfalfa seed, walnuts, flax, and jute.

Shasta County, in the northern part of the state, showed valuable minerals like gold, silver, copper, and iron. The city of Oakland, in Alameda County, displayed products from the Alameda

Sugar Company and the Oakland Fruit Preserving Company. It also featured refined salt from the Solar Salt Works. The San Francisco Chronicle exhibit showed the growth of the railroad; maritime shipping; and lumber, milling, and manufacturing industries.

In the middle of Santa Clara County's impressive exhibit was a life-sized statue of a horse, ridden by a knight in full armor. Light and dark prunes completely covered the horse and rider.

Placer County displayed a variety of cherries, apricots, oranges, grains, and honey. This county's claim to fame was the early ripening of its fruit. Farmers in Placer

County could market their wares three to five weeks earlier than farmers in the northern counties.

Branch headed for the Great Central Valley exhibits. Fresno County had a large alcove decorated with bundles of wheat, oats, rye, and barley. In the middle of the alcove was an 8-foot-high pyramid made with boxes of raisins. A woman offered Branch a box as a souvenir. He thanked her, opened the box, and ate a handful. The raisins were plump and delicious.

The Kern County exhibit was a beautiful Venetian bridge. On it were many beautiful dried peaches and pears, along with such cereals as barley, wheat, and oats. Branch marveled at the beauty and quality of the grains.

### The Sweet Taste of Success

After looking at all this delicious food, Daniel Branch was hungry for lunch. He thought he might try one of those new hamburgers and a carbonated soda. He had heard that the fizzy drinks were quite refreshing. Branch left the California Building and headed for the food stands



World's Fair, 1893



Ferris wheel, World's Fair, 1893

that surrounded the Ferris wheel and other attractions.

As he took a big bite of his juicy hamburger, Branch thought about California's success in agriculture. That success had begun soon after the Gold Rush ended. Miners and mining companies had seen that the next great opportunity lay in the flat, fertile ground of the state's central valleys. The mild, rainy winters and hot, dry summers were perfect for growing wheat year-round. In contrast, in the eastern United States and in Europe, farmers had to wait for the last frost before they could plant their spring crops.

Wheat grew easily in California. New growers could

focus on improving planting and harvesting technology to increase their crops. The soil in the Central Valley was easy to till, and the ground was flat. The growers invented special wide plows and sowers that scattered seeds over a wide area. With this technology, one man and a team of eight horses could work six to ten acres per day, whereas farmers in the East or Midwest considered one-and-a-half acres of plowing to be a good day's work.

Daniel Branch knew agriculture in California had changed greatly since farmers had harvested the first wheat crops more than 40 years ago. Recently, wheat exports to Europe had decreased.

Farmers had done little in the early days to improve the soil or to rotate crops. As a result, the soil lost nutrients, and the grain grown was starchy and less edible.

Even so, California farmers had continued to learn by doing. They had put their heads together, leveled their fields, and built thousands of miles of ditches to drain and water their crops. They had built dams to hold winter rains and snowmelt. They had learned which crops would grow best in different types of soil and how to keep that soil healthy and productive.

When banks had offered lower-interest loans in the 1870s, many people had been able to purchase farms. Farmers had begun to grow specialty crops like fruit, nuts, and vegetables on smaller plots of land. They had used the technology that wheat growers had previously developed to plow and sow their fields. Crops grew so well in the sunny inland valleys that growers increased their harvest by 25% each year during the 1870s and 1880s.

For example, California fruit production was hugely successful; it was so

successful that it had almost destroyed the incomes of raisin growers in Spain, prune growers in Serbia and Bosnia, and citrus growers in Sicily. In addition, the California Debris Commission was currently planning to dredge the Sacramento and San Joaquin rivers. Dredging the rivers would make it possible to ship even more goods from the Central Valley to the coast and beyond. When the Transcontinental Railroad was completed in 1869, the state had also begun providing the East and Midwest with an abundance of fruit, vegetables, and grain. Trade with other countries, however, was a relatively small part of California's growing economy at the time.

### New Technologies at the Fair

After lunch, Branch planned to investigate the new electrical technology displays by Edison and Tesla. He had heard a rumor that electricity could power irrigation pumps, and California's State Legislature had recently passed laws that would provide funding for new irrigation technology. These



Electric display, World's Fair, 1893

new systems would enable farmers to bring water to dry areas in the hot summer months. Imagine how that would improve productivity!

Daniel Branch took long strides across the square. The famous Ferris wheel was directly in front of him. Before visiting Edison's and Tesla's exhibits, he thought he might take in a view of Chicago from the top of the ride.

Branch sat down on the long hard seat as the carriage swept him up. What a thrill! As he moved toward the top, he could see the entire fair and the city beyond. He remembered that Chicago had been largely rebuilt after the Great Chicago Fire burned nearly all of it to the ground in 1871. Since then, the city had grown faster than any other in the Western world.

Looking across the vastness of Lake Michigan to the sparkling city, Branch thought about the costs, as well as the benefits, of this growth. As impressive as the city was, with all its wealth and beauty, Chicago was also known all too well for its filth, poverty, and crime.

As he completed his first turn around the Ferris wheel, Branch looked across to the broad walls of the California Building. He thought about how the "gold" in the "Golden State" included much more than the shiny metal. By carefully managing its natural resources and population growth, he believed that California would be able to continue its economic expansion, offering its wealth of golden grains, flowers, fruit, and vegetables to the world.

# McCormick Reaper



McCormick reaper, ca. 1900

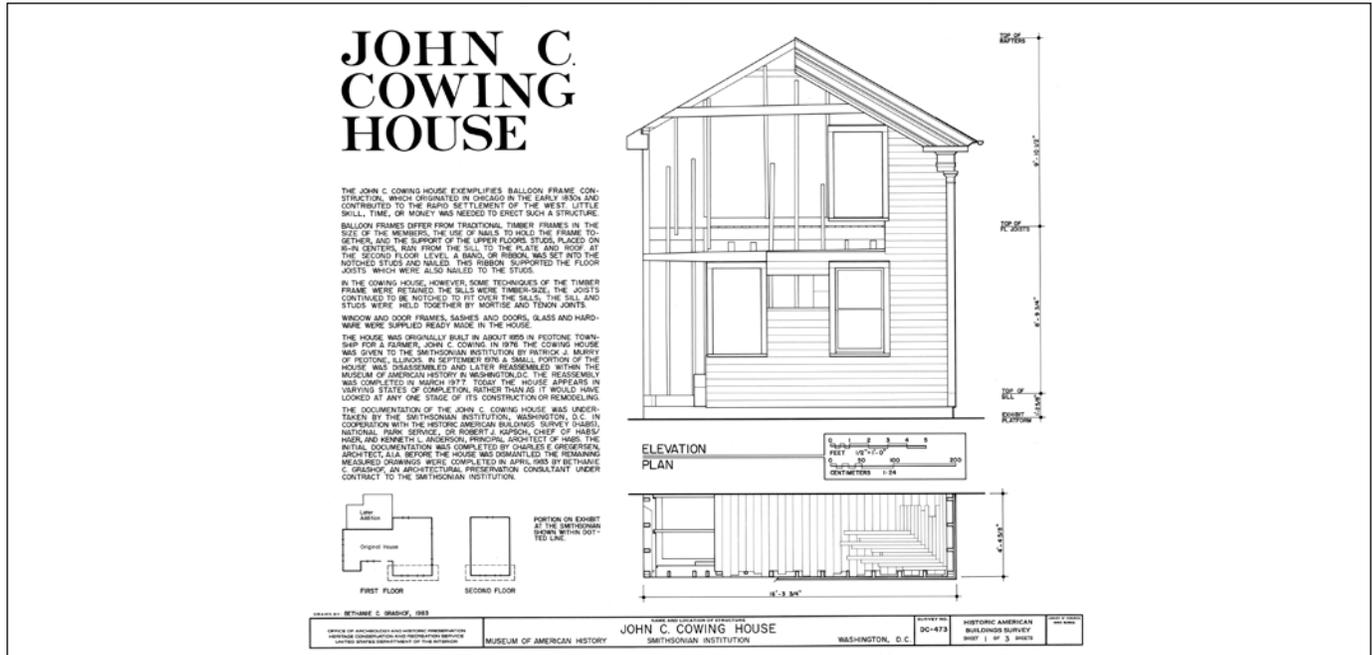
Cyrus McCormick invented his reaper in 1831. The reaper is a machine that cuts grain. Before this invention, farmers cut grain by hand, using tools such as scythes and sickles. Harvesting an acre of wheat—an area about the size of a football field—took a long time! Using the reaper, a farmer could cut in a few hours a volume of grain that would have taken two to three men using hand tools a whole day to harvest.

McCormick's first factory for making reapers was in Virginia. He moved the factory to Chicago in 1847. This made it easier for farmers in the west to buy reapers. With reapers, they could harvest and sell more wheat. They also had more free time to participate in other activities.



Garfield Park, Chicago, 1907

# Balloon Frame



Balloon frame diagram

The balloon frame was a new design for buildings. It changed the construction industry by standardizing materials, such as nails and lumber, that were used in a building's frame or skeleton. Builders were able to put the balloon frame up quickly without too many workers to help. They could get the wood easily because of the standardization of the lumber. Some people thought that the frame was too light—they called it a “balloon frame” to suggest that the house might float away.

Although cutting logs into standardized boards required a lot of effort, sawmills did this work efficiently, and railroads allowed the resulting lumber to be shipped over long distances. The railroad and the balloon frame allowed people

in areas with few local sources of wood to put up houses and farm buildings cheaply and easily. This opened up more areas, especially in the West, to farming.



Balloon frame detail

# Barbed Wire



Cattle behind barbed wire

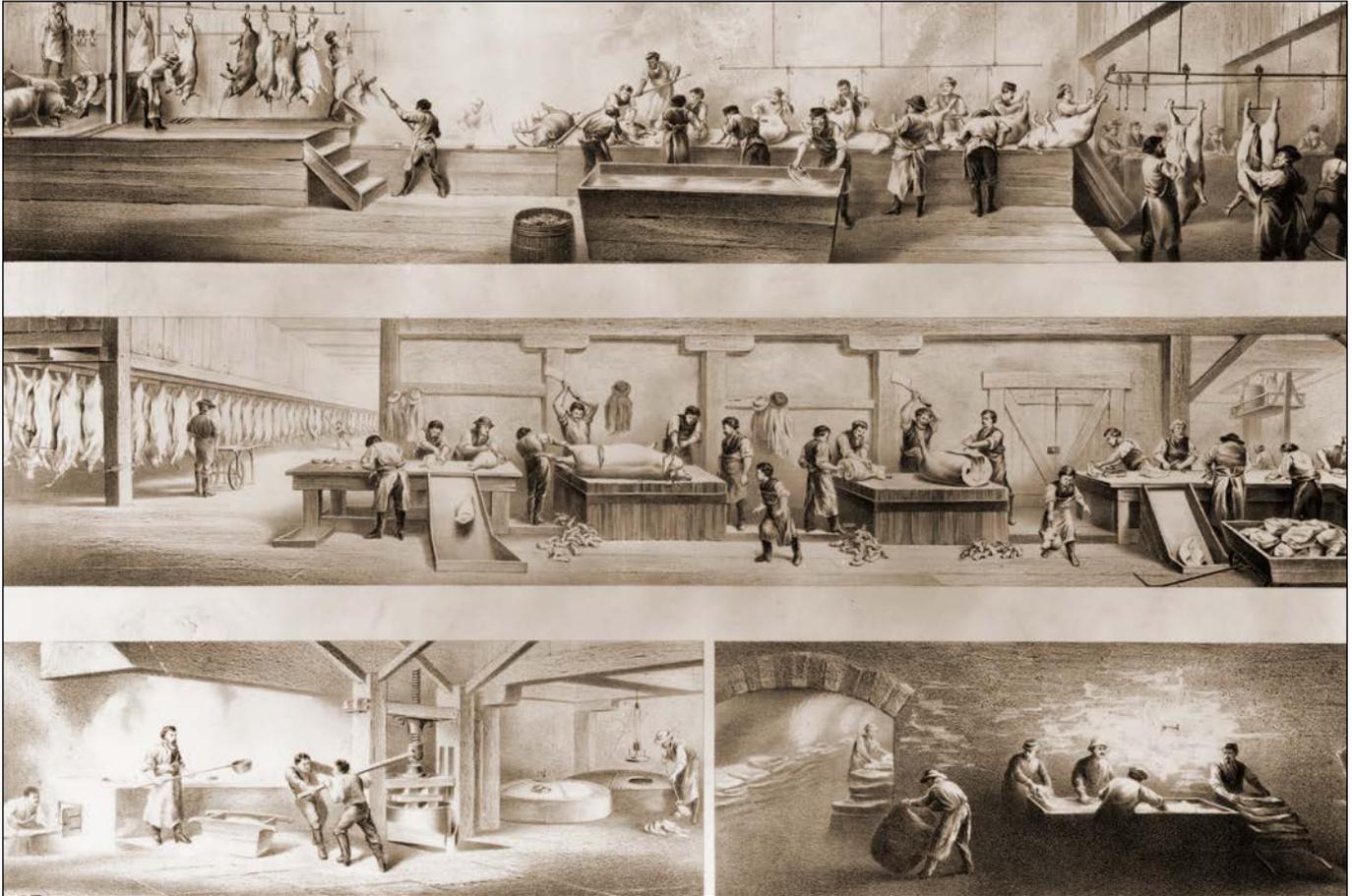
Cattle drives were a common feature of the Western landscape. Ranchers, *vaqueros* (Mexican ranch hands), and cowboys drove herds of cattle from grazing land to “cow towns” such as Abilene, Kansas, from which they could be shipped to market.

Conflicts resulted as farmers claimed formerly public lands as their own, some of which were located along the routes of the cattle drives. The cattle drives threatened the crops of farmers in the West. The herds of cattle broke through wooden fences and trampled crops. The wooden fences were expensive because there

were few trees in this region of the country. Several inventors came up with a solution to these problems in the late 1860s and the early 1870s. This solution was barbed wire, also called “devil’s rope.” Barbed wire has sharp barbs all along the wire. Because running into the barbs hurt, barbed wire kept farmers’ animals in and other animals out. Barbed wire fences were also cheaper and easier to maintain than wooden ones.

The use of barbed wire in the late 1800s enabled farmers on the Great Plains to expand agricultural operations in that region.

# Disassembly Line



Images from a disassembly line

Butchering an animal carcass—cutting it up for use as food—was traditionally a process done by one person. Butchers in Cincinnati, Ohio, invented a new way of cutting up carcasses. This process was called the disassembly line. The carcass moved along a line, where different people did different steps. Among the 13 steps were jobs like scraping the hair off the body, cutting off the head, and splitting the carcass into parts.

This method, picked up by butchers in other cities, such as Chicago, was very efficient. Workers in the Union Stock Yards in Chicago could cut up 5,000 pigs in one day. A new byproducts industry turned the inedible parts of the animal into other usable products, such as combs and oleomargarine. This stimulated agriculture and commerce in Chicago and nationally.

# Refrigerated Car



Refrigerated train car



Meat spoils fairly quickly after the carcass has been cut up. George Hammond invented the refrigerated car in 1868. The refrigerated car was a technological advance of the 19<sup>th</sup> century that prevented meat from spoiling by keeping it chilled on the way to market.

The refrigerated car allowed meat to be carried long distances from the stockyards to market.

It created meatpacking centers in Chicago and an ice industry in the Great Lakes region.

The advertising industry also grew. People were afraid of buying meat that was not salted and preserved; they thought it would be spoiled. The meat companies advertised to convince people that fresh meat was safe.

Joshua Sloth hurried to load up his wagon for the long trip into Bellestadt. The recent storms had turned to mud the dirt path that led from his farm out to Millview Creek. Yesterday, he'd seen Steven Johnson out in the far reaches of his cornfield, as both worked furiously to bring in the last of the year's crop. Steven, who had just come back from Bellestadt, warned Joshua that the creek was high and about to breach Alder's Bridge. Joshua knew this might be his last chance to get into town before winter hit.

Grueling as it was, the trip into town was a special event, a chance to see people and things out of the usual daily routine. The fall harvest trip was especially exciting to farm families everywhere in western Illinois, because it was the last chance to see other folks and gather supplies before hunkering down at home for the long winter. It might be months before they'd see other people again.

Young Jonathan, chosen by his father to make the journey, couldn't wait to leave.

"We ready to go yet, Pa?" he yelled as he burst out of the house.

"You finished patchin' up that hole in the wall?" asked Joshua. "There's bound to be another storm soon, and if that sod ain't packed good, Ma'll be swimmin' from the kitchen to the barn."

"All done, Pa, let's go!"

Joshua carefully pulled a tarp over the wagon's load, and Jonathan helped him tie it down. The crop had been good, and the bed was stacked with sacks of corn. They'd even grown enough peas and beans to have some surplus to sell in Bellestadt. Two years earlier, the sows had birthed 12 piglets; by now they were fully grown, and two huge pigs were tied down as well, ready to be sold to the butchers. Three of the others had already been slaughtered, and Ma had spent months preparing them into the bacon and hams that were packed down with salt in a big box. Joshua knew they would fetch a pretty penny in the Bellestadt market.

When the wagon was ready, Joshua and Jonathan went out to the smokehouse where Martha was taking down the last of the meats to bring into the house for the winter.

"Well, we're off, Ma," said Joshua. "We should be back by the end of the week. You have everything you need?"

“I’m just fine, Pa,” replied Martha. “Emily’s picklin’ the last of the cucumbers and beets, and Thomas should be back from huntin’ out in the woods by the end of the day. Abraham’s out fixin’ the fence where that cattle herd broke through last week. I’m a tad worried about that, Joshua. What if another drive comes through?” Martha was concerned about stray cattle coming onto the farm and trampling the last of the corn.

“I don’t think there’s anything to worry about,” Joshua answered. “With winter coming, they’ll be closing down the stockyards up in St. Louis, and none of those cattle kings will risk the weather turnin’ bad and losin’ their herds. You should be fine. Take care now, we’ll see you before long.”

Ma hugged both of them, and they turned toward the wagon to head off for town.



Joshua drove the horses out over the mud path, going slowly as they headed toward the main trail along Millview Creek. It was a good hour before they passed by the Johnsons’ house, and the Sun was just peeking up over the horizon. Steven and his boys were already out in the fields; Jonathan could see them in the distance bent over the last of the wheat stands, cutting down the stalks with their hand-held scythes. He waved, but they were too busy to see him.

Fortunately, it was a sunny day, and the path dried up enough during the morning that they made it to Millview Creek just before noon. There were more and more farmhouses as they got closer to the creek; someone had told Jonathan a while back that this was because the creek used to overflow more often and the floods brought rich soil to the nearby lands.

Along the way, Joshua told stories about his own first trip into Bellestadt when he was Jonathan’s age. The town had just been founded, and there weren’t more than 30 families living there, but Joshua’s father had found it worth the trip to sell off his surpluses and meet some new people. He’d even taught Joshua a little German so that he could speak a few words and make friends with the children his age. Jonathan was most interested, though, in the stories about the Illiniwek Indians his father described, who used to outnumber the settlers and lived in their own villages all along the route from their farm into the new town. Jonathan was pretty sure that the name of the state he lived in was taken from the tribe’s name. He’d heard, too, that the Illiniwek had lived in the area for hundreds of years. They even had stories that there was a city in

the area long ago that made it sound as big as Philadelphia today, the most populated city in the United States. By now, though, in the year 1822, almost all the villages were gone, and Jonathan had only heard about these people from his older brother Thomas, who had had some encounters with them while on his hunting trips.

There were few trees along the path from the farm, and it had become unseasonably hot for so late in the year. It was a welcome relief for both Joshua and Jonathan to arrive at the shady creek. They let the horses drink, but Joshua insisted they move on. “No time for tarryin’ – you never know what it’ll be like by the time we have to get back,” he admonished Jonathan. It was almost two o’clock by the time they got to Alder’s Bridge. Joshua could see that Steven Johnson’s news report was accurate: the water was running high, and another big storm could lead to a wash-out and big problems on their return trip. They crossed the bridge, tipped their hats to the Sattlers (who were patiently waiting on the other end until they’d crossed), and continued on along the new widened road that led to Parker’s Pond.

Jonathan loved the pond. Not only was it a great spot for fishing, but it was the closest fishing hole to Bellestadt, and he could count on some of the town boys being there whenever his family made the day trip for a picnic. There were a couple of boys he’d had a fine time with earlier that summer, and he was hoping to run into them as they passed by the pond. The few people they saw, though, were making their way either into or out of town. This wasn’t really the time of year for relaxing.

At the end of the pond, the road led just a short way to the main road that ran from Millview to Bellestadt. Joshua and Jonathan turned toward the east. Many more houses lined the main road, and they saw even more as they approached Bellestadt. Some were log cabins, but most were made of sod, like their own house. A few of the older ones were even made of stone.

They made much better time along the main road, and by late afternoon they were in town. This wasn’t his first time in Bellestadt, but to Jonathan, every trip was like the first. There were so many things to see, and the town was growing so quickly that there were always new things to fascinate him. The little burg of 30 families his father had visited in his youth was now a bustling home to 15,000 people, and more seemed to be making their way there every day. Jonathan was sure that the fields used to stretch much closer to the center of town, where now there were rows of neat new houses along streets he didn’t recognize. A good number of the houses

were just being built; there were stacks of sod dotting the landscape, with split logs for the balloon frames piled up next to them. At one point a wagon came by loaded up with stone, obviously on its way to a construction site for a family lucky enough to be able to afford a nicer house.

Jonathan knew that his father didn't see the changes as kindly. At first, when Joshua was Jonathan's age, he too had been excited about the newness. But over time, he'd become concerned about what was happening to his beloved home. Joshua loved the woods, and he hated to see them disappear so quickly. He knew, too, that the damming of the river and the logjams created by waste from the paper mill had created changes in the natural ways of things. The flooding around Alder's Bridge was just one example of the effects. He was upset, too, at the way the Illiniwek had been displaced from their ancestral lands. "It's no fault of theirs we've got so many people movin' in," he'd told Jonathan, "but they're the ones that suffer for it."

By the time the Sloths got into the center of town, it was getting near sunset. They made their way toward the river and the tavern where they'd be staying the next couple of evenings. As they passed the line of butcher shops, where they'd be spending a good deal of time the next day, Jonathan felt like he'd entered a new world. Life in town wasn't like it was on the farm. Here, it wasn't about one family surviving on its own. The butchers weren't slaughtering cows they'd be eating themselves; they were preparing different kinds of meats for all kinds of different people, some of whom may never have even milked a cow, let alone lived a day on a farm. In a way, he felt a little irritated that his father would be selling animals he'd helped raise himself for somebody else's benefit, somebody who might not appreciate the hard work that had gone into it. But he knew they needed the money they'd get from the sales to make it through the winter, so he let the thought go.

Jonathan loved the bustle along the riverfront, which reached a fever pitch as dusk approached. Butchers and other shopkeepers were busily cleaning up and getting ready to close down for the evening. Dozens of workers grunted and chanted out calls as they shoveled heaps of grain into cargo ships and barges that were nearly ready to set off on one of their last runs before winter. "Two days here," he thought to himself, "just isn't enough." He imagined what it might be like to actually live in town, but that seemed too distant an idea. For now, the two days would have to do. He planned to make the most of it.

### Balloon Frames

As agriculture expanded in the West, so did the demand for lumber. In order to have functioning farms, farmers needed not only a crop, but also structures in which to reside and others in which to store the crop. Balloon frames economically fulfilled this demand, simply using wood and nails in standardized sizes. As farmers began to deplete the limited local tree supply, they looked to the north woods of Wisconsin and Michigan. From the 1850s to the 1880s, the lumber industry grew and thrived off of the seemingly endless supply of white pines in these northern timberlands, supported by the expanding transportation networks linking different areas of the country. Water routes on Lake Michigan and the railroad lines stemming from Chicago linked farmers in the Midwest to lumber suppliers in the north. But by the 1890s, the supply of white pine began to dwindle, and farmers and companies began to look west to Washington and Idaho for their lumber supply. By the 1900s, after failed attempts by farmers to grow crops in the soil previously inhabited by forests, the northern woods were abandoned and left treeless.

### Barbed Wire

The invention of barbed wire bypassed the need to build miles of wooden fences to demarcate boundaries and enclose pastureland. Barbed wire could do the same work as wooden fences, but with less wood needed, since wood was only used as fence posts in barbed-wire fences, and not for rails. Barbed wire supported the expansion



Logged forest, 1906, near Seattle, Washington

of ranches raising livestock, and the grazing of the livestock, in turn, depleted vegetation on the prairie. Thus, the technological advances of the balloon frame and barbed wire, considered together, accounted for the destruction of two natural systems—the prairies of the Midwest and the white pine forests of Michigan and Wisconsin—through the unregulated extraction of natural resources for economic development.

### Disassembly Line and Refrigerated Car

The disassembly line and refrigerated car in the meatpacking industry increased water pollution in the areas in which they operated. Both technologies allowed the meatpacking industry to expand in Chicago, but this expansion generated vast quantities of unusable portions of carcasses that required disposal. Some of this material was used to create byproducts such as lard, candles, and soaps, but the majority of this

toxic industrial waste was dumped into the Chicago River. A foul odor pervaded the areas around the river, to such a degree that residents complained throughout the 1850s and 1860s. In 1871, city engineers reversed the direction of flow in the Chicago River, sending it through the Illinois and Michigan Canal into the Illinois River instead of into Lake Michigan. The reversal of the Chicago River resulted in Chicago residents having a relatively clean water supply and air quality; however, residents downstream on the Illinois River then had to cope with the waste of the meatpacking industry in their water. One resident's complaint appeared in the *Chicago Tribune* in 1879: "...the stench has been almost unendurable. What right has Chicago to pour its filth down into what was before a sweet and clean river, pollute its waters, and materially reduce the value of property on both sides of the river and canal, and bring sickness and death to the citizens?"

### Technology

While use of technology affected nature and natural systems, so too did production of technological goods. For example, the balloon frame required trees to be cut for lumber, plus iron to be mined for nails. The refrigerated car required ice and salt for refrigeration, both of which were extracted from the environment; the refrigerated car was also part of a railroad system that required steel rails made from mined metal ores, water (as steam) and coal to fuel the engine, and wood for railroad ties and for the construction of the cars themselves.

The effects of extraction went beyond the simple depletion of natural resources; natural systems were affected as well. For example, clear-cutting of woodlands exposed soil, resulting in massive erosion and silting of streambeds. Waste lumber complicated this process further by producing artificial dams that altered those systems.

Other types of waste from production of goods such as steel and processed lumber created extensive environmental problems. The Bessemer process generated air pollution in the form of coke-oven gas (coke is made from coal and used as fuel), naphthalene, sulfur, and coke dust, and other emissions. Iron was mined for use in making steel, and slag, a solid byproduct, contributed to water pollution in the course of being used to create other products, such as road fill and fertilizer. Sawdust from lumber mills also polluted water supplies and was a source of air pollution when large quantities were burned for disposal.

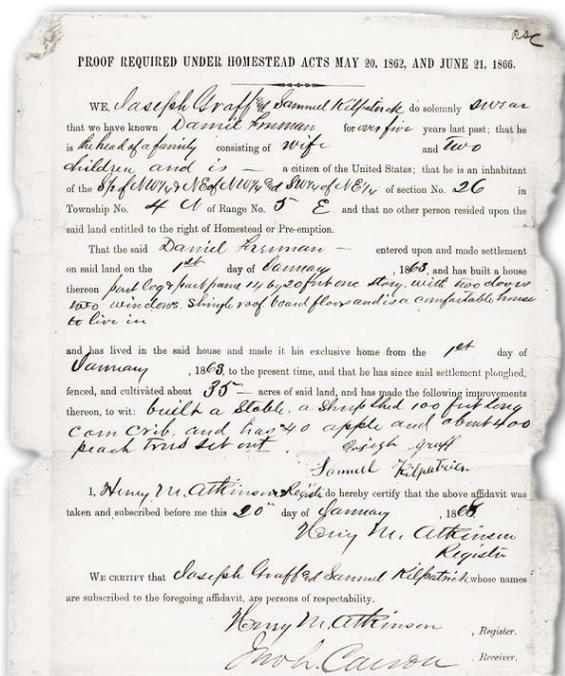


Chicago River

# Homestead Act of 1862



Homestead, 1933

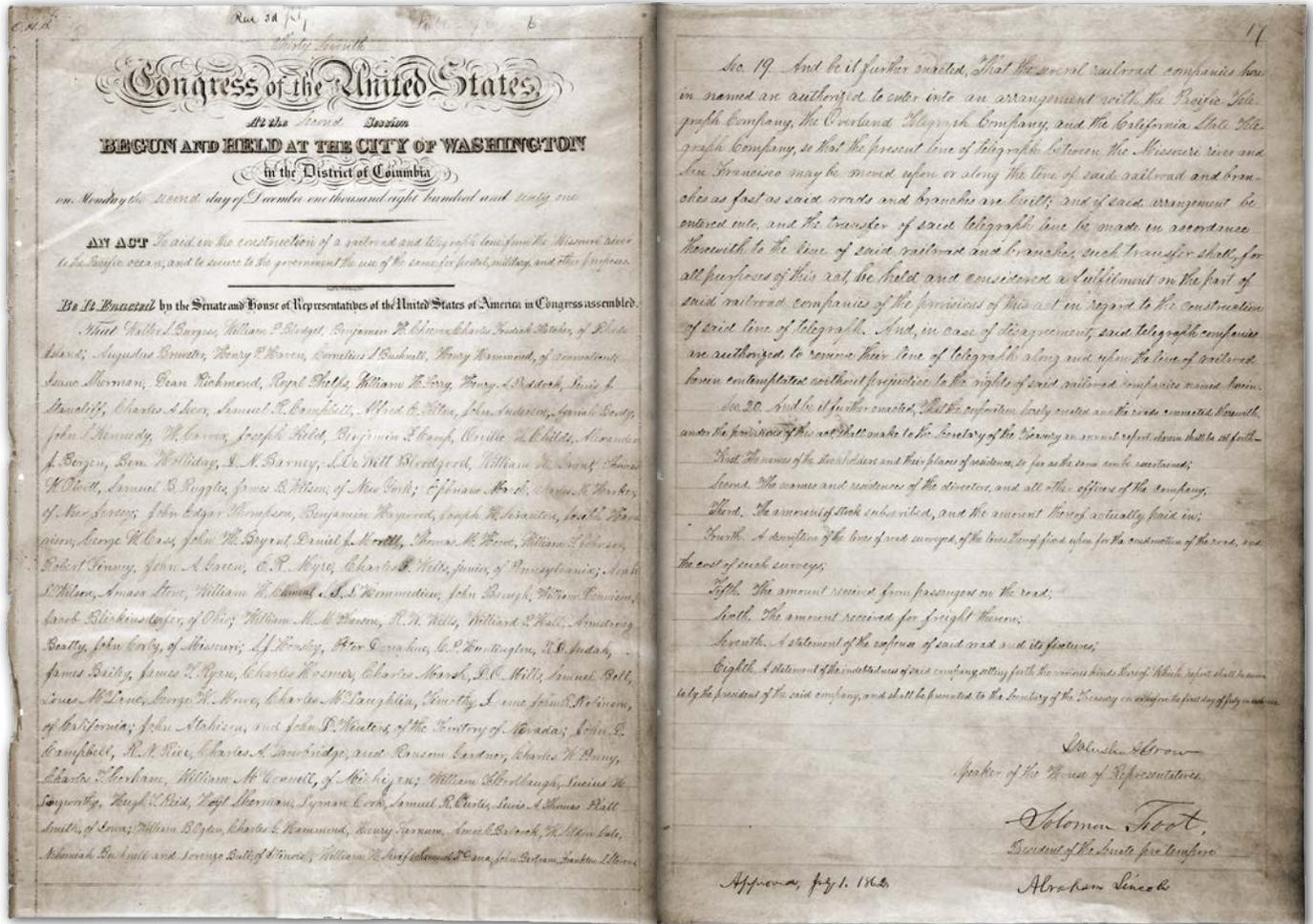


Homestead document

The Homestead Act of 1862, passed by Congress and signed by President Abraham Lincoln, gave large amounts of land to any U.S. citizen willing to live on and improve it over the course of five years. This provided incentives for farmers – speculators<sup>1</sup>, cattlemen, miners, lumbermen, and railroad companies to move west. Some 500 million acres of land—greater than the size of the state of Texas—were granted by the U.S. Government from 1862 through 1904.

<sup>1</sup> A person who takes a lot of financial risk for the chance to make a lot of profit.

# Pacific Railway Act of 1862



Railway Act of 1862

“An act to aid in the construction of a railroad and telegraph line from the Missouri river to the Pacific Ocean, and to secure to the government the use of the same for postal, military, and other purposes.”

This act, passed by Congress and signed by President Abraham Lincoln, authorized the building of four transcontinental railroads. This law provided government loans and land on either side of the tracks to railroad companies. Railroad companies ended up receiving some 174 million acres of land from this law. The first Transcontinental Railroad was completed in 1869.

# Internal Combustion Engine



1896 Benz Velo automobile

The internal combustion engine burns fuel primarily to move vehicles, though it also has many industrial purposes. It was developed in stages over two centuries. By the end of the 19<sup>th</sup> century, it was finally being used to propel automobiles, one of which was on display at the 1893 World's Fair in Chicago.

Petroleum had previously been used mostly to make kerosene for lamps, but with expanding use of the internal combustion engine, the demand for petroleum oil increased dramatically. In 1869, about 4 million barrels of crude oil were produced in the United States; by 1889, production had increased to more than 35 million barrels. By 1906 the number had risen to more than 126 million barrels.



Oil field, Los Angeles, 1896

# Deforestation of the American West

By the middle of the 19<sup>th</sup> century, the northeastern United States was almost entirely deforested. This process moved west as people migrated in that direction. As cities like Chicago grew, deforestation hit a peak in the Great Lakes region.

Deforestation had many effects. Habitat destruction can lead to the loss of many species of plants and animals. Interruption of the water cycle can change the availability of water and water resources. This can affect wildlife and human communities. Soil erosion can create problems for water systems and lead to further problems created by landslides.



Logged forest, 1906, near Seattle, Washington



Packing lumber on mules, 1934, Arizona

# Byproducts Industry



Union Stockyards, 1941, Chicago, Illinois

The byproducts industry was a completely new industry created by the livestock and meatpacking industries of the West. Most of an animal became meat for people to consume, but what happened to the inedible parts—bone, innards, fat? As more and more livestock was slaughtered, these inedible parts

accumulated. Rather than see them go to waste, the main meatpackers, such as Phillip Armour, devised products so that every part of an animal's carcass was sold. Butchers acting individually could never collect enough of these materials. As one reporter at the World's Fair of 1893 observed:

*“Every single thing [related] to a slaughtered beef is sold and put to use... The straight lengths of leg bone go to the cutlery-makers... the entrails become sausage-casings; their contents make fertilizing materials; the livers, hearts, tongues, and trails, and the stomachs, that become tripe, all are sold over the butchers' counters of the nation; the knuckle-bones are ground up into bone-meal for various uses; the blood is dried and sold as a powder for commercial purposes; the bladders are dried and sold to druggists, tobacconists, and others; the fat goes into oleomargarine, and from the hoofs and feet and other parts come glue and oil and fertilizing ingredients.”*









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