SECTION 1

The Expansion of Industry

MAIN IDEA	WHY IT MATTERS NOW	Terms & Names
At the end of the 19th century, natural resources, creative ideas, and growing markets fueled an industrial boom.	Technological developments of the late 19th century paved the way for the continued growth of American industry.	• Edwin L. Drake • Bessemer process • Thomas Alva Edison • Christopher Sholes • Alexander Graham Bell

One American's Story

One day, Pattillo Higgins noticed bubbles in the springs around Spindletop, a hill near Beaumont in southeastern Texas. This and other signs convinced him that oil was underground. If Higgins found oil, it could serve as a fuel source around which a vibrant industrial city would develop.

Higgins, who had been a mechanic and a lumber merchant, couldn't convince geologists or investors that oil was present, but he didn't give up. A magazine ad seeking investors got one response—from Captain Anthony F. Lucas, an experienced prospector who also believed that there was oil at Spindletop. When other investors were slow to send money, Higgins kept his faith, not only in Spindletop, but in Lucas.

A Personal Voice PATTILLO HIGGINS

"Captain Lucas, . . . these experts come and tell you this or that can't happen because it has never happened before. You believe there is oil here, . . . and I think you are right. I know there is oil here in greater quantities than man has ever found before."

—quoted in *Spindletop*

VIDEO

GUSHER!
Pattillo Higgins and the Great Texas Oil Boom

In 1900, the two men found investors, and they began to drill that autumn. After months of difficult, frustrating work, on the morning of January 10, 1901, oil gushed from their well. The Texas oil boom had begun.

Natural Resources Fuel Industrialization

After the Civil War, the United States was still largely an agricultural nation. By the 1920s—a mere 60 years later—it had become the leading industrial power in the world. This immense industrial boom was due to several factors, including: a wealth of natural resources, government support for business, and a growing urban population that provided both cheap labor and markets for new products.

BLACK GOLD Though eastern Native American tribes had made fuel and medicine from crude oil long before Europeans arrived on the continent, early American settlers had little use for oil. In the 1840s, Americans began using kerosene to light lamps after the Canadian geologist Abraham Gesner discovered how to distill the fuel from oil or coal.

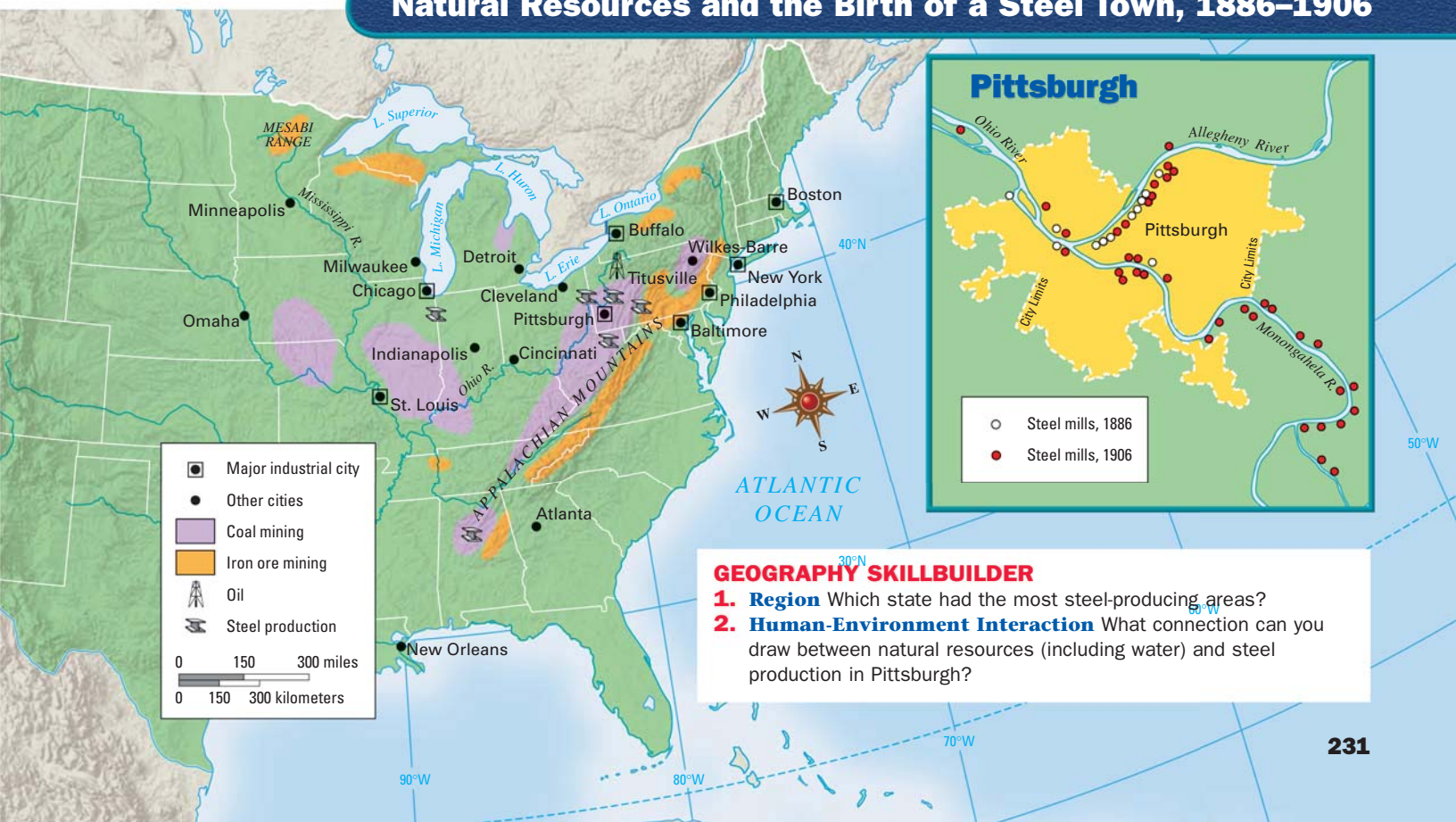
It wasn't until 1859, however, when **Edwin L. Drake** successfully used a steam engine to drill for oil near Titusville, Pennsylvania, that removing oil from beneath the earth's surface became practical. This breakthrough started an oil boom that spread to Kentucky, Ohio, Illinois, Indiana, and, later, Texas. Petroleum-refining industries arose in Cleveland and Pittsburgh as entrepreneurs rushed to transform the oil into kerosene. Gasoline, a byproduct of the refining process, originally was thrown away. But after the automobile became popular, gasoline became the most important form of oil.

Vocabulary
entrepreneur: a person who organizes, operates, and assumes the risk for a business venture

BESSEMER STEEL PROCESS Oil was not the only natural resource that was plentiful in the United States. There were also abundant deposits of coal and iron. In 1887, prospectors discovered iron ore deposits more than 100 miles long and up to 3 miles wide in the Mesabi Range of Minnesota. At the same time, coal production skyrocketed—from 33 million tons in 1870 to more than 250 million tons in 1900.

Iron is a dense metal, but it is soft and tends to break and rust. It also usually contains other elements, such as carbon. Removing the carbon from iron produces a lighter, more flexible, and rust-resistant metal—steel. The raw materials needed to make steel were readily available; all that was needed was a cheap and efficient manufacturing process. The **Bessemer process,** developed independently by the British manufacturer Henry Bessemer and American ironmaker William Kelly around 1850, soon became widely used. This technique involved injecting air into molten iron to remove the carbon and other impurities. By 1880, American manufacturers were using the new method to produce more than 90 percent of the nation's steel. In this age of rapid change and innovation, even

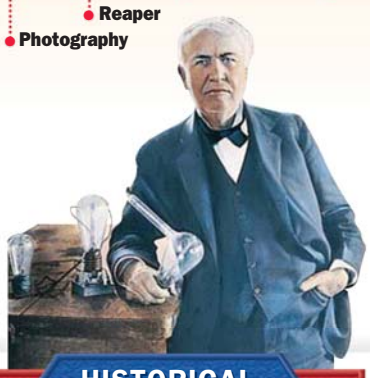
Natural Resources and the Birth of a Steel Town, 1886–1906



GEOGRAPHY SKILLBUILDER

1. **Region** Which state had the most steel-producing areas?
2. **Human-Environment Interaction** What connection can you draw between natural resources (including water) and steel production in Pittsburgh?

The Technological Explosion, 1826–1903



HISTORICAL SPOTLIGHT

ILLUMINATING THE LIGHT BULB

Shortly after moving into a long wooden shed at Menlo Park, Thomas Alva Edison and his associates set to work to develop the perfect incandescent bulb. Arc lamps already lit some city streets and shops, using an electric current passing between two sticks of carbon, but they were glaring and inefficient.

Edison hoped to create a long-lasting lamp with a soft glow, and began searching for a filament that would burn slowly and stay lit. Edison tried wires, sticks, blades of grass, and even hairs from his assistants' beards. Finally, a piece of carbonized bamboo from Japan did the trick. Edison's company used bamboo filaments until 1911, when it began using tungsten filaments, which are still used today.

the successful Bessemer process was bettered by the 1860s. It was eventually replaced by the open-hearth process, enabling manufacturers to produce quality steel from scrap metal as well as from raw materials. A

NEW USES FOR STEEL The railroads, with thousands of miles of track, became the biggest customers for steel, but inventors soon found additional uses for it. Joseph Glidden's barbed wire and McCormick's and Deere's farm machines helped transform the plains into the food producer of the nation.

Steel changed the face of the nation as well, as it made innovative construction possible. One of the most remarkable structures was the Brooklyn Bridge. Completed in 1883, it spanned 1,595 feet of the East River in New York City. Its steel cables were supported by towers higher than any man-made and weight-bearing structure except the pyramids of Egypt. Like those ancient marvels, the completed bridge was called a wonder of the world.

Around this time, setting the stage for a new era of expansion upward as well as outward, William Le Baron Jenney designed the first skyscraper with a steel frame—the Home Insurance Building in Chicago. Before Jenney had his pioneering idea, the weight of large buildings was supported entirely by their walls or by iron frames, which limited the buildings' height. With a steel frame to support the weight, however, architects could build as high as they wanted. As structures soared into the air, not even the sky seemed to limit what Americans could achieve.

MAIN IDEA

Summarizing

A What natural resources were most important for industrialization?

Inventions Promote Change

By capitalizing on natural resources and their own ingenuity, inventors changed more than the landscape. Their inventions affected the very way people lived and worked.

THE POWER OF ELECTRICITY In 1876, **Thomas Alva Edison** became a pioneer on the new industrial frontier when he established the world's first research laboratory in Menlo Park, New Jersey. There Edison perfected the incandescent light bulb—patented in 1880—and later invented an entire system for producing and distributing electrical power. Another inventor, George Westinghouse, along with Edison, added innovations that made electricity safer and less expensive.

Vocabulary

incandescent: giving off visible light as a result of being heated

The harnessing of electricity completely changed the nature of business in America. By 1890, electric power ran numerous machines, from fans to printing presses. This inexpensive, convenient source of energy soon became available in homes and spurred the invention of time-saving appliances. Electric streetcars made urban travel cheap and efficient and also promoted the outward spread of cities.

More important, electricity allowed manufacturers to locate their plants

MAIN IDEA

Analyzing Effects

B How did electricity change American life?

wherever they wanted—not just near sources of power, such as rivers. This enabled industry to grow as never before. Huge operations, such as the Armour and Swift meatpacking plants, and the efficient processes that they used became the models for new consumer industries. B

INVENTIONS CHANGE LIFESTYLES Edison's light bulb was only one of several revolutionary inventions. **Christopher Sholes** invented the typewriter in 1867 and changed the world of work. Next to the light bulb, however, perhaps the most dramatic invention was the telephone, unveiled by **Alexander Graham Bell** and Thomas Watson in 1876. It opened the way for a worldwide communications network.

The typewriter and the telephone particularly affected office work and created new jobs for women. Although women made up less than 5 percent of all office workers in 1870, by 1910 they accounted for nearly 40 percent of the clerical work force. New inventions also had a tremendous impact on factory work, as well as on jobs that traditionally had been done at home. For example, women had previously sewn clothing by hand for their families. With industrialization, clothing could be mass-produced in factories, creating a need for garment workers, many of whom were women.

▲ The typewriter shown here dates from around 1890.

Industrialization freed some factory workers from backbreaking labor and helped improve workers' standard of living. By 1890, the average workweek had been reduced by about ten hours. However, many laborers felt that the mechanization of so many tasks reduced human workers' worth. As consumers, though, workers regained some of their lost power in the marketplace. The country's expanding urban population provided a vast potential market for the new inventions and products of the late 1800s.

SECTION 1 ASSESSMENT

1. TERMS & NAMES For each term or name, write a sentence explaining its significance.

- Edwin L. Drake
- Bessemer process
- Thomas Alva Edison
- Christopher Sholes
- Alexander Graham Bell

MAIN IDEA

2. TAKING NOTES
In a chart like the one below, list resources, ideas, and markets that affected the industrial boom of the 19th century. In the second column, note how each item contributed to industrialization.

Resources, Ideas, Markets	Impact

CRITICAL THINKING

3. MAKING INFERENCES
Do you think that consumers gained power as industry expanded in the late 19th century? Why or why not?

4. HYPOTHESIZING
If the U.S. had been poor in natural resources, how would industrialization have been affected?

5. ANALYZING EFFECTS
Which invention or development described in this section had the greatest impact on society? Justify your choice. **Think About:**

- the applications of inventions
- the impact of inventions on people's daily lives
- the effect of inventions on the workplace

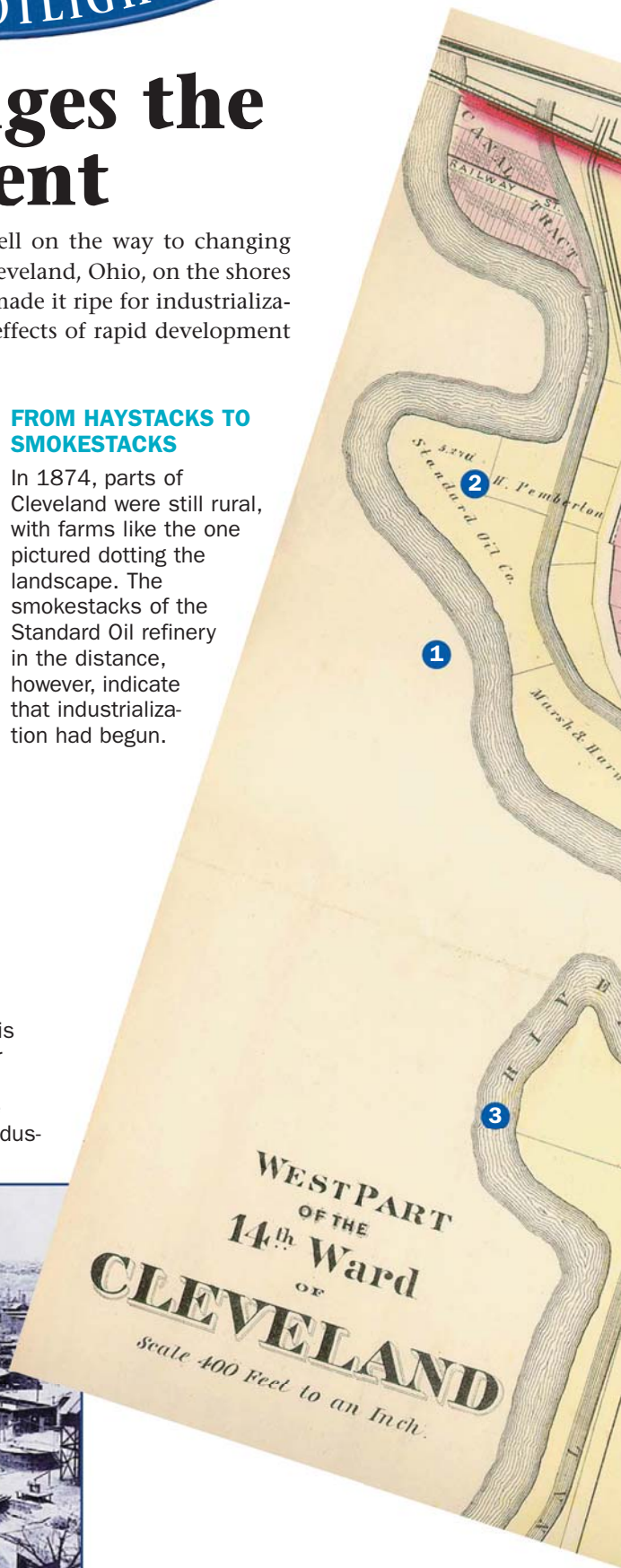
GEOGRAPHY SPOTLIGHT

Industry Changes the Environment

By the mid-1870s, new ideas and technology were well on the way to changing almost every aspect of American life. The location of Cleveland, Ohio, on the shores of Lake Erie, gave the city access to raw materials and made it ripe for industrialization. What no one foresaw were the undesirable side effects of rapid development and technological progress.

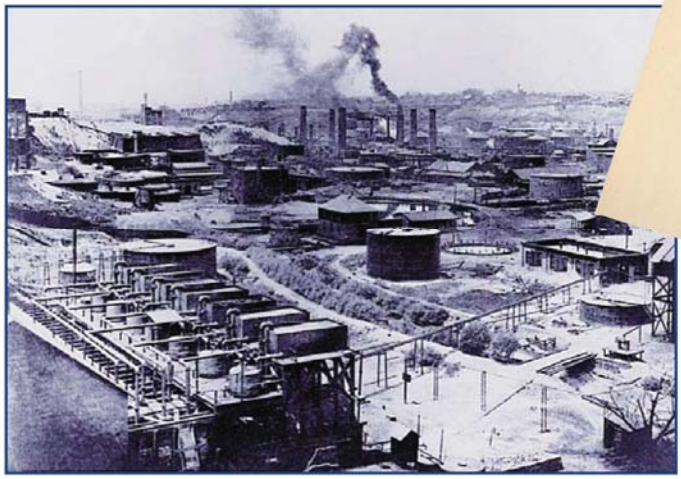
1 FROM HAYSTACKS TO SMOKESTACKS

In 1874, parts of Cleveland were still rural, with farms like the one pictured dotting the landscape. The smokestacks of the Standard Oil refinery in the distance, however, indicate that industrialization had begun.



2 REFINING THE LANDSCAPE

Industries like the Standard Oil refinery shown in this 1889 photo soon became a source of prosperity for both Cleveland and the entire country. The pollution they belched into the atmosphere, however, was the beginning of an ongoing problem: how to balance industrial production and environmental concerns.



3 A RIVER OF FIRE

Industrial pollution would affect not only the air but also the water. Refineries and steel mills discharged so much oil into the Cuyahoga River that major fires broke out on the water in 1936, 1952, and 1969. The 1952 blaze, pictured above, destroyed three tugboats, three buildings, and the ship-repair yards. In the decade following the 1969 fire, changes in the way industrial plants operated, along with the construction of wastewater treatment plants, helped restore the quality of the water.

THINKING CRITICALLY

1. **Analyzing Patterns** Locate the Standard Oil Company on the map of Cleveland. What can you conclude about where industry was located as compared with the location of residential neighborhoods?
2. **Creating a Thematic Map** Pose a historical question about the relationship between industry and areas of the Midwest. For example, what types of industry developed near Chicago and why? Then research and create a map that answers your question.

SEE SKILLBUILDER HANDBOOK, PAGE R32.

RESEARCH LINKS CLASSZONE.COM