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WALTER A. HAZEN

 GOOD YEAR BOOKS

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### Dedication

To Martha, Jordan, and Allison

### Acknowledgments

Grateful acknowledgment to my editor, Laura Strom, who has guided me through several books in Good Year’s “Everyday Life” series. Without her advice and support, this book would not have been possible.

I would also like to thank Roberta Dempsey, Acquisitions Manager at Good Year, for giving me the opportunity to be a part of such an exciting project. Her support and confidence in me is likewise appreciated.

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## Introduction

**A**mericans have always been a people on the go. Daniel Boone helped set the tone in the late 1700s by stating that when he could see the smoke from his nearest neighbor's chimney, the time had come to move on.

Like people everywhere, colonists in the beginning “moved on” by either foot or horseback. Then they learned to make canoes and dugouts from the Indians and did much of their traveling by water. But a water route did not always go in the direction they desired. So they were forced to come up with other means of travel.

*Everyday Life: Transportation* is the story of how those other means developed. It follows Americans from the time they went about on foot and horseback to when they first blasted off from Cape Canaveral in a space shuttle in the late 20th century. In between, it accompanies them as they bounce along on crude roads in equally crude carriages and stagecoaches or float down rivers on flatboats and keelboats. It continues to follow them as they cruise along on steamboats, clipper ships, and then magnificent ocean liners. Further, it relates their excitement as they experience trips in early trains, trolleys, and motor vehicles. And it goes right along with them as they brave those early rickety airplanes and later enjoy the speed and comfort of modern jet airliners. Almost every means of transportation used in America's long history is covered.

As with other books in Good Year's “Everyday Life” series, *Everyday Life: Transportation* is written in a style designed to appeal to young readers. Each chapter contains interesting stories and anecdotes and is followed by activities that span the entire curriculum. I am certain students will find *Everyday Life: Transportation* both informative and interesting.

Walter A. Hazen





## By Foot, Horse, and Canoe

**L**ife was simple in the early days of our country. If you wished to travel, or rather, if you had to travel, you walked. You chose a narrow Indian path heading in the general direction you wanted to go, and you set out. If you were very young or very old or in ill-health, you rode pickaback, or piggyback. And if you were very lucky, you didn't get lost.

Early settlers traveled only when necessary. Trails were poorly marked, and possible danger lurked at every turn. There might be a hostile Indian hiding somewhere along the way, or even a highwayman, or bandit. (Yes, there were bad guys even in those innocent days.) To offset the danger of being attacked, colonists usually traveled in groups.

Even after the colonies were well established, people still traveled primarily on foot. Round-trip walks of twenty miles or more were not uncommon for settlers who had to go into town for provisions. Such treks caused shoes to wear out quickly and kept village cobblers busy.

As time passed, pioneers who pushed farther into the wilderness blazed, or marked, trails for others to follow. They did this by making notches on trees that bordered the paths on which they traveled. These trails were so narrow that only people on foot and horseback could use them. Roads as such did not appear until well into the colonial period.

Foot was the means of travel for those who accompanied Daniel Boone through the Cumberland Gap of the Appalachian Mountains into Kentucky in 1769. Earlier, Boone, along with his parents and eight brothers and sisters, had walked the entire distance from Pennsylvania to North Carolina. And even after crude roads were built, there were always hearty souls who walked to where they were going. Many of the Mormons who set out for Utah in the 1840s walked every foot of the way, pushing their belongings along in handcarts. Even after roads were improved, pioneers without either horses or wagons traveled them on

Daniel Boone leading a group of pioneers through the Cumberland Gap into what is now part of the state of Kentucky.





foot. One family was observed in 1811 making its way on foot along the National Road that ran from Cumberland, Maryland, to Vandalia, Illinois. These people walked the entire 600 miles with all their worldly possessions crammed into a wheelbarrow.

## Travel by Horse

If you were fortunate in those early days, you owned a horse. If you didn't, you might share a horse with another person. A system of travel developed that was called ride-and-tie. It was a unique method that allowed at least four people traveling to the same destination to ride part of the way. And part of the way, of course, they walked.

Here is how the ride-and-tie method worked. Imagine that four travelers set out together for the same location. Two started on foot and two on horseback. The two on horseback rode ahead several miles to a predetermined spot, where they dismounted, tied the horse to a tree, and continued on foot. The two who had begun the journey on foot walked until they came to where the horse was tied. They then took the horse and traveled for several miles to another predetermined place, where they in turn tied the horse to a tree and once again sallied forth on foot. The two who had ridden the horse at the beginning then walked until they could claim the horse again. Thus the travelers alternated riding and walking until they reached their destination. Such a simple method allowed all four to complete the journey without becoming overly fatigued.

Sometimes a person traveling

Traveling by horse or wagon was a luxury in the early days of our country. Some people walked the entire 600 miles of the National Road.





by horse was faced with crossing a river. If the river was particularly deep, the traveler might make use of a ferry service. Such services began almost as soon as the colonies were founded. At first they consisted only of canoes. For a few pennies a rider was ferried across the river by the owner of the canoe. There was no extra charge for the rider's horse swimming along behind.

With horses such valuable property, laws were quickly passed to deal with thieves who took them and committed other crimes as well. For the first offense, the guilty party had the letter *B* for "bandit" branded on his forehead. The second time around, he was branded again and given a severe whipping. The third offense meant death. And for any crime committed on Sunday, the outlaw had his ears cut off as an added punishment.

It was best to behave yourself in those early days of our country!

### Canoes and Boats

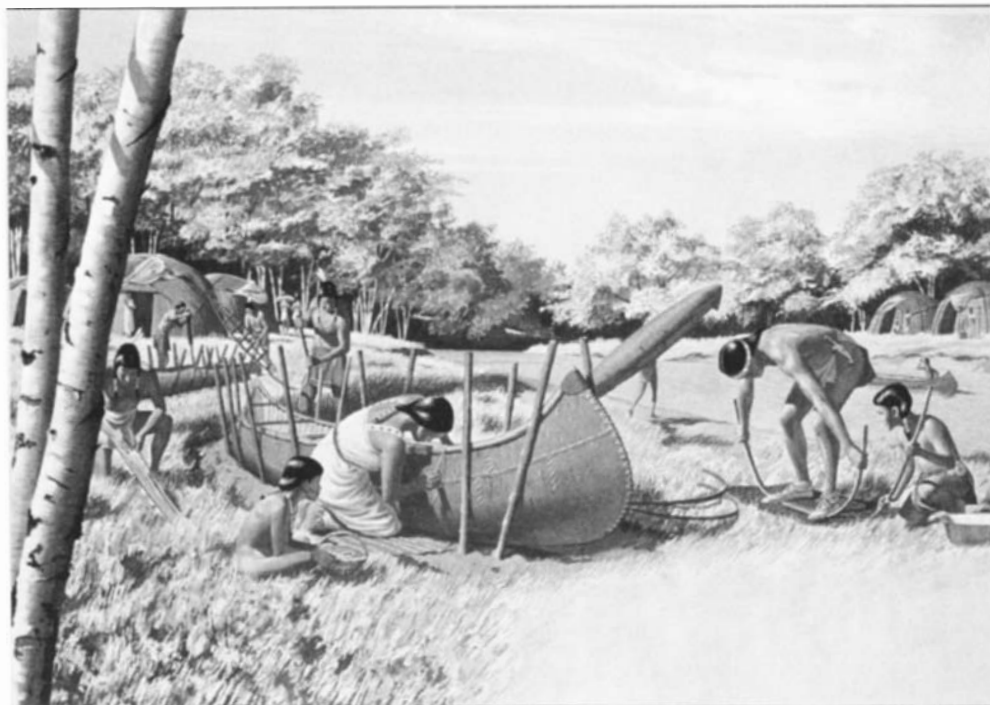
Native Americans shown building a canoe of birch bark and white cedar wood.

Next to walking, the easiest way to get around during colonial times was by canoe or boat. Since many settlements sprang up near a river or some other waterway, any person in possession of a canoe or boat had no problem traveling to another location that could be reached by water.

Early settlers learned to make canoes and dugouts from the Indians. A canoe, of course, is a light boat consisting of a framework covered with bark,

animal skin, or canvas. In the case of the Indians, canoes were usually covered with bark. A dugout is exactly what the name implies. It was a larger boat cut or burned out from a big log. More about dugouts in a moment.

Most canoes were of the birch-bark variety. The kind of birch tree used to make such canoes is called paper birch or white birch. Sometimes, for





obvious reasons, it is called canoe birch. Birch was preferred for canoe-making because the bark is thin and light and can be removed from the tree in strips. Although a birch-bark canoe held only one or two people, it was easy to transport and handled well in the water.

Contrast the birch-bark canoe with the elm-bark canoe of the Iroquois. The country of the Iroquois, which corresponded with what is now New York state, contained few birch trees. So the Iroquois fashioned their canoes from the bark of the elm tree. Although the elm-bark canoe was heavy and clumsy in the water, it did have one advantage over its birch-bark cousin: if the Iroquois

were attacking a stockade (a defensive barrier) or blockhouse (a small fort), they could stand their canoes on end against the fort's wall and climb up the rough bark of the boats' bottoms.

Early explorers and colonists adopted the birch-bark canoe because of its light weight. One man could carry it across even a long portage, the land over which a boat has to be carried from one river or stream to another. With the birch-bark canoe, an adventurous explorer or pioneer could go almost anywhere.

The dugout was a completely different kind of canoe. It was the type of boat used by the Massachusetts Indians who greeted the Pilgrims in 1620. Commonly made from a pine log, the dugout usually measured about 20 feet in length and was from 2 to 3 feet in width. It carried six people. An American Indian could make a dugout in about three weeks. We can only assume that it took a settler a trifle longer.

And so, by foot, horse, and canoe, Americans got to where they wanted to go in those early days of our nation's history. Travel became somewhat easier when roads and canals started to appear in the late 1700s and early 1800s.



The canoe was a major form of transportation in America for many years. This photograph from the late 1800s is of a Seminole Indian family near Miami, Florida.





## Finish a Story

But mishaps and strange things must have happened from time to time. With this in mind, finish the story that has been started for you. Give it any ending you choose. Continue on a sheet of notebook paper if necessary.

As the two men approached the clump of trees where they could once again claim rights to the horse, they stopped abruptly. The horse was not there! And there was no sign of Thomas and Ezekial.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



Name \_\_\_\_\_ Date \_\_\_\_\_

## Complete a Word Search

In the word box are 30 words from Chapter 1. Find and circle each in the word search. They run horizontally, vertically, and diagonally. None are inverted or backwards.

PATH	PIGGYBACK	TRAIL	PIONEER
CANOE	BLAZE	WILDERNESS	FERRY
MORMON	DUGOUT	HORSE	DANIEL
APPALACHIAN	BOONE	CANAL	OUTLAW
TRANSPORT	DESTINATION	UTAH	BIRCH
COLONIAL	INDIAN	KENTUCKY	SETTLER
IROQUOIS	STOCKADE	COBBLER	TRAVELER
MASSACHUSETTS	PORTAGE	PILGRIMS	

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T E N N E S S E E X M A R Y L A N D C
R T T A P I G G Y B A C K O R L A N O
A O R P R O B B L I S S O U T L S W L
N W A P A C K S I T S P R I N C E T O
S N I A Z A A K K R A X I X N T R A N
P U L L C N D N E F C G H L I D J K L
O L M A D O P N A O H H P K F Q I R A
R S T C U E O D V L U W X E Y R Z A L
T A B H C D R A D E S T I N A T I O N
E F G I H I T N S J E K L T P R M M N
O P Q A R S A I E E T T U U V A W X S
Y P Z N X K G E Y S T Z P C C V T D F
R I S T X K E L G C S T D K Z E Z H X
M O R M O N F B G H I J L Y B L A Z E
A N B C D E H O R S E X L E M E N O P
Q E R S T I R O Q U O I S U R R V W X
F E R R Y Y Z N Y T Z S T O C K A D E
Y R Z C K X P E Q A R T D D X Y A B C
C O B B L E R D F H G H J D U G O U T

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Name \_\_\_\_\_ Date \_\_\_\_\_

## Make Complete Sentences of Fragments

All of the statements here are fragments. They are not sentences because they lack a subject, a verb, or some other necessary part. Rewrite each as a complete sentence on the line provided.

1. When people traveled about in colonial times.

\_\_\_\_\_

2. Danger along the trail.

\_\_\_\_\_

3. Because roads were rough and few.

\_\_\_\_\_

4. Narrow trails that were poorly marked.

\_\_\_\_\_

5. As Daniel Boone neared the gap.

\_\_\_\_\_

6. Traveling through the mountains.

\_\_\_\_\_

7. Paddling along in a dugout.

\_\_\_\_\_

8. A bend in the road.

\_\_\_\_\_

9. Stripping bark from a birch tree.

\_\_\_\_\_

10. Ferry service across a river.

\_\_\_\_\_

11. Because canoes made of elm were heavy.

\_\_\_\_\_





Name \_\_\_\_\_ Date \_\_\_\_\_

## Account for the Short Life Expectancy

Because early Americans traveled by foot, horse, or boat wherever they went, one can assume they were all in good health and lived to ripe old ages—right?

Wrong! The average life expectancy in colonial times was 35 years. How can this be explained? Today, doctors advise us to participate in physical exercises, which include, among other things, walking, riding a horse, and rowing a boat or canoe. Such activities are health-giving and help us live longer.

Not so for the colonists. They walked, rode, and rowed to their hearts' content, yet lived relatively short lives. With this in mind, write your best answers to these questions.

1. List as many reasons as you can about why you think the life expectancy was so short in colonial times.

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2. Some people in colonial America did live to be 85, 90, or even 100 years old. If this is true, why was the average life expectancy only 35?

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3. Most Americans today, barring accident or serious illness, can expect to live to be about 75 years old. Why is this so?

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## Roads and Canals

**T**he story of roads in America is a story resembling a game of Follow the Leader. First, buffaloes and other animals created trails through forests and wilderness. Then, Indians came along and used many of these same trails to get to where they wanted to go. Soon, settlers arrived and gratefully availed themselves of the routes carved out for them by the animals and the Indians. Then, in time, many of these footpaths were widened and turned into roads. Some became turnpikes, or roads that charge a toll or fee to use.

### Early Roads

Two of the earliest roads in America were the Forbes Road and the Wilderness Road. The Forbes Road ran from Philadelphia to Pittsburgh, Pennsylvania. The Wilderness Road began in Virginia and crossed the Appalachian Mountains through the Cumberland Gap into Kentucky. One branch of it went into what is now Indiana.

The Forbes Road was hacked through the Allegheny Mountains by British troops in 1758. It was little more than a rough wagon road that led to Fort Duquesne, which later became Pittsburgh. After the French and Indian War, the road was used by many travelers and settlers to cross the Alleghenies into the Ohio valley. The Forbes Road was also known as the Pennsylvania State Road.

The Wilderness Road was started in 1775 by Daniel Boone and thirty other pioneers wielding axes. At first no more than a trail, it became a rough road in the 1790s. It was more than 300 miles long, and in time it became a turnpike. More than 200,000 pioneers traveled the Wilderness Road by the year 1800.

### The Lancaster Turnpike

The first surfaced road in America was the Lancaster Turnpike. It ran from Philadelphia to Lancaster, Pennsylvania, a distance of some 60 miles. It was 16–20 feet in width and was constructed of crushed rock and gravel. Travel along the

Travel along the National Road in the 1820s. Note the variety of types of traffic making its way past the Fairview Inn, a popular rest stop near Baltimore, Maryland.





road was fine except during times of heavy rain. Then, some of the stone and gravel was washed away and the occupants of wagons and coaches were subjected to bone-jarring rides. Horses suffered even more; many stepped into holes and broke their legs.

### The National Road

With more roads being carved out of the wilderness, the Western states began to fill up in the early 1800s. The “West” in those days consisted of what is now Ohio, Indiana, Kentucky, Michigan, and Illinois. In about 1806 settlers in those areas began to petition Congress to build a national highway that would run through the mountains to the Mississippi River. They needed a road by which to ship their farm products to the East and over which manufactured goods from the East could reach them. Congress agreed to put up the money, and work began in 1811 at Cumberland, Maryland.

At first the road was called the Great National Pike. By 1817 it reached the Ohio River at Wheeling, Virginia (later West Virginia). For its passage across the river, a suspension bridge that was the largest in the world at the time was built. The bridge was 1,010 feet in length and was suspended from towers that rose 153 feet above the river.

From Wheeling, the Cumberland Road, or National Road as it came to be called, extended on to Zanesville, Ohio. It reached the state’s capital at Columbus in 1833. From there it continued to Indianapolis, Indiana, and ended at Vandalia, Illinois, in 1852. Until the railroads made it less important, the 800-mile National Road served as the main link between East and West. Over its crushed stone passed thousands of wagons and coaches, as well as countless herds of cattle being driven to markets in the East.

Tolls to use the National Road varied considerably. For every score (20) of sheep, for example, the cost was six cents. The same was true for small carriages pulled by one horse. But for every coach or wagon with two horses and four wheels, the price rose to twelve cents. Tollgates were usually under the supervision of a family that lived near the road. Those in charge of the gate were responsible for collecting the tolls and seeing that cheapskates did not try to slip through without paying.



Coaches and Conestoga wagons jam the National Road about the year 1840.







Most roads were unpaved and stumps were never removed. Even the Wilderness Road contained stumps 12 to 18 inches high. Most roads also did not have bridges. In swampy areas, corduroy roads were necessary. Corduroy roads were made of logs laid sideways. A journey along such a road was hard on horses, wagons, and travelers alike.

Any person traveling one of America's early roads experienced an adventure neither they—nor their bones—quickly forgot!

### Canals

Transporting goods along America's roads was expensive. The average cost in 1800 for shipping goods a distance of 100 miles was \$10 per ton. This was about the same cost as shipping goods across the Atlantic to Europe. The overland freight charge between Philadelphia and Pittsburgh was a whopping \$125 per ton!

Faced with such costs, merchants began to think in terms of canals as a cheaper alternative for shipping their products. You may be wondering: why not use America's numerous rivers and other waterways to transport goods? Surely, such mighty rivers as the Mississippi and the Ohio were adequate for getting merchandise from Point A to Point B.

Rivers were and always had been used for moving freight. But rivers did not always go where goods needed to be shipped. For this reason, canals had been built as early as 1640. These canals, however, were short in length and could not compare with what Mayor De Witt Clinton of New York City proposed in 1812.

### The Erie Canal

Since the beginning of colonial times, people had talked about a canal that would link the Great Lakes with the Atlantic Ocean. But government leaders dismissed the idea as impractical and too expensive. When Mayor Clinton went to Washington in 1812 to ask for federal assistance in building such a canal, his request was turned down.

Clinton then turned to the New York state legislature for financial help. He got it in 1816—to the tune of \$7 million, which was a lot of money in

Scene along the Erie Canal, which ran from Albany to Buffalo, New York. From a steel engraving by William Henry Bartlett.





those days. When he was elected governor of the state in 1817, work on the canal began immediately.

The Erie Canal—as Clinton’s proposed project came to be called—took eight years to build. Work crews averaged about a mile a week, despite having to dig through rough ground. Most of the workers were Irish immigrants, who received 50 cents a day and all the meat they could eat. The canal was 42 feet wide at the top, 28 feet wide at the bottom, and was dug to a depth of 4 feet. Towpaths were built adjacent to the canal so that horses could pull boats along.

To cover the 363 miles from Albany to Buffalo, New York, eighty-three locks had to be built. A lock is like an elevator for water and boats. It raises the level of the water in a canal and permits the canal to be built over unlevel terrain.

The Erie Canal opened with much fanfare on November 4, 1825. Cannons were fired up and down the Hudson River to celebrate its dedication. Governor Clinton himself rode in the first boat to travel on the new waterway. His boat was followed by another called *Noah’s Ark*. Aboard *Noah’s Ark* were two Indian boys, two deer, two eagles, and other kinds of animals in sets of two. Another boat followed that included four raccoons, two wolves, another deer, and a fox. At the end of this first run, church bells rang, people cheered, and a big parade took place.

The Erie Canal was an immediate success. It paid for itself in twelve years, carrying both freight and passengers. Anybody could use the canal. People traveled along in simple rafts and flatboats as well as on fancy passenger boats whose dining rooms boasted linen tablecloths. Passengers had their choice of slow boats or fast boats. A slow boat moved at two miles per hour and cost 1½ cents a mile to ride. For those not afraid of whisking along at four miles an hour, a “fast” boat could be had for 5 cents a mile.

Other canals were soon constructed in various parts of the country. They cut not only the cost of shipping, but the travel time between destinations as well. When the Erie Canal began operation, for example, the time of travel between New York City and Buffalo was reduced from twenty days to six. And the cost of shipping a ton of freight between the two cities fell from \$100 to \$5.

The great age of canal building lasted until the railroads provided a faster means of transporting goods and people. But in their heyday, canals offered Americans a new and exciting way to get around at a time when their nation was constantly on the go and ever pushing westward.



## Keep a Canal Boat Diary

June 9, 1827

Dear Diary,

Name \_\_\_\_\_ Date \_\_\_\_\_



## Solve Some Road and Canal Math Problems

Here are several word problems dealing with travel on America's early roads and canals. Solve each in the space provided and write the answer on the appropriate lines.

1. Jordan and Allison Brewton took a pleasure ride the entire length of the Erie Canal. If they traveled on a passenger boat that averaged 4 miles an hour, how many hours (in round numbers) did it take them to go from Albany to Buffalo?  
\_\_\_\_\_ hours
2. A stagecoach traveling the Lancaster Turnpike from Philadelphia to Lancaster, Pennsylvania, made the trip in 3 days. How many miles did the coach average each day? \_\_\_\_\_ miles
3. Create a word problem of your own from the information given below. Ask a classmate to solve it.

### Means of Travel    Length in Miles

Erie Canal            363

Wilderness Road    300

National Road        800

Lancaster Turnpike   60

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Name \_\_\_\_\_ Date \_\_\_\_\_

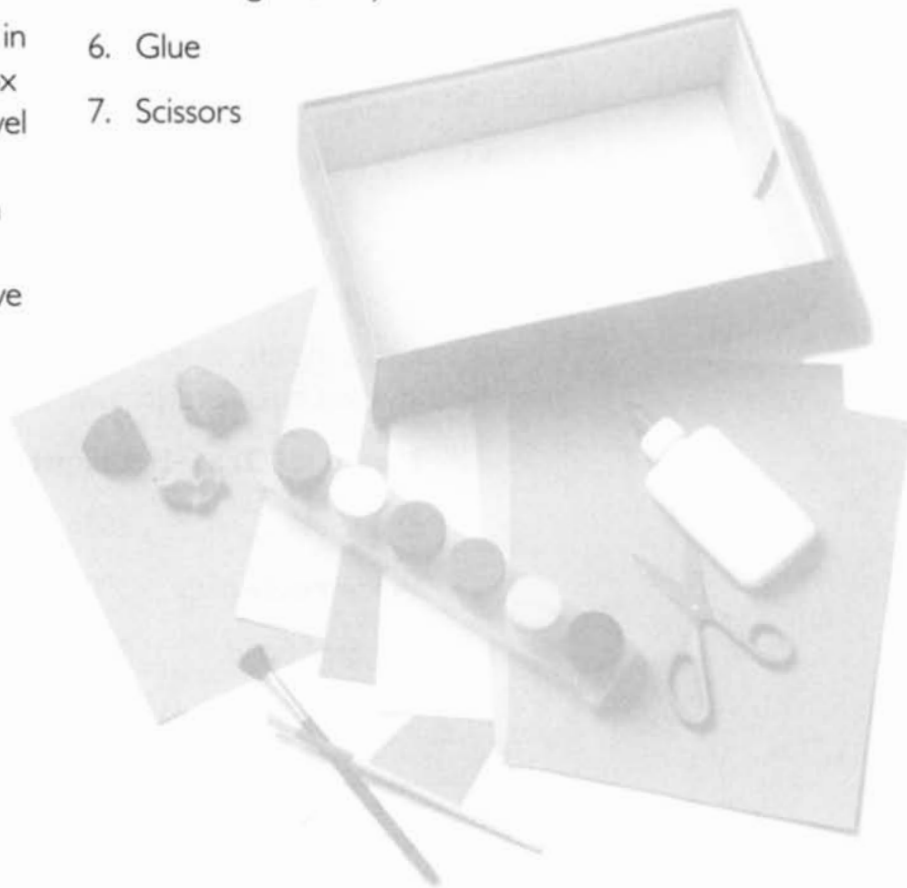
## Make a Shoe Box Diorama

All types of vehicles and foot traffic traveled the National Road from Cumberland, Maryland, to Vandalia, Illinois. The same was true of the Erie Canal with regard to the different kinds of boats that used it.

With this information in mind, make a shoe box diorama depicting travel on one of these early routes. A picture from an encyclopedia or history book might give you an idea for your scene.

### Some of the materials you might use include:

1. A shoe box
2. Construction paper
3. Magic markers or watercolors and paintbrush
4. Modeling clay or small figurines
5. Ice cream sticks or other small pieces of wood (for making rafts, wagons, etc.)
6. Glue
7. Scissors



Name \_\_\_\_\_ Date \_\_\_\_\_



## Recall What You've Read

The word(s) in *italics* make each of these statements false. On the blank line provided, and without looking back through the chapter, write the word(s) that make each statement a true sentence.

1. The Forbes Road was cut through the Allegheny Mountains during the *American Revolution*. \_\_\_\_\_
2. *Interstates* are roads that charge a toll, or fee to use. \_\_\_\_\_
3. Daniel Boone helped start the *National Road*. \_\_\_\_\_
4. The Lancaster Turnpike ran from Lancaster, Pennsylvania, to *Pittsburgh*. \_\_\_\_\_
5. The *Wilderness Road* was called the Great National Pike.  
\_\_\_\_\_
6. The National Road began in *Kentucky* and ran to Illinois.  
\_\_\_\_\_
7. *Large stones* were used to make corduroy roads.  
\_\_\_\_\_
8. Money to construct the Erie Canal came from the U. S. Congress. \_\_\_\_\_
9. Most of the workers who built the Erie Canal were *Scottish* immigrants. \_\_\_\_\_
10. The Erie Canal ran from *Philadelphia*, Pennsylvania, to Buffalo, New York. \_\_\_\_\_
11. The Erie Canal covered a distance of 200 miles. \_\_\_\_\_
12. De Witt Clinton was the governor of *Pennsylvania*. \_\_\_\_\_
13. The Erie Canal was dug to a depth of *eight* feet. \_\_\_\_\_
14. A passenger could take a "fast boat" on the Erie Canal and travel at a speed of ten miles an hour. \_\_\_\_\_
15. The *Lancaster Turnpike* was also known as the Pennsylvania State Road. \_\_\_\_\_







## Riverboats and Sailing Ships

**S**ettlers going West in the early 1800s often went part of the way by road and part of the way by water. On foot or by wagon or coach, they traveled overland to one of several rivers that would take them on the final leg of their journey. Three of these rivers were the Tennessee, the Ohio, and the Mississippi. Then, by flatboat or keelboat, they rode the river's current downstream to where they wanted to go.

### Flatboats and Keelboats

Most pioneers floated west on flatboats. Flatboats were raftlike barges that came in various types. They all had flat bottoms, square sides, and were about 40 feet in length. Flatboats traveled with the current and were steered by two long oars. One oar was located at the rear of the boat while the other was operated from atop a box-like shelter built in the center.

A flatboat in the early 1800s sold for about \$35. Some pioneers bought them outright; others traded their wagons to obtain them. Many had to pay rivermen to take them downstream. Because a flatboat could not travel upstream, those pioneers who owned their boats broke them down and sold them for lumber or firewood when they reached their destination. Others used the lumber to help start their first homes.

Rivermen who guided flatboats downstream usually walked home at the completion of their long journeys.

Many boats were fitted with tables, chairs, beds, and even stoves. Others resembled arks in that they were crammed to capacity with chickens, ducks, sheep, hogs, cattle, and horses. Sometimes overloaded flatboats hit sandbars or snags and sank. At such times, pioneers stood by helplessly and watched their prize

possessions sink to the bottom of a river.

A trip downstream on a flatboat was filled with adventure. During the long three-month journey, rivermen kept pioneers entertained with their yarns and fiddling (fiddle playing). Men talked and fished, while women busied themselves cooking and sewing. Children enjoyed a cool swim each time the boat tied up to the bank for a brief stay. Occasionally, hostile Indians would



A flatboat shares the river with steamboats in this Currier & Ives lithograph of 1870.





attack, at which time everyone retreated inside the flatboat's "house" for protection.

In time, some flatboat traffic gave way to keelboats. Keelboats differed from flatboats in a number of ways. They were long, narrow craft with tapered or pointed bows and sterns. Their name came from their having a keel, a long, wooden bar at the bottom on which the ribs or frames of the boats were built up. If desired, a keelboat could be pulled or poled back upstream once its journey was completed. To do so, however, took a lot of effort. Men had to stand at the back of the boat with long poles and push the vessel forward. Sometimes a sail was used to navigate a keelboat upstream.

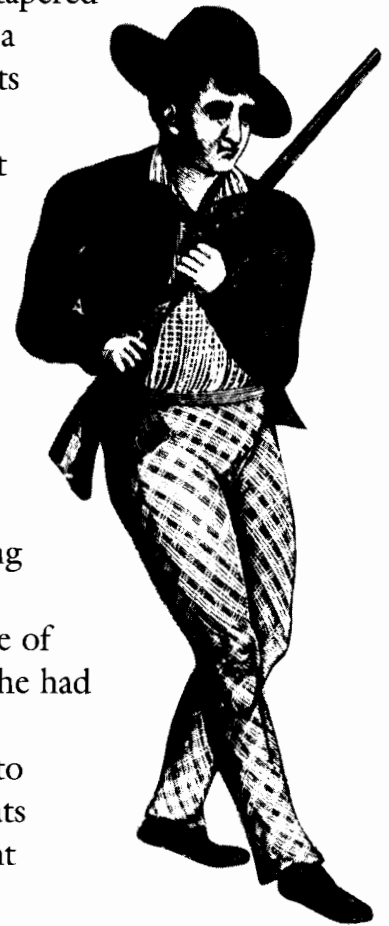
The men who worked the flatboats and keelboats were as tough and rowdy as any the frontier produced. You may have heard of Mike Fink. Mike was a boatman who steered keelboats down the Ohio and Mississippi Rivers in the early 1800s. He was always involved in fights and liked to boast to people that he was "half horse, half alligator, and half snapping turtle." He also enjoyed pranks, even going as far as setting his wife's hair on fire. (She managed to jump into a river and douse the flames before suffering any serious injury.) In the end, Mike met the fate of many who lived outside the law; he was shot dead by a friend of a man he had killed.

Even after steamboats appeared, flatboats and keelboats continued to travel the rivers of America. In the year 1846 alone, long after steamboats were in general use, more than 2,000 flatboats carried people and freight down the Ohio and Mississippi rivers to New Orleans.

### The Steamboat

One bright summer day in August 1807, a large group of people stood on the banks of the Hudson River in New York, pointing to something in the water. They were hooting and laughing at a boat they called "Fulton's Folly." With thick black smoke streaming from its stack, it looked a little like a sawmill on fire. The source of the crowd's amusement was Robert Fulton's steamboat, the *Clermont*.

Robert Fulton did not invent the steamboat. He simply made the first one that was practical and proved to be a commercial success. Actually, an inventor named John Fitch produced the first steamboat in 1787. It was a



Mike Fink, legendary keelboatman who became the subject of many "tall tales." Fink guided keelboats down the Ohio and Mississippi Rivers in the early 1800s.





Gold prospectors aboard a steamboat on their way to the Yukon Territory of Canada in the late 1890s. The large paddle wheel at the rear propelled the ship along.

strange-looking craft with long, canoelike paddles on each side. But since it was driven by a steam engine, it could properly be called a steamboat. Unfortunately for Fitch, the public showed little interest in his vessel, and he was unable to turn it into a financial success.

Then along came a tinkerer named Robert Fulton. Fulton started out as a painter, but his real interest lay in gadgets. He invented and successfully tested both a dredging (canal-digging) machine and a crude submarine before turning his attention to the

steamboat. Financed by the American ambassador to France, Fulton had his *Clermont* ready for its maiden run in 1807. On August 17 of that year, the *Clermont* smoked and chugged its way from Albany to New York City at the unheard-of speed of 5 miles an hour. It made the 150-mile trip in 32 hours, much to the surprise of onlookers on the shore, who half expected Fulton's contraption to blow up.

The voyage of the *Clermont* started the great age of the steamboat. Twelve years later, the *Savannah* became the first steamship to sail the Atlantic. The story of the *Savannah* and other great ships is told in detail in Chapter 9.

### Sailing Ships

Until steam-powered boats and ships became commonplace, various types of sailing vessels got people where they wanted to go. Sailboats and sailing ships are classified by size and the way in which their sails are arranged. Some are quite small, such as the catboat or dinghy. Others, such as the graceful schooner, have several masts and a number of sails.

In the early days of our country, the sloop was a popular means of water transportation. A sloop has a mast toward the middle of the boat and two sails. Sloops carried passengers and cargo up rivers along the Atlantic coast. It took about three days for a sloop to travel between Philadelphia and New York.

By far the greatest of the sailing ships was the mighty clipper. The fastest ship afloat at the time, it was so-named because it "clipped off" the miles at sea. The clipper ship had tall masts and as many as thirty-five sails. The largest of the clippers, the *Great Republic*, was the biggest wooden sailing ship ever built. It was 325 feet long and 53 feet wide. It weighed 4,555 tons and could





sail at a speed of 20 knots. Designed to be manned by a crew of 130, the *Great Republic* never had an opportunity to show what she could do at full speed. Shortly before her maiden voyage in 1853, she was badly damaged by a fire.

Clippers were developed by American shipbuilders in the 1840s and 1850s. They appeared at a time when a fast ship was needed to take emigrants to California during the 1849 gold rush. They also played an important role in the tea trade with China, since their speed lessened the bad effect that long stowage had on tea. Clipper ships were further used for carrying gold and wool from Australia and, unfortunately, were a favorite of African slave traders.

The most famous builder of clipper ships was Donald McKay of New York City. Among his famous clippers were the *Flying Cloud*, the *Lightning*, and the *Great Republic* mentioned above. The *Flying Cloud* set a speed record for sailing ships in 1854. It sailed from New York around Cape Horn at the tip of South America to San Francisco in 89 days and 8 hours. To all in the sailing business, the *Flying Cloud* was known as the “Queen of the Clippers.”

Other clipper ships also set records. In the early 1850s, clipper ships were crossing the Atlantic in 12 days and the Pacific in 18 days. *Lightning*, another of Donald McKay’s clippers, set a speed record for a 24-hour period by traveling 436 nautical miles in one day on her first voyage across the Atlantic. A second clipper, the *Red Jacket*, which was racing *Lightning*, managed 413 miles herself. Two years later, a clipper named the *James Baines* reached a record speed of 21 knots. These speeds were incredible when one considers that clippers were driven solely by the wind.

The age of the clipper ship was relatively short. The first clipper was built in 1832, and by the end of the Civil War, 1865, clippers were all but gone. They were replaced by steamships, which could go faster and carry heavier loads. But for a quarter of a century, these majestic sailing vessels ruled the seas and set speed records that held even into the age of the steamship.



A majestic clipper ship. Clippers ruled the seas in the years leading up to the Civil War. They could attain speeds of 20 knots—fast considering they relied solely on the wind for power.





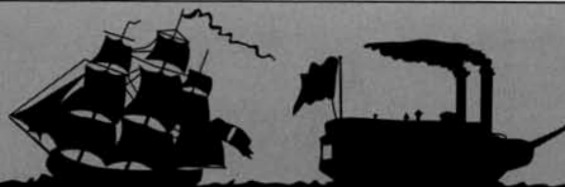
Name \_\_\_\_\_ Date \_\_\_\_\_

## Know Your Shipping Terms

How familiar are you with ship terminology? In the word box are 15 words having to do with ships and shipping. Look up each in a dictionary and match it with its correct meaning.

A. aft	F. knot	K. rudder
B. berth	G. mast	L. schooner
C. bulkhead	H. nautical mile	M. sloop
D. fore	I. port	N. starboard
E. galley	J. rigging	O. yard

- \_\_\_\_\_ 1. unit of speed equal to 1 nautical mile an hour
- \_\_\_\_\_ 2. distance of 6,080 feet
- \_\_\_\_\_ 3. long pole to which sails are attached
- \_\_\_\_\_ 4. rope equipment of a ship
- \_\_\_\_\_ 5. sailboat with one mast, rigged fore-and-aft
- \_\_\_\_\_ 6. toward the stern, or rear, of a ship
- \_\_\_\_\_ 7. a ship's right side when facing forward
- \_\_\_\_\_ 8. toward the bow, or front end of a ship
- \_\_\_\_\_ 9. a ship's left side when facing forward
- \_\_\_\_\_ 10. sailing ship having two or more masts with fore-and-aft rigging
- \_\_\_\_\_ 11. slender pole fastened across a mast to support a sail
- \_\_\_\_\_ 12. sailor's bunk or bed
- \_\_\_\_\_ 13. sailor's term for a wall or partition
- \_\_\_\_\_ 14. a ship's kitchen
- \_\_\_\_\_ 15. device used to steer a ship

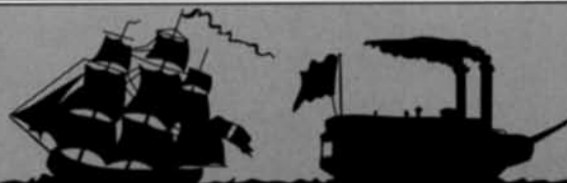
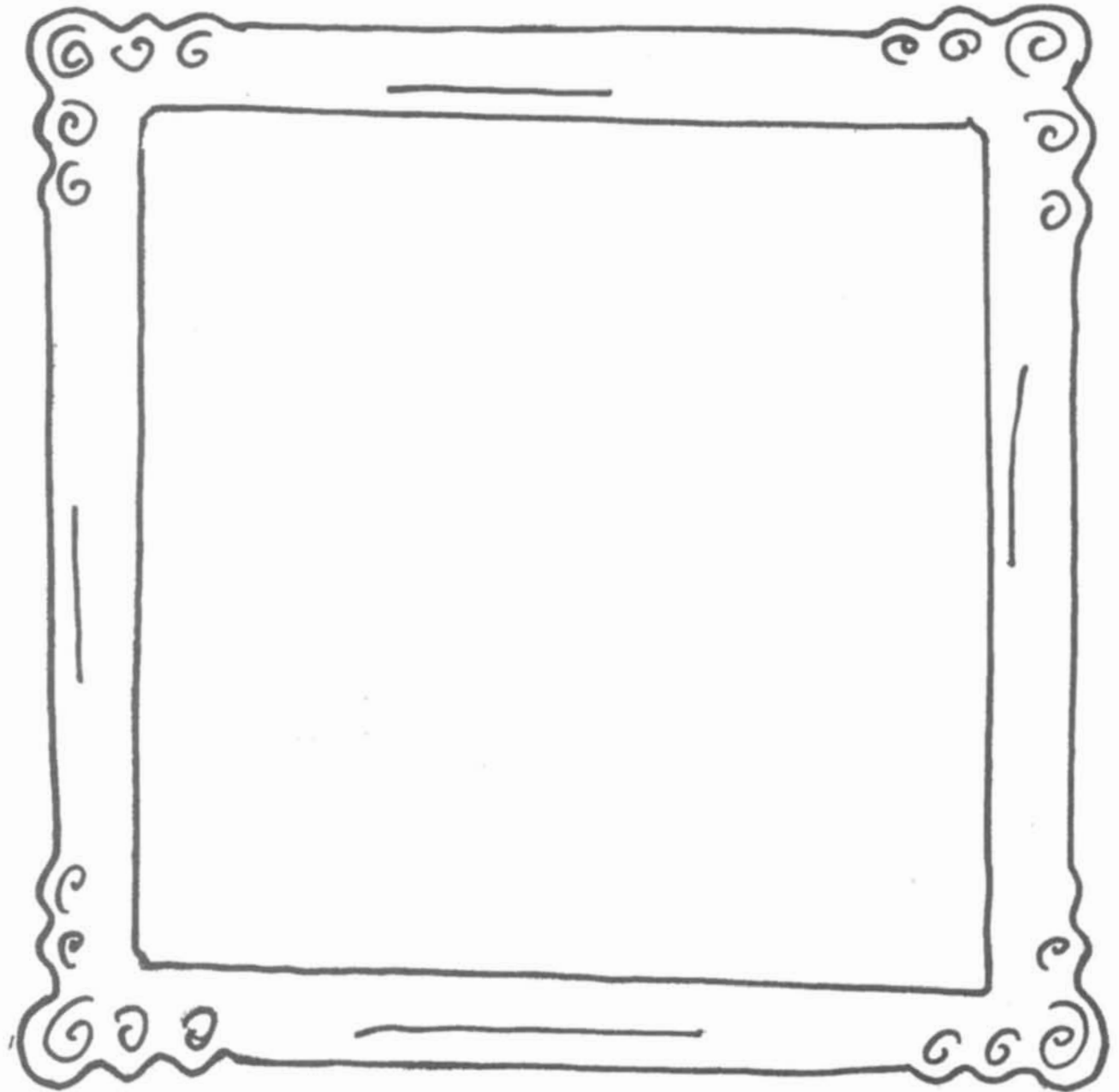


Name \_\_\_\_\_ Date \_\_\_\_\_



## Draw a Picture of a Boat

**D**raw a sketch of any of the boats discussed in Chapter 3: flatboat, keelboat, steamboat sloop, or clipper. Look in a textbook, a book, a book on boats and ships, or an encyclopedia for samples to go by.







Name \_\_\_\_\_ Date \_\_\_\_\_

## Sail with Billy to California

Consult an atlas and an encyclopedia to help you fill in the blanks in this story. Your history book might also come in handy.

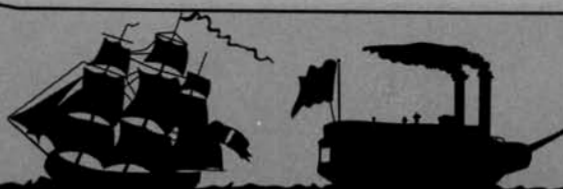
The year is 1849, and \_\_\_\_\_ has recently been discovered in California. Like many adventurers of the time, young Billy decides to go there to seek his fortune. He purchases a ticket and sets sail from New York aboard the *Flying Queen*.

In those days there was no \_\_\_\_\_ Canal cutting through Central America from the \_\_\_\_\_ to the Pacific Ocean. So the *Flying Queen* had to sail around Cape \_\_\_\_\_ at the tip of South America, turn north, and proceed on to California. The total distance of such a voyage was about \_\_\_\_\_ thousand miles.

As the *Flying Queen* sails along the Atlantic coast of the United States, it passes a state named for Queen Elizabeth I of England. That state is \_\_\_\_\_, and its capital is \_\_\_\_\_. Continuing southward, it sails close to a southern state named for King George II. That state's capital is \_\_\_\_\_. Before bidding the United States farewell, the *Flying Queen* skirts the coast of Florida, which was named by that famous Spanish explorer \_\_\_\_\_.

From Florida the *Flying Queen* sails past Cuba and the islands of the \_\_\_\_\_ Indies. After some time, it passes \_\_\_\_\_, the largest country in South America. It then cruises on until it rounds the tip of South America and heads north. On its northern journey the ship proceeds along the coast of \_\_\_\_\_, a country that is 2,600 miles long from north to south. It then passes \_\_\_\_\_ and Ecuador, before turning slightly northwest for its final run to California. The last country the *Flying Queen* sails by before reaching its destination is \_\_\_\_\_.

Tired, but considerably more aware of the world's geography, Billy reaches California after a voyage of three \_\_\_\_\_.



Name \_\_\_\_\_ Date \_\_\_\_\_



## Make Inferences from What You Have Read

You are probably not familiar with the term *infer*. To *infer* means "to draw a conclusion from facts you have read." Authors often imply, or suggest, things that are not stated outright in their writing. When you make inferences, you are "reading between the lines" and making a logical guess about what certain facts are pointing to.

Read each of the paragraphs. Then, on the lines provided, draw your own conclusion as to its meaning.

1. Sometimes a flatboat traveling down a river hit a sandbar and became stuck. Sometimes a snag in the water or a sudden storm caused a flatboat to sink. And there was always the threat of attack by hostile Indians.

What does this tell you about traveling by flatboat?

2. When a flatboat reached its destination, it was usually broken up and sold for lumber. Then the rivermen who had guided the boat downstream but who had no intention of staying in the West started the long journey back home on foot.

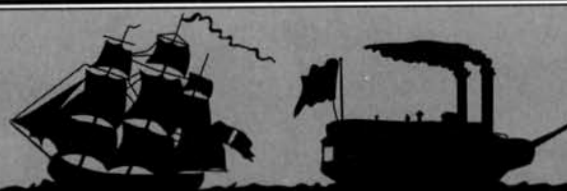
What does this tell you about flatboats?

3. Before the Panama Canal was built, the only way for a ship to go from the east coast of the United States to the west coast was by sailing around the tip of South America. This made for a trip of about 13,000 miles. The Panama Canal reduced the distance to about 5,200 miles.

What can you conclude from this huge reduction in mileage?

4. People stood on the banks of the Hudson River and laughed as the *Clermont* chugged by, churning out great billows of smoke. Some stood at a safe distance.

What does this say about the opinion some people had of the boat?



## Wagons and Carriages

**Y**ou have learned that transportation in America improved greatly when surfaced roads began to appear. The Lancaster Turnpike and the National Road were two roads over which passengers, pioneers, and freight moved with greater ease. There were also a number of trails that crossed the Great Plains and helped open the Far West to settlement. Little more than wheel ruts, such trails nevertheless provided emigrants with ways to get to California, Oregon, and other destinations.

Chief among the routes heading west was the Oregon Trail. It began at Independence, Missouri, crossed the Plains and the Rocky Mountains, and then branched off into two trails. One branch took settlers to California, while the other ran on to the Oregon Territory.

Over this ever increasing number of roads and trails, as well as along America's city streets and country lanes, traveled a variety of horse-drawn vehicles. The most important of these are discussed in the pages that follow.

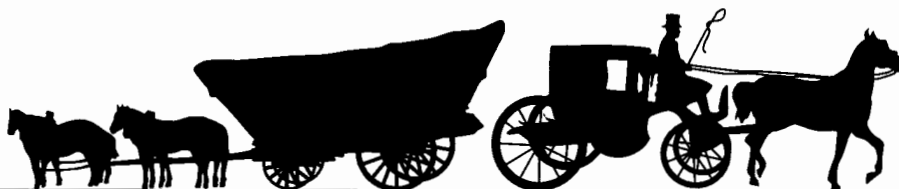
### The Conestoga Wagon

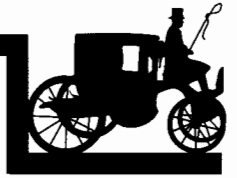
You have probably seen Western movies about pioneers crossing the Great Plains and Rocky Mountains in brightly colored wagons with white canvas tops. These wagons were called prairie schooners. A schooner is a sailing ship, and the wagons, when viewed from a distance with their white tops, looked like a group of schooners at sea.

The prairie schooner was a smaller cousin of the great Conestoga wagon. This wagon was first built in the town of Conestoga in Pennsylvania; hence its name. Until the appearance of the railroad, Conestoga wagons were the "freight trains" of our nation. They were drawn by from four to eight horses, mules, or oxen and could carry up to four tons of cargo. They also carried passengers across the Alleghenies and later the Great Plains.

Conestoga wagons were shaped like boats, with both ends curved upward as much as twelve inches higher than the middle. They were built that way to prevent freight and supplies from falling out on hillsides. They also had large wooden wheels with broad rims to prevent their sinking in mud. This made them highly

Pioneers in a Conestoga wagon. Note how the ends curved slightly upward to prevent cargo from spilling out when the wagon went up a hill.





prized on unpaved roads and the rough trails of the prairie. When it was necessary to cross a river, the wheels could be removed and the wagon could be used as a boat.

One had little difficulty in spotting a Conestoga wagon. Its underbody was painted bright blue and its upper half bright red. A white canvas top was stretched over a frame of curved slats or hoops. A round opening at the rear of the top gave the wagon the appearance of a bonnet.

As previously mentioned, smaller Conestoga wagons used to cross the Plains were called prairie schooners. They were built to travel great distances rather than to carry heavy loads. The typical prairie schooner measured 10 by 3½ feet and could carry a load up to a ton and a half in weight. Wise pioneers, however, usually kept the load a little lighter. Many a large piece of furniture or a prized possession, such as an organ, had to be abandoned along the trail because a wagon could not make it up a mountainside.



A line of prairie schooners, a smaller version of the Conestoga wagon, heading west. From a motion picture still.

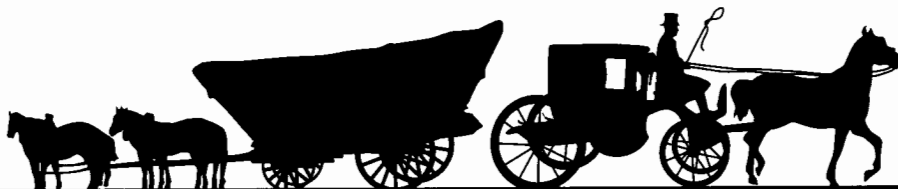
Pioneers traveling the Oregon Trail lived, ate, and slept in their prairie schooners during the three-month trip. They were cramped inside the small wagon and were careful to use every available space. But they were far better off than some emigrants. Many people going west traveled in farm wagons, while others pushed handcarts or wheelbarrows. Some simply walked.

### The Concord Coach

People not moving their entire families west might travel by coach. Do you know how a coach differed from a wagon? A coach was a large, enclosed carriage built to carry passengers and mail. Coaches were used in America before the Revolution. The first coach, in fact, traveled between New York and Boston some thirty years before the American Revolution began.

The first coaches were uncomfortable, to say the least. They were little more than covered wagons with three or four benches installed for passengers to sit on. The benches were hard and had no backs. Would you have enjoyed a trip on one of these early coaches?

In time, coaches improved and travel became less of a bone-jarring experience. The finest of the coaches was the Concord coach, built in





Concord, New Hampshire, beginning about 1825. The Concord coach had doors and windows of glass, along with cushioned seats. It was often brightly colored and had landscape pictures on the doors. Its body was equipped with springs, making for a more comfortable ride except on the roughest of roads. Nine passengers could fit inside while two or more rode on top behind the driver's seat.

The Concord coach was pulled by six horses and usually clipped along at a speed of 10 miles an hour. The horses were changed at relay stations every fifteen or twenty miles. In good weather the carriage could make about 100 miles a day. When the weather was bad or the roads muddy, travel distance was cut considerably. Sometimes passengers had to get out and help push the coach when it became stuck in mud. At other times they were asked to lean to the right or lean to the left to prevent a coach from overturning on a particularly rough road.

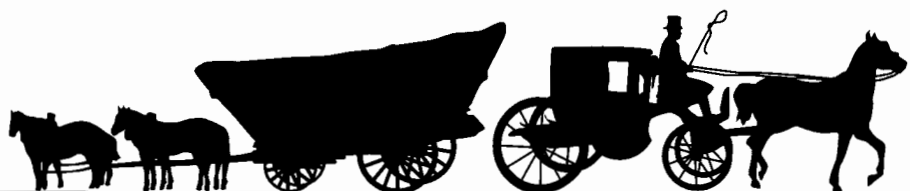
At first Concord coaches and others operated only in the East, usually between Boston, New York, and Philadelphia. Journeys normally took from two days to a week, depending on one's destination. Even with the added conveniences offered by the Concord coach, passengers were cold and damp in the winter and hot and dusty in the summer. They always welcomed the rest and meals offered by inns that sprang up along the routes followed by the coaches.

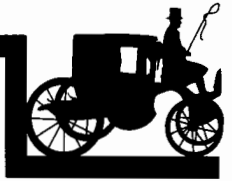
Coast-to-coast stagecoach service began in 1858 when John Butterfield's Overland Mail Company received a government contract to deliver mail and passengers from St. Louis to San Francisco. Butterfield's stages made the trip in twenty-five days. Twice a week, one coach left St. Louis heading west, while another left San Francisco on its way east. Through all kinds of weather and

hazards, the Overland Mail Company fulfilled its contract. Sometimes attacks by bandits and Indians slowed the stages, but the mail and passengers usually got through. These cross-country stage trips were vital to the nation until the first transcontinental railroad was completed in 1869.

An array of colorful characters drove the coaches both ways across the prairies and

Two children sit in a one-horse shay, or chaise. A shay had a folding top and seated two people.





mountains. The stories they told made for interesting reading in newspapers everywhere. One veteran driver quipped that he was so full of bullet holes from bandit and Indian attacks that his “vittles” (food) leaked out when he ate. Each driver stood out in his own particular way, with his own peculiarities. Perhaps the most interesting was Charlie Pankhurst. Charlie had only one eye, and he smoked cigars, chewed tobacco, and used his fair share of profanity. Only after his death in 1879 was it discovered that Charlie was a woman!

### Private Carriages

People who had long distances to travel would go by stagecoach, and, before that, by covered wagon. You might be wondering what kinds of vehicles were available for people who only wanted to ride to town or down the lane to see a neighbor.

Buckboards were carriages most often used by farmers and ranchers. You have seen them countless times in Western movies. They were four-wheeled vehicles with no tops or sides. Their seats rested on a frame of long, flexible boards whose ends sat directly on the axles. Can you imagine the jar the driver received upon hitting a hole or bump in the road?

A popular two-wheeled carriage was the chaise, or shay. It had a folding top and carried two persons. Another was the buggy, which had a single seat and which may or may not have had a top. Some buggies had two wheels, while others had four. They were usually drawn by one horse.

Those people who could afford them rode about in victorias. Named for Queen Victoria of England, the victoria had four wheels and a seat for two people. It had a folding top and a high seat in front for the coachman, or driver. The victoria was highly comfortable with its rubber tires and cushioning springs.

At the turn of the twentieth century, there were hundreds of carriage manufacturers in the United States, but by 1920 the industry had almost gone the way of the dinosaur. Probably no one needs to tell you the reason why. The appearance of the “horseless carriage,” otherwise known as the automobile, was responsible for the decline of the elegant horse-drawn variety.

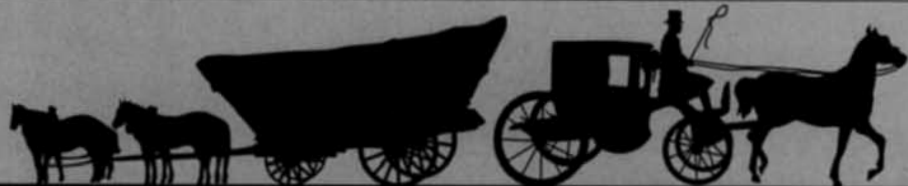
The elegant victoria carriage, which had rubber tires and cushioning springs. The victoria was the preferred means of travel for the wealthy.





## Write a Time-Travel Story

On the lines provided, write a story based on such a happening.





Name \_\_\_\_\_ Date \_\_\_\_\_

## Wagon and Carriage Crossword

### Across

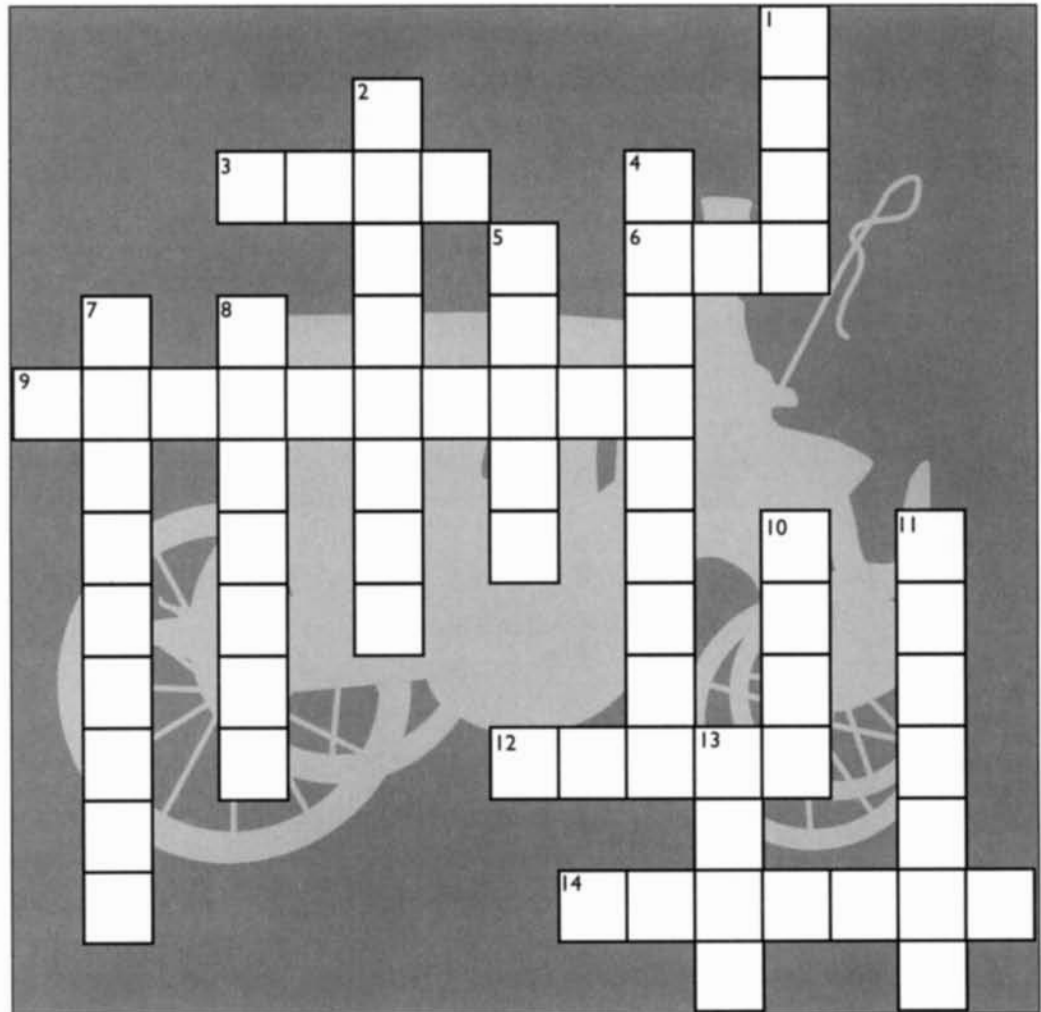
3 The  
Overland  
\_\_\_\_\_ Company

6 Number of  
seats on a  
buggy

9 The  
horseless  
carriage

12 Kinds of  
doors and  
windows on  
Concord  
coaches

14 \_\_\_\_\_  
Pankhurst,  
stagecoach  
driver



### Down

1 Red and \_\_\_\_\_, the color of the  
Conestoga wagon

2 Carriage named for a queen

4 Wagon made in Pennsylvania

5 Color of prairie schooner's tops

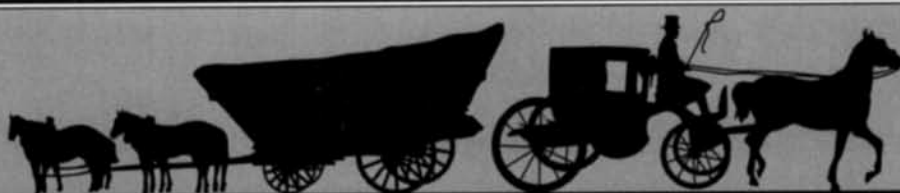
7 A farmer's carriage

8 Coach made in New Hampshire

10 Places where stagecoach travelers rested

11 \_\_\_\_\_ schooner

13 Another name for a chaise

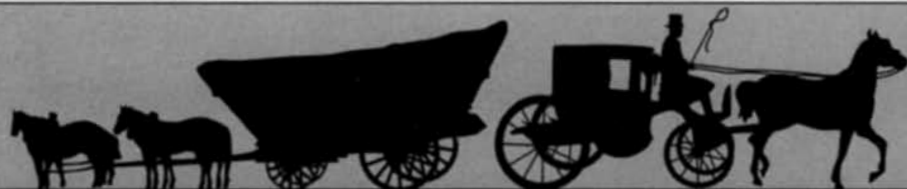


Name \_\_\_\_\_ Date \_\_\_\_\_

## Solve Some Word Problems

Solve these word problems in the space provided. Write your answers on the blank lines.

1. A Concord coach traveling from Boston to New York City averaged 8 miles an hour. How many hours on the road did it take for the coach to make the 208-mile trip?  
\_\_\_\_\_ hours
2. a. A prospective buyer noticed in the 1902 Sears, Roebuck Catalog an Acme Royal Top Buggy with a basic price of \$54.90. For an extra \$14.50, he could have it fitted with 1-inch rubber tires. For \$3.75 more, he could get leather side curtains. Finally, for the small sum of \$2.00 more, he could get leather upholstery instead of cloth. If he decides he wants the extras, what is the total price of the buggy?  
\_\_\_\_\_ total price
- b. The buyer decides to purchase the buggy on the installment plan. He makes a down payment of \$10.00 and agrees to pay the balance in 12 equal installments, or payments. How much is his payment each month?  
\_\_\_\_\_ monthly payment
3. On its second day out of Independence, Missouri, a wagon train heading west traveled 22 miles. This was 10 percent farther than it managed on the first day. How many miles did it travel the first day? \_\_\_\_\_ miles





Name \_\_\_\_\_ Date \_\_\_\_\_

## Name Those Synonyms and Antonyms

You know that a synonym is a word that has the same meaning as another word, while an antonym is a word that means the opposite of another word.

Here are 18 words from the chapter you have just read. On the lines provided, write a synonym and an antonym for each. Consult a dictionary, a thesaurus, or a book of synonyms and antonyms.

1. improve (v)

**Synonym****Antonym**

2. smaller (adj)

3. curved (adj)

4. prevent (v)

5. broad (adj)

6. rough (adj)

7. heavy (adj)

8. always (adv)

9. colorful (adj)

10. interesting (adj)

11. often (adv)

12. flexible (adj)

13. popular (adj)

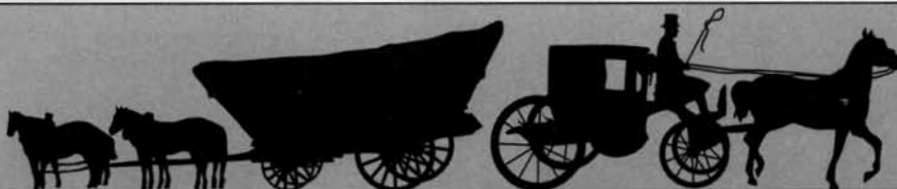
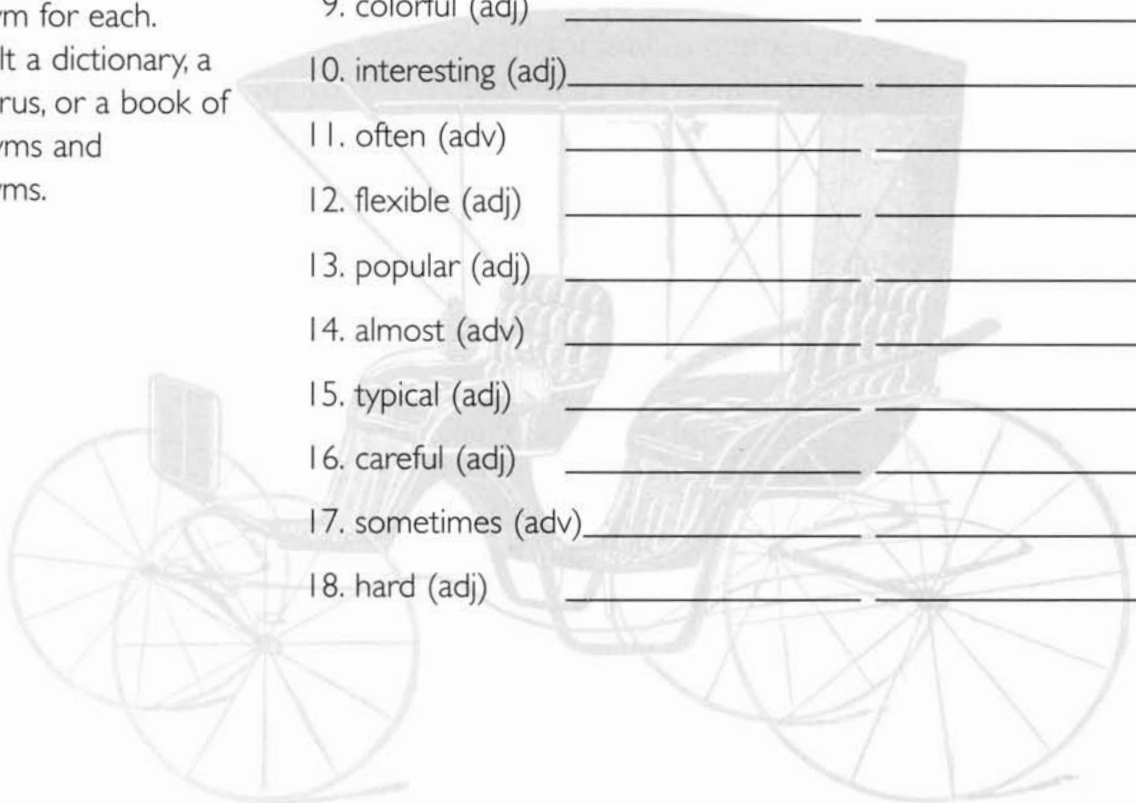
14. almost (adv)

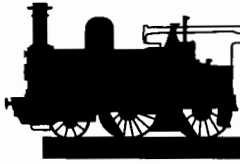
15. typical (adj)

16. careful (adj)

17. sometimes (adv)

18. hard (adj)





## Railroads, Streetcars, and Other Means

**Y**ou read in the last chapter how the automobile brought an end to the era of the personal carriage. Even earlier, another means of transportation had dealt a similar blow to the age of the stagecoach. That new means of transportation was the railroad.

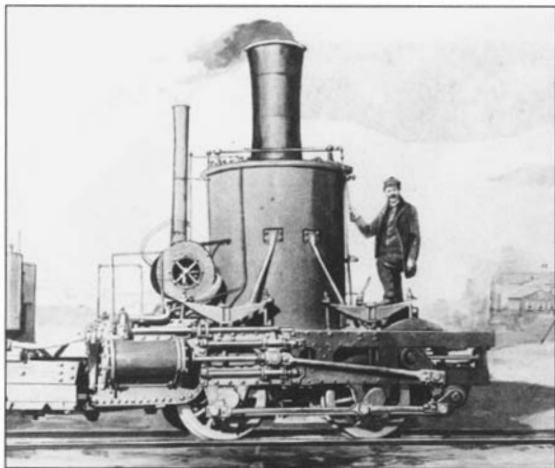
The idea of a road of rails goes back many years. Europeans in the 1500s built wooden tracks over which carts and wagons were pulled by horses. They later added iron strips to the wood to make for a smoother ride.

In 1804 Richard Trevithick of England built the first steam locomotive, and the age of the railroad was born. The first American to build a steam locomotive that worked was an inventor and engineer named John Stevens. Using his own money, he built the engine in 1825 and successfully demonstrated it on a circular track at his estate in Hoboken, New Jersey.

### Tom Thumb

The first practical use of a steam locomotive in America came a few years later. In 1828, a group of businessmen decided to build a short railway westward from Baltimore. Once the railway was completed, the next step was to find a means of power to pull their train. They tried both horses and a treadmill, neither of which proved very successful. They even experimented with using sails. But sails only worked if there was a wind blowing in the direction the train wanted to go.

Peter Cooper's little locomotive, the "Tom Thumb," which lost a race to a horse in 1830.



Enter Peter Cooper, a New York industrialist. In 1830 Cooper built the first steam locomotive in America to pull a passenger train. He called his small locomotive Tom Thumb, after the tiny hero of an old nursery tale. The Tom Thumb was indeed small; so small, in fact, that its boiler tubes were made of gun barrels!

Shortly after the Tom Thumb appeared, the owner of a stagecoach line challenged it to a race. A huge crowd in Baltimore turned out to see if the tiny locomotive could pull a car full of passengers faster than a big, gray horse named Dobbin. At first, it appeared that it could. Although Dobbin and her car took a quick lead, Tom Thumb, once it got up steam, passed the horse and made for the finish line.





Then a stroke of bad luck befell the little locomotive. Just as it neared its goal, a belt slipped and the engine stopped. Before the belt could be changed, Dobbin galloped past and won the race.

The Tom Thumb convinced railway owners that the steam locomotive was practical. Soon other locomotives with catchy names appeared. Some of these were the Best Friend, the De Witt Clinton, the John Bull, and Old Ironsides. By 1835, some 200 small railroads were operating on 1,000 miles of track in eleven states.

From these early beginnings, railroad traffic multiplied in the years leading up to the Civil War. Passenger cars, which at first resembled the stagecoaches they replaced, took on the appearance that later came to be associated with them. In 1859, George Pullman introduced the first sleeping car. Ten years later, in 1869, the first transcontinental railroad was completed. The era of the railroad was off and running.

Railroads monopolized transportation in America until about the 1930s. At that time, they began to face stiff competition from automobiles, buses, and airplanes. In the following years, passenger service dropped off so much that railroads began to depend more on freight than passengers for their profits.

In 1970, to aid the ailing railroad industry, Congress created a nationwide rail passenger system. It was first called Railpax, and later Amtrak. In the name, *Am* stands for American, *tr* for travel, and *ak* for track. All told, Amtrak has not been the financial success it was hoped to be.

## The Streetcar, or Trolley

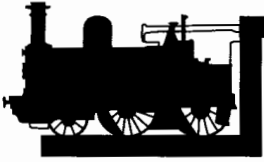
Photographs of cities in the 1800s show street scenes where horses are everywhere. Until the 1870s, horses pulled wagons and carriages of every description along city streets. They even pulled the first streetcars, which began to appear in large cities such as Chicago as early as 1860.

The first streetcar was the bobtail horsecar. It was pulled by a single horse and carried 16 passengers. In cold weather, straw was spread on the car's floor for riders to bury their feet under to keep warm.

Beginning in the 1870s, horsecars started giving way to power-driven cars. The first was the cable car, which originated in San Francisco in 1873. The cable car ran on a rail and was pulled along by an endless wire cable moving in a slot beneath the street. Cable cars are still used today on the steep hills of San Francisco. They are one of that city's leading tourist attractions.







The era of the cable car was brief. By the 1890s, it had been replaced in most cities by the electric trolley. The first trolley went into operation in Richmond, Virginia, in 1888. A short twelve years later, every major city in the United States had a trolley system, and the number of cars in use had risen to 30,000.

Do you know why a trolley is called a “trolley”? Electric streetcars have a long pole to which is attached a metallic wheel or pulley. This wheel is called a trolley. It maintains contact with an electric wire running above the level of the streets. Through this wheel and pole passes the electricity that provides the power to make the streetcar move.

Electric streetcars opened up a new world for city dwellers. For a few pennies, passengers could take the streetcar to exciting places like amusement parks and beaches. They might even ride from one city to another. In the early 1900s, trolleys ran between some nearby cities such as Cleveland and Akron in Ohio. And they ran in comfort. Unlike the earlier horsedrawn streetcars, trolleys came equipped with electric heating.

### Subways and Elevated Trains

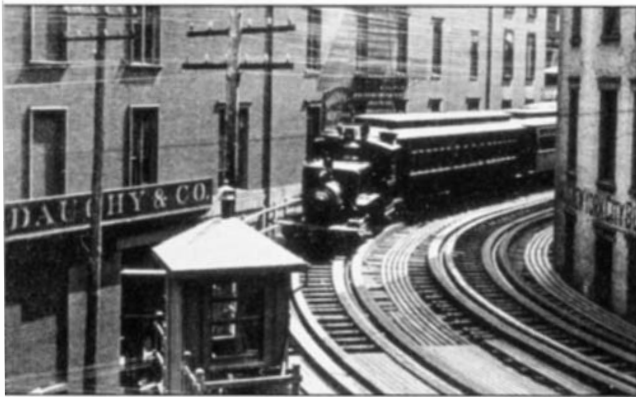
Shortly after the trolley made its appearance, two other means of transportation came into use. They were the subway and the elevated train, or El as it came to be called.

You know that a subway is an underground tube through which electric trains travel from one part of a city to another. The first city in the United States to have a subway was Boston. It opened a 1½ mile subway line in 1897. New York City, Philadelphia, and Chicago were soon to follow. In time, the New York City subway system became one of the largest in the world.

Subways are still important in large cities such as New York and Chicago, where thousands of people depend on them to get from their homes to work and back. Can you imagine how much worse traffic jams in those cities would be without the subway?

The elevated train, or El, appeared at about the same time as the subway. The El runs on tracks above the ground. Its power comes by way of a third rail that runs along the track. An electric

An early elevated train in New York City





current sent from a powerhouse flows down the third rail and is directed to the car's motor. Elevated trains were operating in such large cities as New York, Boston, and Chicago by the end of the 1800s.

## The Bicycle

One popular means of transportation in the late 1800s was driven simply by people power. That was the bicycle. The bicycle became so popular, in fact, that by the 1890s it was a national craze. Old and young alike could be seen pedaling their way along America's paths and thoroughfares. Artists' sketches of the time show entire streets almost filled with people on bicycles.

The bicycle as we know it was slow to evolve. You would have laughed at the first one that appeared around 1790. It had two wheels with a saddle or seat on a bar between them. No pedals! Riders pushed themselves along with their feet, much in the manner of a kiddie-car. This first bicycle was appropriately called the "walk-along."

By the 1830s a pedal was added to the front wheel of the bicycle, and it lost its kiddie-car characteristic. But it was still made of wood and for obvious reasons was called the "bone-shaker." In 1873, what was called the "high-wheeler," or "ordinary," appeared. This bicycle had an enormous wheel in front and a small wheel at the rear. The seat was situated almost directly over the large front wheel. The high-wheeler was difficult to control, and only the most daring attempted to ride it. Since the front wheel was as tall as a man, any spill on the part of the rider might result in numerous bruises and even a broken bone or two.

The modern bicycle came on the scene in the 1880s. It was made of hollow, iron tubing instead of wood. In time, rubber tires, coaster brakes, and adjustable handlebars were added, all of which made the bicycle more comfortable and safe. In the 1890s, cyclists took to the roads in droves. Entire families enjoyed long excursions into the countryside, and bicycle clubs sprang up everywhere. To meet the demand of some 4 million riders, over 300 bicycle factories were in operation before 1900.

The bicycle craze lasted only a few years. Trolleys and electric trains all but replaced them in America's cities. But the bicycle continued as a means of recreation and exercise for millions. It still does today.



An adventuresome man poses with his high-wheeler bicycle



A hand-propelled bicycle

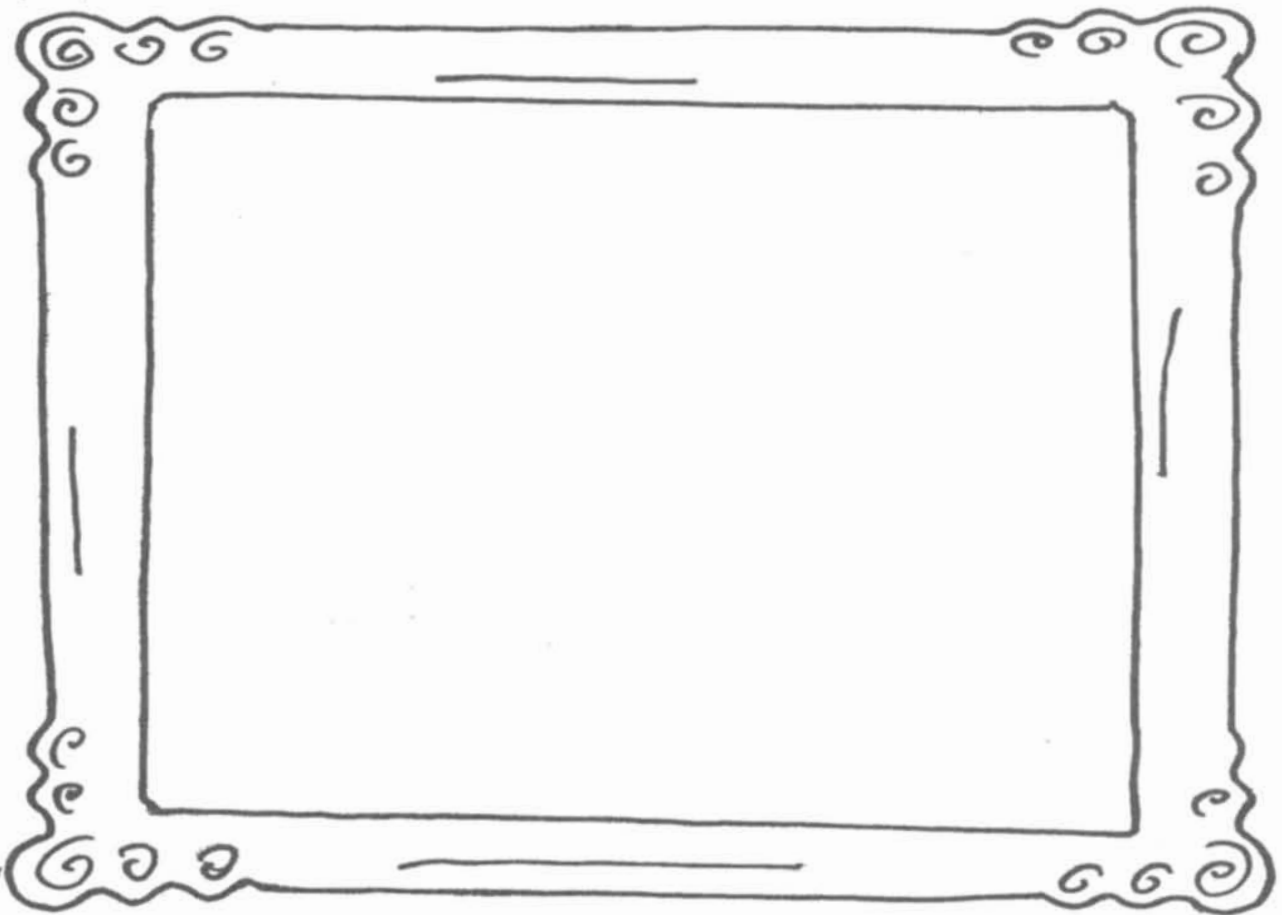




Name \_\_\_\_\_ Date \_\_\_\_\_

## Draw a Picture of an Early Bicycle

Find pictures of early bicycles in an encyclopedia or a book on transportation. Select one and draw a sketch of it below. Then, on the lines at the bottom, write a paragraph describing the bicycle you have drawn.



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Name \_\_\_\_\_ Date \_\_\_\_\_

## Use Context Clues to Complete Sentences

Use the words in the word box to fill in the blanks in the story about the De Witt Clinton.

burned	flames	pulled	thrown
end	fuel	shield	together
enjoyed	passengers	stopped	wheels
fire	problems	strange	worry

The De Witt Clinton was a \_\_\_\_\_ little locomotive. Its engine consisted of a round boiler lying on four wheels with a smokestack at one \_\_\_\_\_. The engine \_\_\_\_\_ four cars. One car was a small flat car that carried wood for \_\_\_\_\_ and water for the boiler. The other three cars were for \_\_\_\_\_. Actually, the last three cars were stagecoaches whose \_\_\_\_\_ had been removed and which had been placed on flat cars.

The cars pulled by the De Witt Clinton were joined \_\_\_\_\_ with chains. This caused them to ram together every time the train \_\_\_\_\_. When this happened, passengers were \_\_\_\_\_ to the floor of their coach in a heap.

Cars ramming together was not the only thing passengers had to \_\_\_\_\_ about. They also had to look out for sparks. Since the De Witt Clinton \_\_\_\_\_ pinewood, sparks were often mixed with the smoke that rolled back over the coaches. Several passengers had their clothes set on \_\_\_\_\_ and had to beat themselves furiously to put out the \_\_\_\_\_. Others opened umbrellas to \_\_\_\_\_ themselves from the sparks. But the umbrellas were also set ablaze and had to be thrown out of the coach.

In spite of \_\_\_\_\_, the passengers on that first run of the De Witt Clinton \_\_\_\_\_ the forty-five minute ride. Do you think you would have?

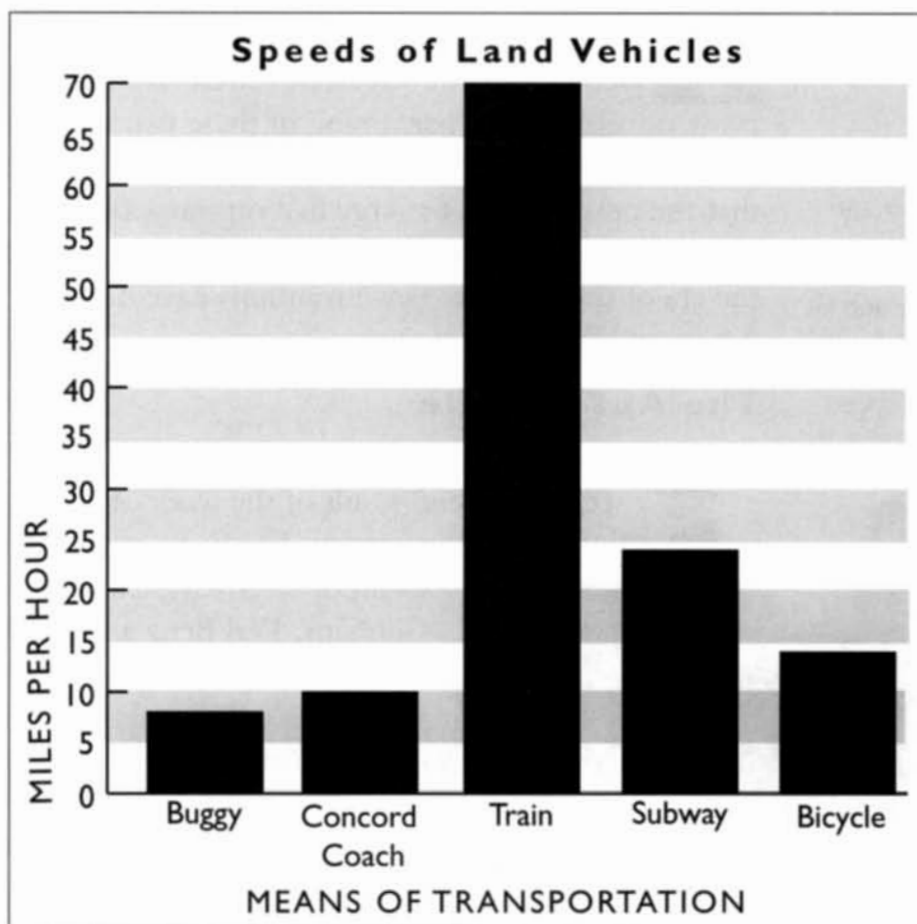




Name \_\_\_\_\_ Date \_\_\_\_\_

## Interpret a Bar Graph

The graph shows the average speeds of various means of transportation in the late 1800s. Use the information from the graph to answer the questions. Write your answers on the lines following the questions.



1. What was the average speed of the five means of transportation? \_\_\_\_\_
2. How many times faster was the subway than the buggy? \_\_\_\_\_
3. How long would it take the Concord coach to travel 100 miles? \_\_\_\_\_
4. How many hours would it take a train to travel from Boston to New York City, a distance of 208 miles? \_\_\_\_\_
5. The combined speeds of the buggy, Concord coach, subway, and bicycle were still \_\_\_\_\_ miles per hour less than the train's speed.







## Automobiles, Trucks, and Buses

**Y**ou have learned about the tremendous impact that steam and electricity had on advancements in transportation. The steam locomotive, the streetcar, the elevated train, and the subway were all made possible by the harnessing of these two sources of power.

But the impact of steam and electricity cannot compare with the effect that the next source of energy had on transportation: the gasoline engine. The gasoline engine ushered in the age of the automobile and, a few years later, the era of the airplane. Few inventions have had such an influence on American life.

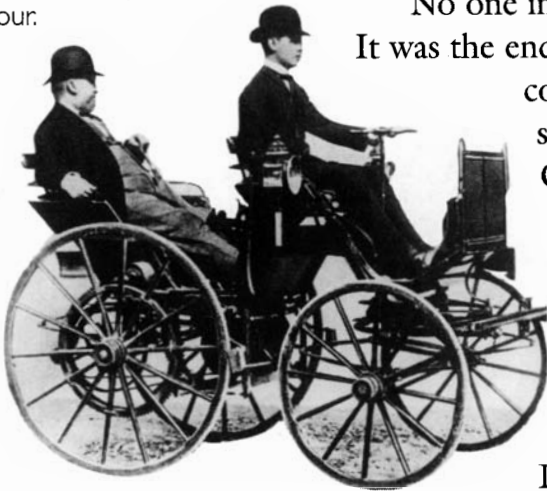
### The Automobile

No one individual can take credit for inventing the automobile. It was the end result of the work of many inventors in a number of countries. The first automobiles were powered by either steam or electricity, and it was not until 1886 that two Germans, Karl Benz and Gottlieb Daimler, separately turned out gasoline-driven cars. Benz's vehicle was a strange-looking affair, having only three wheels. But both automobiles could attain the breathtaking speed of 10 miles per hour!

The first gasoline automobile in the United States was built by Charles and Frank Duryea in 1893. It looked like a buggy, except that it had a two-cylinder engine and was steered by a tiller, or handle. On a snowy Thanksgiving Day in 1895, the brothers entered their car in a race sponsored by a Chicago newspaper. Spectators in sleighs and cutters laughed and whooped as they followed the strange contraption along the 52-mile race course. Much to the surprise of everyone, the Duryea completed the race without breaking down or blowing up, and it averaged just over 5 miles per hour in doing so.

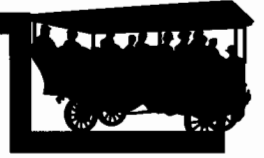
The Duryea brothers opened the Duryea Motor Wagon Company in 1896. They turned out a whopping total of fourteen cars that first year, successfully launching the American automobile industry. Other cars soon followed. The Packard came out in

German automobile manufacturer Gottlieb Wilhelm Daimler and his first car in 1896. This car could attain a speed of ten miles per hour.



Charles and Frank Duryea's first automobile in 1893. It resembled a buggy in appearance and was steered by a tiller.





1899, the Studebaker (built by a famous wagon manufacturer) in 1904, and the Nash in 1918. None of these automobiles are made today.

One early automobile that is still manufactured today is the Ford. Its success and endurance can be attributed to its creator, Henry Ford. Ford not only built what became America's most popular car but he turned it out on the assembly line. On an assembly line, workers remain at a station and wait for the car to come to them on a conveyor belt. They then add one part, and the car moves on to the next station. Ford's assembly-line method made the mass production of automobiles possible. In just one day in 1925, more than 9,000 of Ford's Model Ts rolled off the line.

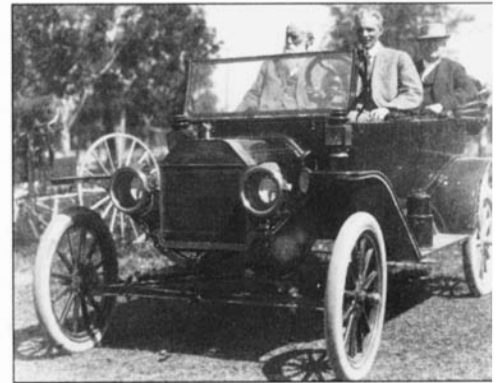
Henry Ford was the son of a farmer, but he never showed any desire to follow in his father's footsteps. His burning interest was in engines and the way they worked. When he was sixteen, he left for Detroit and went to work as an apprentice machinist.

Ford started working on an automobile engine shortly after his marriage to Clara Bryant. He first experimented with steam, but gave up on that idea because he shuddered at the thought of being blown sky-high if a high-pressure boiler exploded. He then turned to gasoline. Some of his early tests were carried out in his kitchen, with his wife checking the engine's oil on occasion. Ford completed his first workable engine in 1893. Three years later he built his first car.

In 1903 Ford started the Ford Motor Company. His first car, the Model T, sold for \$850. By 1924 his company had turned out so many Model Ts that its price was lowered to \$290. The "Tin Lizzie," as the Model T was called, was well within the price range of most Americans. In 1927, after more than 15 million of these cars were traveling the streets and roads of America, Ford produced the Model A, the most popular car ever made in America. It sold for \$550.

The automobile captured the imagination of the American people as nothing had done before. It became even more popular with such improvements as pneumatic (air-filled) tires, a steering wheel, electric headlamps, and a self-starter. And a much quieter engine made it more acceptable to its critics, many of whom had threatened, in its earlier years, to shoot every one that came their way!

Henry Ford at the wheel of his famous Model T in this undated photograph. Thomas Edison, one of America's foremost inventors, sits in the back (wearing hat) with a friend.





## Early Trucks

Trucks began to appear shortly after the automobile. And like the automobile, they were slow and cumbersome and had few modern conveniences. Their cabs were open, they had no windshields, and they bounced along on solid rubber tires. The latter, combined with the lack of good springs, could cause a truck to literally bounce itself to pieces in a hundred miles.

The first trucks were powered by either steam or electricity. They were, to say the least, strange-looking vehicles. An early truck used by the Post Office department was typical. It had three wheels and a carriagelike cab situated in the rear behind a body that resembled a coffin. Like all early cars and trucks, the one used by the Post Office was prone to breaking down. But concerned citizens were relieved when they learned that the mail carrier could be hitched to a mule if necessary, thereby assuring that the mail would always get through.



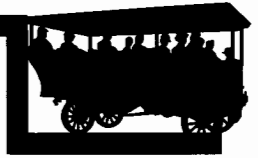
The driver of an early truck loads processed food from a New England cannery in 1917.

Another strange truck appeared in 1906. It was built by the Brush Runabout Company of Detroit and was called—appropriately—the Brush Runabout. Although it had a gasoline engine, it more closely resembled a covered wagon than a truck. It even had a canvas top over the back, not unlike the prairie schooners of years past. But it could boast of a steering wheel, which put it one step ahead of earlier motor vehicles, which were guided by a tiller (a type of handle or stick).

The Brush Runabout, like all trucks and automobiles at the time, had to be started by the driver vigorously turning a crank at the front. Such a chore was dangerous and often resulted in injury. Many a motorist suffered from what doctors called starter's arm, a broken bone caused by unexpected kickbacks of the crank. Motorists breathed a sigh of relief (and physicians lost a portion of their income) when the self-starter appeared in 1911.

Another milestone occurred in 1911 when a truck made the first coast-to-coast trip from Los Angeles to New York. One year later, a truck built by Packard carried a three-ton load from New York to San Francisco. Even though it took the Packard truck 46 days to make the trip, the era of long-distance trucking had begun. Soon trucks displaced horses as the principal means of transporting goods.





World War I helped turn trucking into an established industry. In 1918 alone, 227,250 trucks were manufactured in the United States. Not only were trucks important in hauling goods across the country, they were shipped overseas by the thousands to aid in the war effort.

As with the automobile, trucks slowly benefited from advances in technology. Pneumatic tires, enclosed cabs, sleeper compartments, and electric lights made them both faster and more practical. In the 1920s, the “fifth wheel” appeared, making it easier to join the cab to the trailer on big rigs. Diesel engines came into use in the 1930s. Improvements continued through the years until trucks took on the appearance they have today.

## Early Buses

Horse-drawn vehicles called omnibuses were carrying passengers around New York City as early as the 1820s. The prefix *omni* means “for all,” and certainly these early buses were for everyone who could pay the fare. Omnibuses were replaced in the 1880s by horse-drawn streetcars, and in the 1890s, by electric streetcars.

Around the turn of the century, motorized buses came into use. At first powered by steam and electricity, they were little more than trucks with seats for passengers. Even when buses with gasoline engines came into use in the first decade of the 1900s, they still resembled trucks in appearance. Many years passed before the bus took on a look all its own.

As was true of early automobiles and trucks, buses at first were open vehicles offering passengers little protection from the elements. They also bounced along on solid rubber tires and springs that absorbed few shocks. A look at a display of early bus types used by the Fifth Avenue Coach Company of New York City illustrates how slowly the bus evolved into a vehicle of modern transportation. From 1906 to 1915 all the company’s buses were open-air double-deckers. Not until 1915 was any effort made to enclose the upper deck. This meant that passengers who rode on top got a thorough drenching when it rained.

Other manufacturers produced single-deck buses earlier. Major manufacturers such as Buick and Chrysler started turning out single-deckers in about 1912.

In time, such added features as heating and pneumatic tires transformed buses into the comfortable means of transportation they are today.



An early bus in 1910. Note its resemblance to a wagon.



## Create a Dialogue

With these facts in mind, create a dialogue between two people who have just witnessed the first "horseless carriage" chug by their farm in rural Michigan.

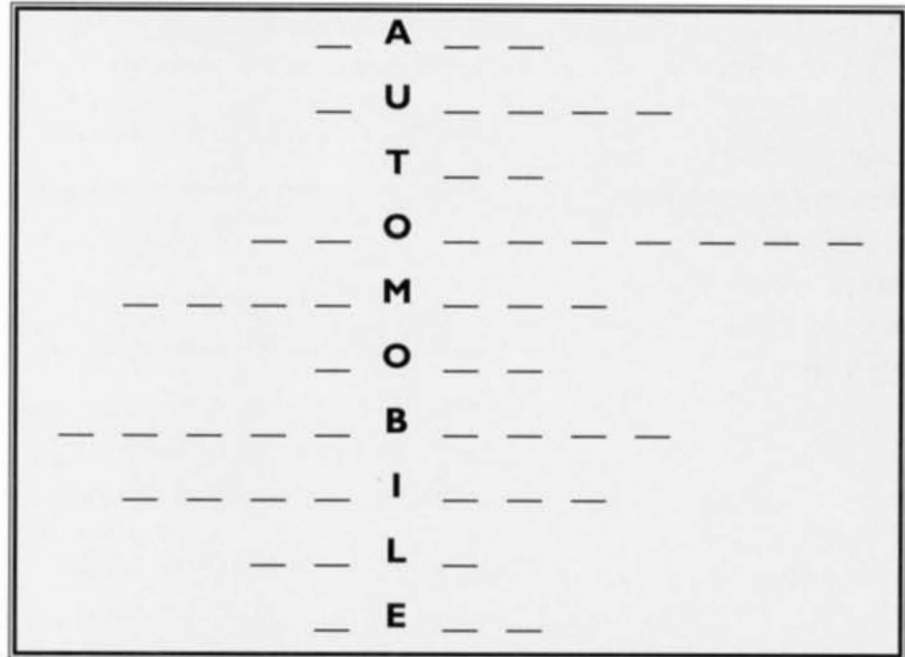
This image shows a single sheet of white, lined notebook paper. The paper has horizontal ruling lines spaced evenly down its length. On the left side, there are three circular binder holes punched through the paper. The top corners of the paper are rounded. There is no handwriting or other markings on the page.



Name \_\_\_\_\_ Date \_\_\_\_\_

## Solve an Automobile Puzzle

Fill in the sentences at the bottom of the page to complete the puzzle about early automobiles.



1. The \_\_\_\_\_ was an early American automobile that came out in 1918.
2. Charles and Frank \_\_\_\_\_ built the first successful gasoline automobile in America.
3. Consumers called Henry Ford's Model T the "\_\_\_\_\_ Lizzie."
4. Henry Ford made the mass \_\_\_\_\_ of automobiles a reality.
5. Ford introduced the \_\_\_\_\_ line at his plant in Highland Park, Michigan, in 1913.
6. Henry \_\_\_\_\_ manufactured the popular Model T.
7. The \_\_\_\_\_ was an automobile built by a company that had first made wagons.
8. The early automobile was known as the "horseless \_\_\_\_\_."
9. On an assembly line, a product moves to the worker along a conveyor \_\_\_\_\_.
10. Karl \_\_\_\_\_, a German, built one of the first gasoline automobiles in 1886.





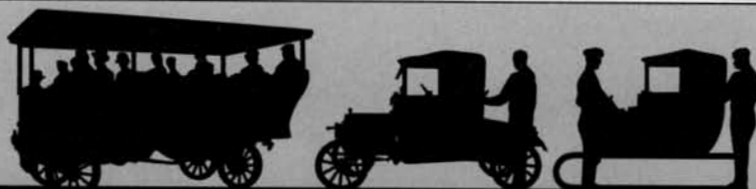


Name \_\_\_\_\_ Date \_\_\_\_\_

## Make False Statements True

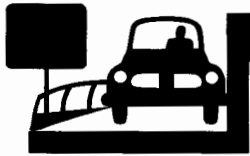
All of these statements are false. Change the word(s) in italics to make them true. Write the replacement word(s) on the lines following the statements.

1. Before the gasoline engine was invented, early automobiles were powered by either steam or *alcohol*. \_\_\_\_\_
2. *Henry Ford* built the first gasoline automobile in the United States. \_\_\_\_\_
3. The first automobiles made were guided along by a *steering wheel*. \_\_\_\_\_
4. Karl Benz built an early automobile that featured *five wheels*. \_\_\_\_\_
5. Both Karl Benz and Gottlieb Daimler built automobiles that could attain a speed of 30 miles per hour. \_\_\_\_\_
6. The *Nash* was the most popular car ever made in America. \_\_\_\_\_
7. The *Duryea Brothers* are credited with introducing the assembly line in the production of automobiles. \_\_\_\_\_
8. Henry Ford's *Model A* was affectionately called the "Tin Lizzie." \_\_\_\_\_
9. The very first gasoline automobiles had *self-starters*. \_\_\_\_\_
10. The *Spanish-American War* helped turn trucking into an established industry. \_\_\_\_\_
11. Omnibuses were replaced in the 1880s by *elevated trains*. \_\_\_\_\_
12. Early buses resembled *stagecoaches* in appearance. \_\_\_\_\_
13. Pneumatic tires are tires *made of solid rubber*. \_\_\_\_\_



What do these pictures tell you about early automobiling? Write your conclusions on the lines provided.

[illegible][illegible]



## Bridges and Highways

**A**s more and more automobiles rolled out of America's plants, better roads and bridges were needed to accommodate them. Improved roads were slow in coming, but significant advances had been made in bridge construction long before the first Tin Lizzie took to the streets.

Except for those built over narrow rivers and streams, few bridges existed in the days of stagecoaches and carriages. Wide rivers were either forded at a shallow point or crossed by ferry. Bridges that were in use at the time were built of either wood or stone. It was not until 1874 that a bridge of steel was constructed to span a great river such as the Mississippi.

### Cantilever Bridges

Many types of bridges have been developed to cross wide expanses (spaces). Two of these are the cantilever and the suspension bridge.

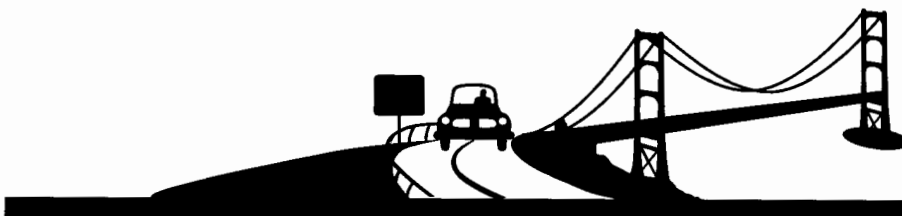
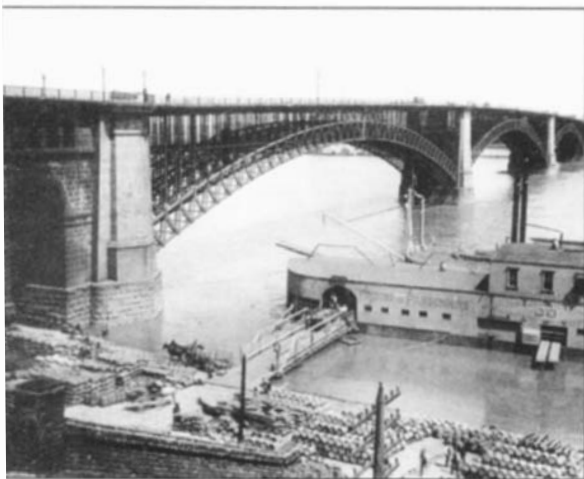
A cantilever is a beam, or arm, that is supported at one end but is free at the other. You use a simple cantilever each time you venture to the end of a diving board. Although the board is not fastened to anything at the end used for diving, it is strong enough to support a person's weight.

A cantilever bridge works on the same principle. Steel beams project out from two towers on opposite sides of a river. The towers, or piers, are located about one-fourth of the distance across the stream. The beams meet in the middle of the river but do not support each other.

The first cantilever bridge in the United States opened in 1874. It was designed and built by James Eads, an engineer and inventor. It spanned the mighty Mississippi River from St. Louis, Missouri, to East St. Louis, Illinois.

At first, people had doubts about Eads's bridge. No one had ever attempted to build a long bridge of steel. Scoffers believed the structure would collapse and fall into the river. After all, it was built to accommodate trains going both ways, and contained a highway for both carriages and pedestrians. But most fears and doubts vanished when the bridge withstood a strong tornado while still under construction.

A 1919 photograph of the famous Eads Bridge, which spans the Mississippi River at St. Louis, Missouri.





## Suspension Bridges

Crude types of suspension bridges were used in ancient times. Indians of Central and South America made such bridges of rope, while primitive peoples of Africa and elsewhere made them of vines. You have probably walked across various kinds of suspensions in parks and along trails.

The modern suspension bridge hangs from thick, steel cables attached to high towers on each end. Some of these cables are as much as three feet thick. Each cable is made of thousands of twisted steel wires. Except in earlier suspension bridges where stone was used, the towers to which these cables are fastened are also made of steel.

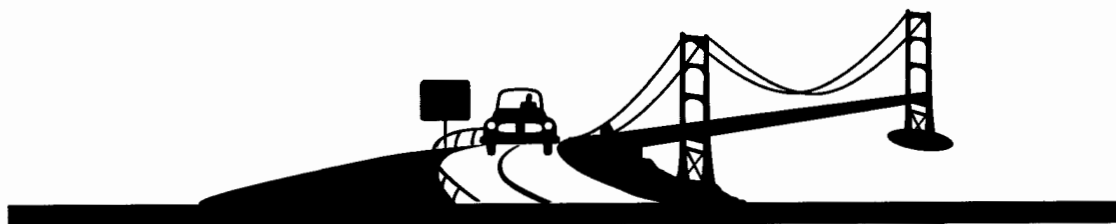
The first steel suspension bridge built in the United States was the famous Brooklyn Bridge. This magnificent structure crosses the East River in New York from Brooklyn to Manhattan. It was the brainchild of engineer John Roebling, who began work in 1869, but died as a result of an accident shortly after construction began. Roebling's son, Washington Augustus, took over as chief engineer and completed the bridge in 1883.

At the time of its construction, the Brooklyn Bridge was called the "Eighth Wonder of the World." With its electric lights, it was truly an imposing sight, and still is. It measures 1,595 feet in length and is suspended from towers 275 feet tall. Its cables are almost 16 inches in diameter, each cable containing 5,358 twisted steel wires. The bridge took thirteen years to build and cost \$15 million and twenty lives before it was finished. It was built high enough that tall-masted ships could easily sail under it.

But there were skeptics. And their doubts came close to being confirmed six days after the grand opening. A huge crowd of people was on the bridge on May 30, 1889, when it began to creak and sway, as suspension bridges sometimes do. Not understanding the nature of such bridges, the crowd panicked and rushed frantically to shore, trampling to death twelve people in the process. Confidence in the bridge grew, however, when circus owner P. T. Barnum later marched a herd of elephants across and the structure did not collapse.



The Brooklyn Bridge in Brooklyn, New York, in 1901. Completed in 1883, it was considered the "Eighth Wonder of the World."





The Brooklyn Bridge was designed to have lanes to accommodate pedestrians, carriages, trains, and trolley cars. Its tolls were reasonable—a mere ten cents was required for a horse and carriage to cross. Anyone driving a herd of sheep over the span paid two cents per sheep, but a pedestrian gained access for only a penny. New Yorkers in the 1880s loved the bridge, and they still do today. Although the Verrazano-Narrows Bridge, built in 1964, which links Brooklyn and Staten Island is nearly three times longer, the Brooklyn Bridge holds a special place in the hearts of the city's residents.



The Golden Gate Bridge as viewed from San Francisco, California. This bridge opened in May 1937 as the longest suspension bridge in the world at the time. It measures 6,450 feet in length and has six lanes for traffic, plus sidewalks for foot traffic.

Other suspension bridges followed the one in Brooklyn. Long before Verrazano-Narrows became a reality, the largest suspension bridge in America was in California. That was the Golden Gate Bridge, which opened to traffic in May 1937. This spectacular structure spans part of the Pacific Ocean, connecting San Francisco with the Marin Peninsula to the north.

The Golden Gate bridge measures 6,450 feet in length. The distance between the two huge towers that support it is 4,200 feet. The towers themselves are 800 feet tall, making them equal in height to a 65-story skyscraper. The cables attached to the towers are more than 3 feet in diameter.

As imposing as they are, such suspension bridges as the Golden Gate and Verrazano-Narrows have to take a back seat to the Mackinac Bridge in Michigan. This bridge, which joins the Upper and Lower Peninsulas of that state, is 7,400 feet in total length. It was completed in 1957.

### National Highways

You read in Chapter 2 about the Lancaster Turnpike and the National Road, two of the first surfaced roads to be built in America. Their construction came about as a result of pioneers beginning to push west in the early 1800s. With the young nation on the move, there was talk of building even more roads. But the appearance of the steam locomotive convinced many Americans that the railroad afforded the best means of travel over long distances. As a result, road construction virtually ceased until the beginning of the twentieth century.

A renewed interest in improving and adding to America's system of roads came about because of the automobile. In 1900 there were only 8,000





automobiles registered in the United States. Eight years later, Henry Ford alone was turning out more than that at his factory in Michigan. The ever increasing number of automobiles led to a demand for more and better roads.

In 1916 Congress passed the Federal Aid Road Act, which provided funds to help states build highways. One of the first federal (national) highways to be constructed was the Lincoln Highway. It runs 3,284 miles from New Jersey's Atlantic coast to the Pacific coast of California. Along most of its route across the nation, the Lincoln Highway is known as U.S. Highway 30.

Once highway construction got started, it spread rapidly. By 1930 more than 100,000 miles of paved roads had been laid. And with more roads came billboards, diners, and tourist cabins to serve the growing number of motorists. Filling (gasoline) stations had appeared even earlier, the first one being opened in 1913. By the time the Great Depression temporarily ended the road construction boom, more than 120,000 filling stations dotted the streets and roadways of America.

Road construction picked up again after World War II when a number of turnpikes, or tollways, were built. The first was the famous Pennsylvania Turnpike, a section of which opened as early as 1940. Other states also built turnpikes, and the trend carried over into the 1950s. Turnpikes continued to be built until the interstate highway system began in 1956.



One of the tunnels on the Pennsylvania Turnpike, a toll superhighway that extends from the New Jersey border to the Ohio border near Youngstown.

## Interstate Highways

In 1956 President Dwight D. Eisenhower proposed a national system of highways connecting all regions of the American mainland. Congress agreed and established the Highway Trust Fund to help finance the project. The plan called for the federal government to pay 90 percent of the total cost, with the states making up the rest. Today, interstate highways crisscross the nation, and there is not a state on the U.S. mainland that is not served by such a highway. There are even several interstate highways in Hawaii.

## Other Roads

In addition to federal highways, many county and state roads have been built in the years since World War II. Some local roads are designed for high speed and have limited access. They are called freeways, expressways, or thruways. If they pass through a park or have roadsides that are landscaped, they are sometimes called parkways.







Name \_\_\_\_\_ Date \_\_\_\_\_

## Make a Cereal-Box Report

In an encyclopedia or any book on transportation, find and read about a famous American bridge. You may read about one of the bridges discussed in the chapter or choose another. After completing your research, prepare a cereal-box report for class.

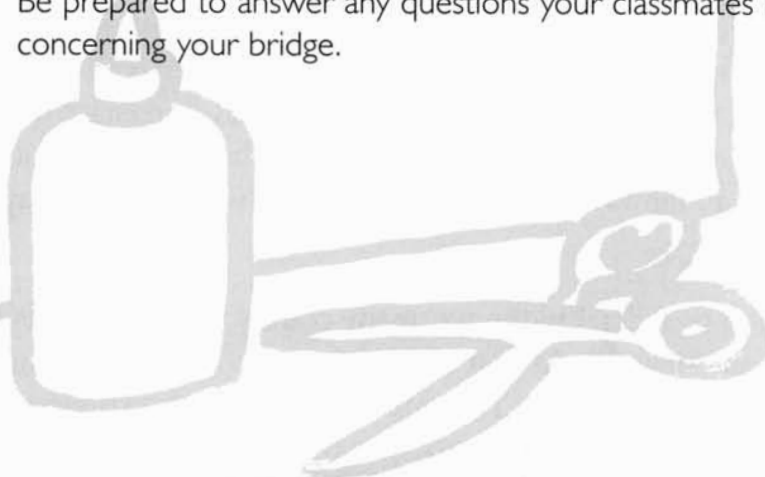
### Here Is What You Will Need:

1. An empty cereal box, or any similar box
2. White paper (sheets of typing or printer paper will work best)
3. Glue or paste
4. A felt-tip pen, or any pen suitable for drawing
5. Scissors

### Here Is What You Do:

1. Glue or paste white paper over all sides of the box.
2. On the top edge of the box, write the name of the bridge you have researched.
3. On one side panel, write what kind of bridge it is (suspension, cantilever, etc.).
4. On the other side panel, write the dimensions of the bridge (height and length).
5. On the front of the box, draw a picture of the bridge.
6. On the back, write a brief history of the bridge's construction.

Be prepared to answer any questions your classmates might have concerning your bridge.





Name \_\_\_\_\_ Date \_\_\_\_\_

## Name Those Highways and Interstates

Consult a road atlas or any other book containing up-to-date maps of the various states, and then fill in the blanks with the correct word or words.

1. Interstate highways with even numbers run \_\_\_\_\_ (which directions?), while those with odd numbers go \_\_\_\_\_.
2. Which interstate highway runs the entire length of the Atlantic coast? \_\_\_\_\_
3. Which interstate extends from San Diego, California, north through Oregon and Washington? \_\_\_\_\_
4. U.S. Highway \_\_\_\_\_ runs along the entire Pacific coast of California.
5. To travel west from Houston, Texas, to Los Angeles, California, a driver would travel Interstate \_\_\_\_\_.
6. If you wanted to travel from Jacksonville, Florida, to Pensacola, Florida, and did not wish to go by way of Interstate 10, you could drive the entire way on U.S. Highway \_\_\_\_\_.
7. Interstate \_\_\_\_\_ runs from Laredo, Texas, north to Duluth, Minnesota.
8. Two interstate highways can be found on the island of Oahu in Hawaii. They are Interstate \_\_\_\_\_ and Interstate \_\_\_\_\_.
9. Which interstate highway runs east and west through the entire state of North Dakota? \_\_\_\_\_
10. There is a U.S. highway that extends from Gainesville, Florida, north through Georgia to the mountains of North Carolina. That highway is U.S. Highway \_\_\_\_\_.
11. Which interstate highway runs north and south near the eastern borders of both North Dakota and South Dakota? \_\_\_\_\_

U.S. HIGHWAY



Name \_\_\_\_\_ Date \_\_\_\_\_

## Solve Some Word Problems

Solve these word problems that deal with bridges and highways. Space is provided for you to work each problem.

1. The cables supporting the Brooklyn Bridge are fastened to towers that are 275 feet tall. This is only \_\_\_\_\_ feet less than the length of a football field.
2. The total length of the Golden Gate Bridge is 6,450 feet. How many feet longer than a mile is this? \_\_\_\_\_ feet
3. In 1900 there were only 8,000 automobiles registered in the United States. In the same year, the nation's population was about 76,000,000. This meant that there was one car for every \_\_\_\_\_ people.
4. Use the figures below to create any two word problems of your own. Ask a classmate to solve them. Use a separate sheet of paper if necessary.

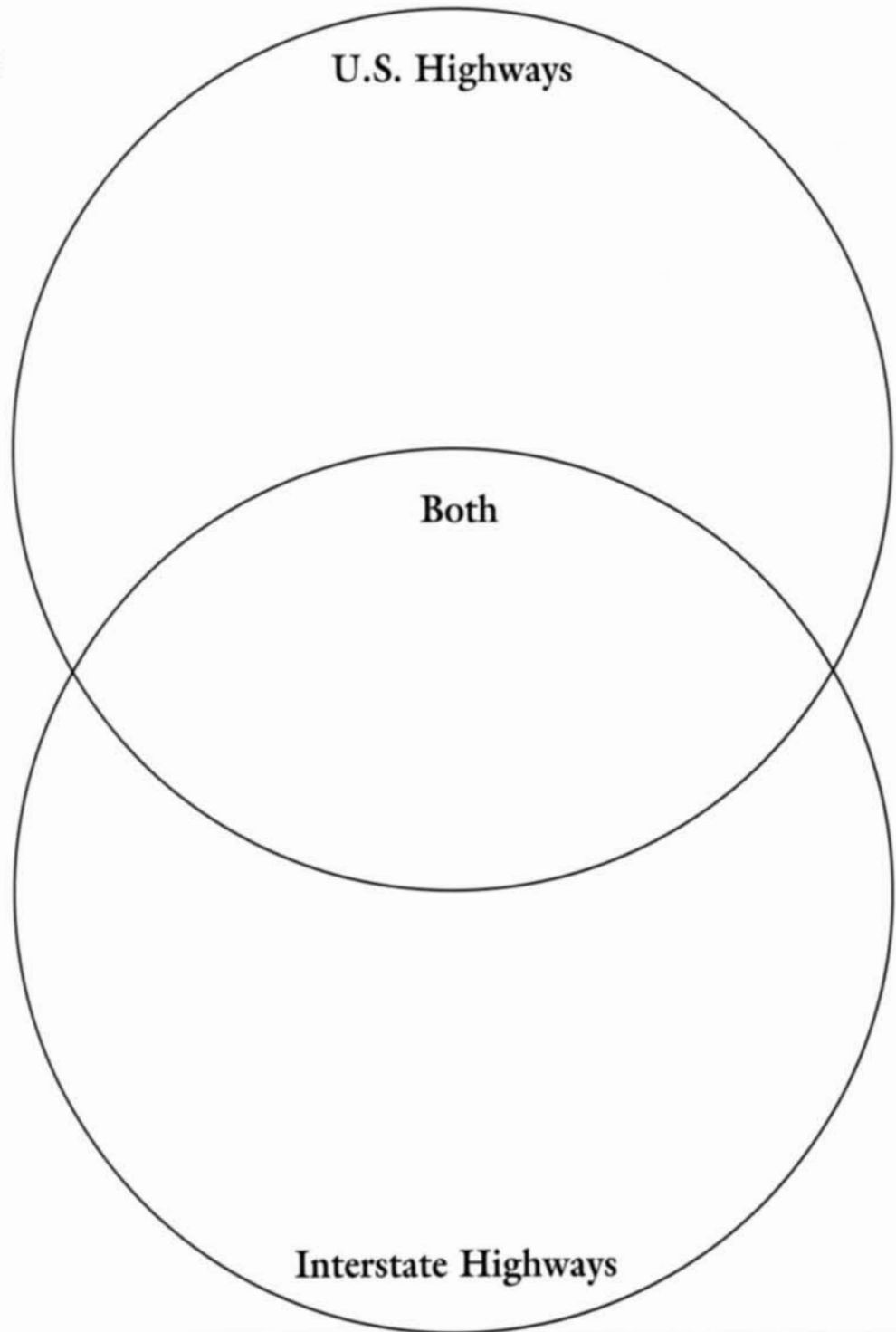
Suspension Bridge	Length of Center Span in Feet
Golden Gate	4,200
Brooklyn	1,595
Mackinac	3,800
Verrazano-Narrows	4,260

Name \_\_\_\_\_ Date \_\_\_\_\_



## Fill In a Venn Diagram

Fill in the Venn diagram to compare U.S. highways with interstate highways. Write facts about each in the appropriate place. List features common to both where the circles overlap.





## Balloons and Biplanes

**P**eople have been interested in flying since time began. We know that early daredevils tried to imitate birds by running at top speed and flapping their arms as they soared off some cliff. How many plunged to their deaths is at best a guess. Others strapped winglike devices of feathers onto their arms and likewise launched themselves from some great height. Flap as they might, they too descended rather sharply to the ground or sea below.

### Early Balloons

After the kite, the first thing humans managed to put into the air was a balloon. The first balloon that flew was launched on June 4, 1783, at the small French town of Annonay. Built by Jacques and Joseph Montgolfier, it was a simple device they filled with hot air and let loose. It rose to a height of 6,000 feet in 10 minutes and stayed aloft for more than a mile.

Three months later, the Montgolfier brothers sent their balloon up with three occupants: a duck, a rooster, and a sheep. The craft stayed up for eight minutes and flew two miles before it safely landed. King Louis XVI was so excited that he provided a permanent home for the sheep in his royal zoo. We can only assume that the duck and the rooster went back unrewarded to the farm.

In November of 1783, Jean François Pilâtre de Rozier and the Marquis François-Laurent d'Arlandes became the first humans to fly in the Montgolfiers' balloon. They managed to stay up for twenty-five minutes and covered a distance of some five miles. They landed safely, despite having to dodge several windmills and numerous rooftops along the way.

### Early Ballooning in America

Six months after the first human-occupied balloon flight, the first hydrogen balloon lifted into the sky in France. Ballooning thereafter became a fad that spread across Europe and on to America. People started going up in all kinds of balloons and performing crazy stunts while in them. Many of these stunts occurred in the United States.



A balloon aloft at the World's Columbian Exposition in Chicago in 1893. Balloons were, and still are, more a form of recreation and entertainment than a means of transportation.





Some antics bordered on the absurd. Balloonist John Wise entertained crowds by dropping dogs and cats wearing parachutes from his balloon. He also sometimes punched holes in his balloon and rode it to the ground like a parachute!

Jean-Pierre Blanchard, a Frenchman, was the first person to go up in a balloon in America. Blanchard was not given to stunts, but his wife, Madeleine-Sophie, was. Madame Blanchard was an accomplished balloonist who became famous for her nighttime launches in which she set off fireworks displays. She was killed in 1819 when the fireworks she carried in the gondola (basket) of her balloon exploded.

Balloons, of course, remained more a fad than a practical means of transportation. But they did prove useful during the American Civil War. Observers went up in them, located the position of enemy troops, and then dropped informative messages to their superiors on the ground.

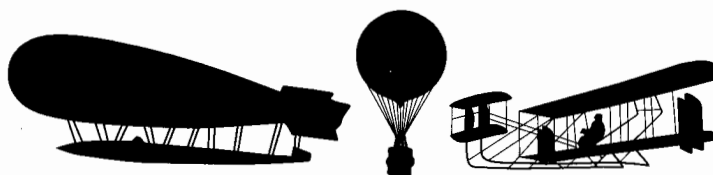
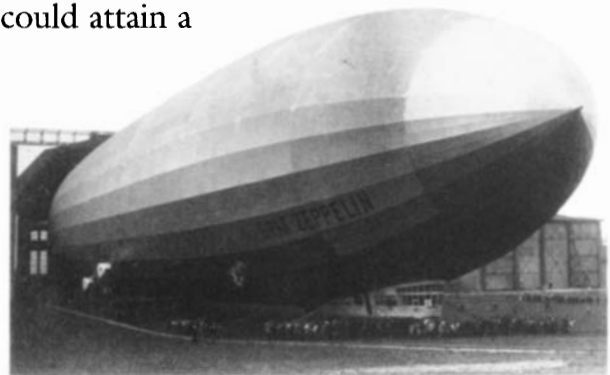
## Dirigibles

As a means of getting around, a balloon had certain shortcomings. Completely at the mercy of the winds, it drifted along with the air currents like a sail. It could neither be steered nor speeded up. Almost from the beginning, early balloonists wrestled with the problem of how to control their airships. They experimented with gadgets ranging from strange-looking oars to paddle wheels. They tried a variety of rudders, sails, and crude propellers. Some even considered tying a large number of birds to their balloons to pull them along.

The answer came with the appearance of a new kind of balloon called a dirigible. The word *dirigible* means “able to be directed or steered.” The first dirigible to actually fly was made by a Frenchman named Henri Giffard in 1852. It was shaped like a cigar and measured 132 feet in length. Powered by a small steam engine and a propeller, it could attain a speed of 6 miles per hour.

Dirigibles became a practical form of transportation thanks to Count Ferdinand von Zeppelin of Germany. Von Zeppelin was a general and balloonist who designed and manufactured a large dirigible in 1900. His dirigible was a rigid airship, which meant that it had a metal framework inside its bag. It was over 420 feet in length and

The first dirigible built by Count Ferdinand von Zeppelin leaving the hangar for its first experimental flight in 1900. The dirigible was over 420 feet in length.







measured 38 feet in diameter. Its two engines propelled it along at a maximum speed of 17 miles per hour.

Count Zeppelin built so many dirigibles that they came to be called zeppelins in his honor. Some zeppelins were over 700 feet long and could cruise at speeds of from 70 to 100 miles per hour. A few zeppelins could carry as many as 100 passengers.

Count Zeppelin had hoped his airship would become a war machine. Indeed, it was used as such during World War I. But it was as a passenger ship that the zeppelin became famous. After the war, passenger service was started between a number of German cities. By the 1930s zeppelins were carrying passengers back and forth across the Atlantic. Huge zeppelins made regular trips between Germany and North and South America before the *Hindenburg* blew up while landing at Lakehurst, New Jersey, in 1937. After that terrible disaster, which killed thirty-six persons, dirigibles ceased to be used in passenger service.

### American Dirigibles

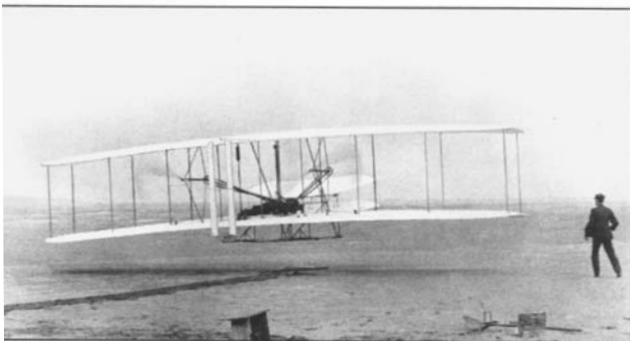
Although Americans benefited from the transatlantic flights of German dirigibles, the large airships never became a high priority in the United States. The first dirigible to be filled with helium instead of explosive-prone hydrogen, however, was an American contribution. That ship was the *Shenandoah*, built by the United States Navy in 1922. The navy built additional dirigibles, but, after several tragic crashes in the 1930s, construction of rigid airships (again, those with a metal framework inside their bag) ended in the United States.

### The First Airplane

Disastrous crashes were only partly responsible for the end of airship passenger service. After about 1914, air travelers could look to a totally new means of transportation: the airplane.

Europeans had experimented with airplanes for years. A number of crafts powered by steam engines were built, but none managed to get off the ground. Strange as it may seem, the first airplane that successfully made it into the air with a human occupant was built by two bicycle mechanics in the United States.

Wilbur and Orville Wright make the world's first successful airplane flight at Kitty Hawk, North Carolina, on December 17, 1903.





Orville and Wilbur Wright ran a bicycle repair shop in Dayton, Ohio. Business was so good that they could afford to devote their spare time to their real interest: flying. In 1899, after reading everything available on the subject, they started experimenting with box kites. From box kites they advanced to gliders, which they tried out on a hill above the beach at Kitty Hawk, North Carolina. One brother would lie face-down on the glider between the wings while the other would dash down the hill, pulling the rope that was attached to it. The glider would soar magnificently into the air, only to crash unceremoniously on the white sands below. They made several gliders, but every attempt to fly them between 1900 and 1902 netted the same results.

After designing a successful wing, the Wrights turned next to making an engine. After some planning, they designed and built a 4-cylinder, 12-horsepower gasoline engine, which, along with two large propellers, they hoped would lift their plane into the air. The engine was mounted on the lower wing, just to the right of where the pilot lay. (If the location of the engine was not enough to put the pilot's life in jeopardy, consider where the gas tank was situated. It was mounted directly above his head!)

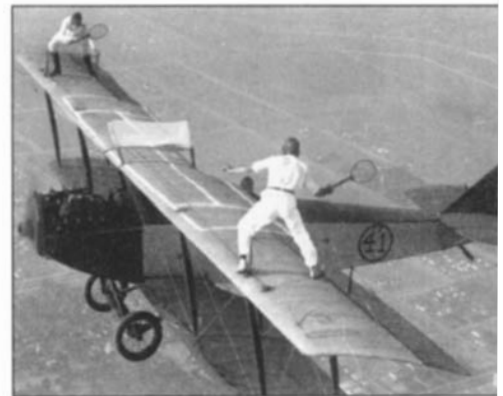
The Wright Brothers' airplane was a clumsy-looking contraption that looked like a box kite with wings. But it got off the ground! On December 17, 1903, at Kitty Hawk, North Carolina, Orville Wright made the first airplane flight in history. With his brother and a few others looking on, Orville flew the plane a distance of 120 feet. He stayed in the air a whopping twelve seconds. But he had flown! That was all that mattered.

A stunt man and stunt woman play tennis while standing on the wings of an airplane in flight. Such acts thrilled audiences at air shows in the 1920s.

## Biplanes

Wilbur and Orville Wright's airplane was a biplane. So were most other airplanes that followed for a number of years. A biplane is an airplane that has two wings on each side of the fuselage, one above the other. Biplanes started being replaced in the 1920s by monoplanes, airplanes having only one pair of wings. But some biplanes were manufactured as late as 1953. They became obsolete because high-powered engines made it possible to lift an aircraft off the ground without it having two wings.

The first solo flight across the Atlantic was made in a monoplane. On May 20–21, 1927, Charles Lindbergh flew *The Spirit of St. Louis* from New York to Paris in 33½ hours.





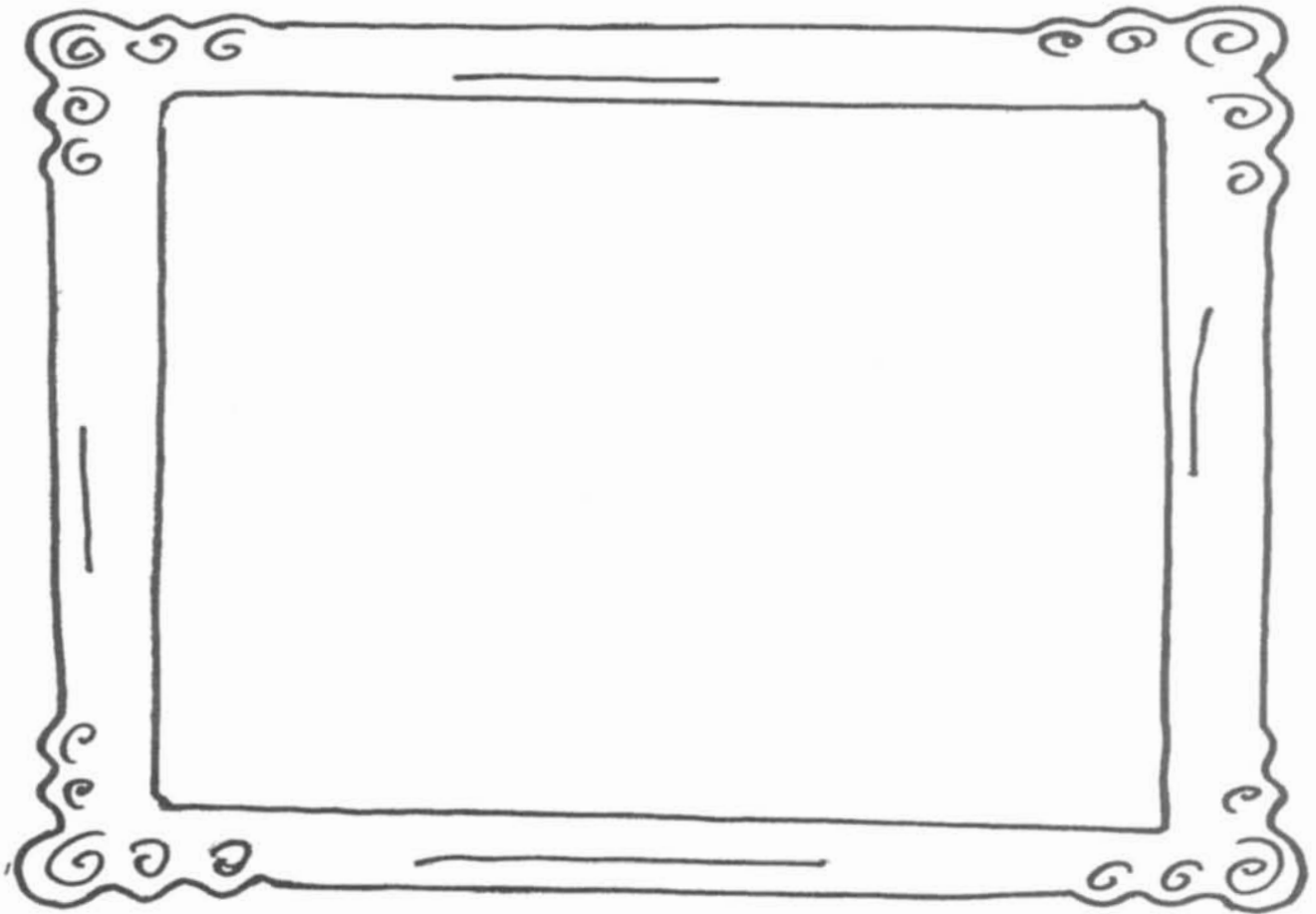
Name \_\_\_\_\_ Date \_\_\_\_\_

## Draw an Early Aircraft

Research one of the early aircraft listed below. Then, in the space provided, sketch and color it.

1. An early hot-air balloon
2. A German zeppelin
3. An early biplane

On the lines below, write an interesting fact about the aircraft you have drawn and colored.




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Name \_\_\_\_\_ Date \_\_\_\_\_



## Early Flight Crossword

### Across

1 First person to go up in a balloon in America

2 One of the first humans to go up in a balloon

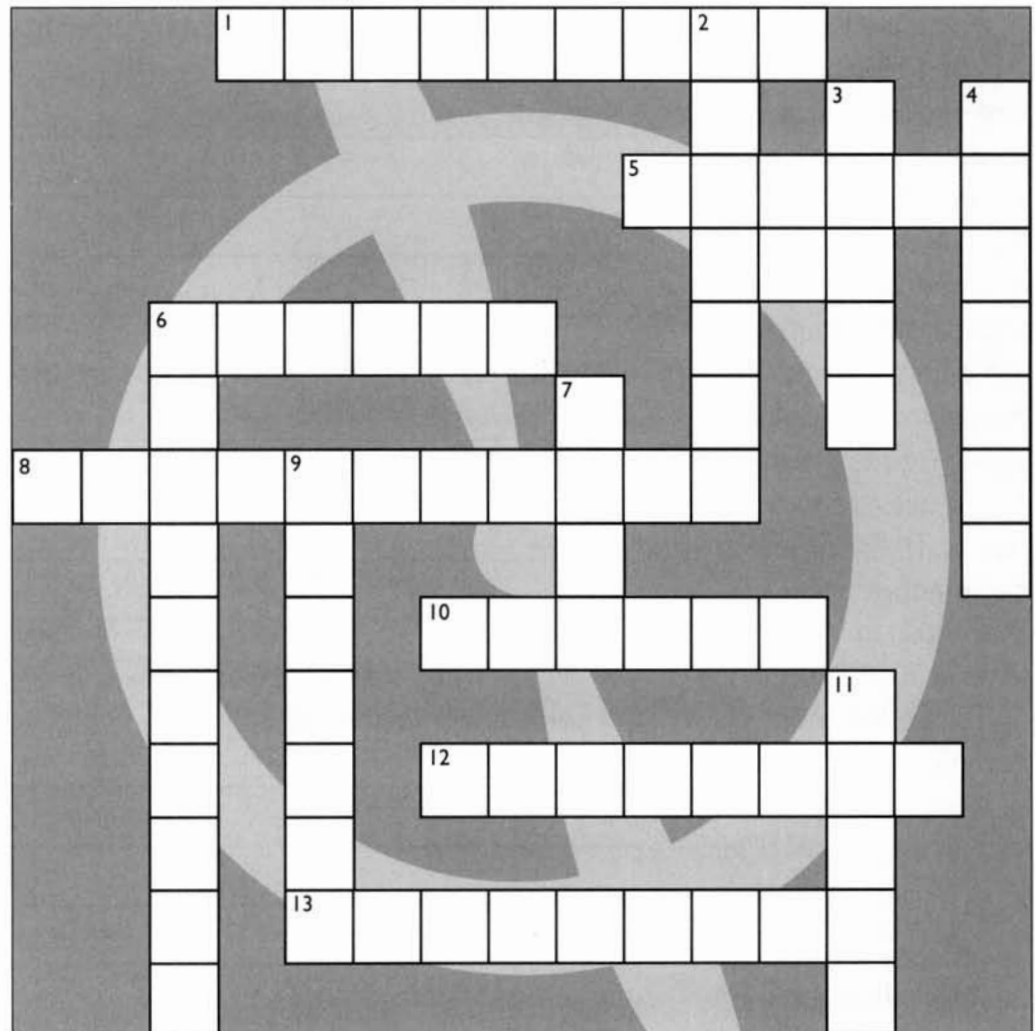
6 It replaced hydrogen in dirigibles

8 Jacques and Joseph \_\_\_\_\_

10 Length in seconds of the Wright Brothers' first flight

12 What Germans called a dirigible

13 Large, cigar-shaped balloon with a motor



### Down

2 One of three animals that flew in an early balloon

3 \_\_\_\_\_ Hawk, North Carolina

4 Wilbur Wright's brother

6 German airship that blew up in 1937

7 He dropped dogs and cats from balloons

9 He flew the first dirigible

11 Box \_\_\_\_\_





Name \_\_\_\_\_ Date \_\_\_\_\_

## Find Facts About Blimps and Zeppelins

You have learned that dirigibles are large balloons that have motors and can be steered. Zeppelins were the largest dirigibles ever made. Blimps are also dirigibles, but they are different from zeppelins. All dirigibles you see today in the sky or on television are blimps. Their name came about because the British in World War I called them limps, and since the most common type was type-B, the *b* was combined with *limp* to form *blimp*.

Research dirigibles in an encyclopedia or book dealing with flight and answer these questions.

1. List several ways in which blimps differ from such dirigibles as zeppelins.

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2. Name three ways in which blimps are used today.

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3. What simple scientific principle explains why a large zeppelin could rise into the air?

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4. Do you think airship passenger service would have continued had it not been for several tragic accidents in the 1930s? Why or why not?

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Name \_\_\_\_\_ Date \_\_\_\_\_



## Write a Letter

December 17, 1903, the day Wilbur and Orville Wright made their historic flight, was cold and dismal. Although the brothers had invited the residents of the small town of Kitty Hawk, North Carolina, to witness the event, only two showed up.

Imagine that you were one of those two who braved the weather to watch the attempted flight. Write a letter to a friend describing and commenting on the events of that day.

Dear \_\_\_\_\_ Date \_\_\_\_\_

Your friend,



# Steamships and Atomic-Powered Vessels

**I**n Chapter 3 you read about the era of the mighty clipper ships. And you may recall that these fast vessels could cross the Atlantic Ocean in twelve days and the Pacific in eighteen. No sailing ships of their day could compare with their speed and beauty.

Clipper ships, however, like all sailing vessels, had one major drawback. They relied on favorable winds to carry them along. When there was no wind, a clipper would lie helplessly in the water. All ships were hampered in this way until James Watt invented the steam engine in 1769.

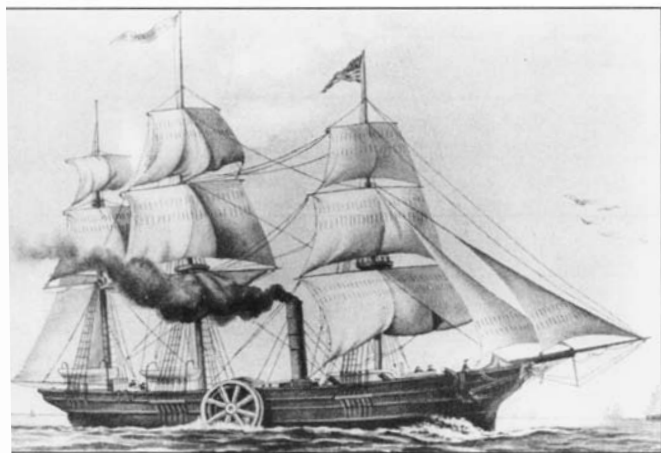
## The Savannah

One day in 1819, a seaman aboard the British cruiser *Kite* called out to his captain that an American ship was on fire off the starboard (right) bow. The captain reached for his glass, took a quick look, and agreed. Shaking his head, the captain expressed his sympathy for the “poor devils” on board. There was nothing, he declared, worse than a fire at sea.

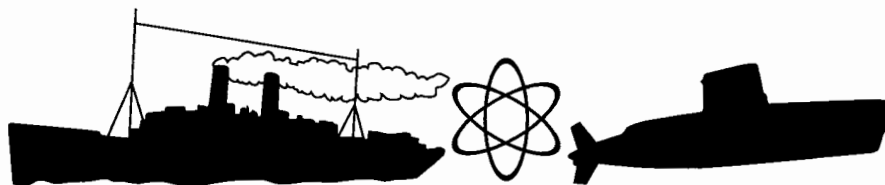
But the captain and crew of the *Kite* were in for quite a surprise. The ship they mistakenly thought to be burning off the Irish coast was the American steamship *Savannah*. She was not on fire at all. The dark smoke that the British seaman had spotted was coming from the *Savannah*’s smokestack. Upon coming up beside the steamer, the British learned that the strange-looking vessel was nearing completion of a historic voyage.

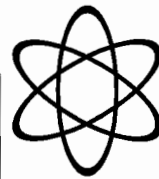
As you have already learned, the steam engine was first applied to riverboats such as Robert Fulton’s *Clermont*. Then, just twelve years after the *Clermont* made its trip up the Hudson River in 1807, the first seagoing vessel to be fitted with a steam engine crossed the Atlantic Ocean. That vessel was the *Savannah*.

The *Savannah* was a small sailing ship that had been equipped with—in addition to a 90-horsepower steam engine—paddle wheels on each side. While under sail, as the *Savannah* was most of the time, the paddle wheels could be folded up and stored aboard the ship. Moses Rogers, the ship’s captain, was not too keen on steam power. He used the engine only in calm weather and



The *Savannah* crossing the Atlantic Ocean in 1819, the first steamship to do so. Although equipped with a steam engine and paddle wheels, the *Savannah* relied on sail power for most of the voyage.





when maneuvering around harbors. The ship's top speed under steam was five knots.

At the time, people did not realize the importance of the *Savannah's* Atlantic crossing. After all, the ship had taken twenty-nine days to complete its voyage and had experienced engine trouble most of the way. Its critics were quick to point out that clipper ships were much faster and were not burdened with an engine prone to breaking down. Caught up as they were in condemning the *Savannah's* performance, shortsighted mariners at first failed to appreciate the potential of steam power.

### Other Steamships

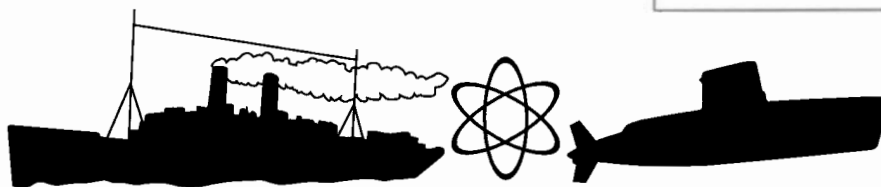
Almost two decades passed before a ship would cross the Atlantic Ocean entirely under steam power. That was the British paddle-wheeler *Sirius*, which accomplished the feat in 1838. After that, the change from sails to steam engines proceeded swiftly.

With steam power to push heavier vessels, the British began building ships with iron hulls (bodies or frames) in the 1850s. The United States followed suit around 1872. Iron hulls were stronger and much more durable than wooden hulls, which were susceptible to worms known as shipworms. By the end of the 1870s, ships were even being constructed of steel.

Another change that accompanied steam power was the use of screw propellers on ships. A Swedish-American inventor named John Ericsson introduced the screw propeller in 1837. (Ericsson later gained fame for designing and building the *Monitor*, the first ironclad ship used by the United States Navy.) The screw propeller is so-called because it cuts into the water in the same way a screw bites into wood. Screw propellers have either three or four blades, and their motion in the water serves to propel a ship much faster than paddle wheels.

The first use of a screw propeller was on the British steamer *Archimedes* in 1839. Six years later, in 1845, the huge British ocean liner *Great Britain* became the first propeller-driven steamer to cross the Atlantic. Soon, paddle wheels on ships were a thing

A 1912 advertisement for Vinolia Otto Toilet Soap boasts of the same standard for luxury as the ship *Titanic*.





of the past. Just to be safe, however, sails were kept for emergencies on ocean liners as late as 1884.

### Ocean Liners

As mentioned above, oceans liners fitted with steam engines and screw propellers began crossing the Atlantic in the 1840s. (In 1853 the American steamer *Monumental City* first accomplished the same feat with regard to the Pacific.) Such liners gradually became larger and more luxurious as engines and shipbuilding methods improved. Until regular transatlantic airline service began in the late 1930s, ocean liners provided the only means of travel

between continents. Even after the appearance of jet airplanes, such huge ocean liners as the *Queen Mary* and the *Queen Elizabeth* were still crossing the Atlantic in the later 1960s. Both made their last voyage in 1967.

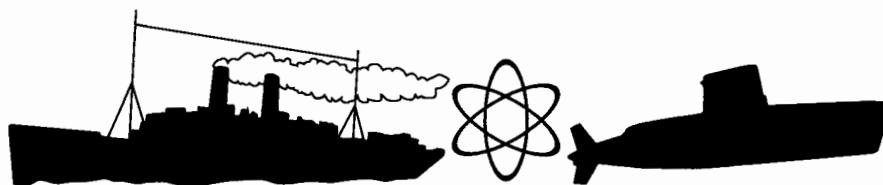
The *Queen Mary* and the *Queen Elizabeth* were but two of the great ocean liners. Others that were equally impressive were the *Leviathan*, the *Île de France*, the *Normandie*, the *United States*, and, of course, the ill-fated *Titanic*, which sank in 1912 after hitting an iceberg.

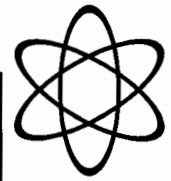
Passenger accommodations on ocean liners consisted of several classes. First-class service provided wealthy travelers with private rooms

for two or four people. Each room had a private bath and often a private deck. Second-class passengers had cabins almost as comfortable, and both classes enjoyed all the luxuries an ocean liner could offer. There were theaters, lounges, and smoking rooms. There were barbershops, hairdressers, and florist's shops. There were decks for walking dogs and playrooms for children, the latter sometimes having a merry-go-round and offering a Punch-and-Judy (puppet) show. With their children safe and entertained, parents might play tennis on one of several courts, swim in the liner's swimming pool, or play miniature golf on the upper deck. And when it was time to dine, passengers could enjoy a nine-course meal in one of the ship's beautifully decorated dining rooms. Ocean liners, in short, resembled grand hotels in what they offered passengers.



The French passenger ship the *Normandie* in 1935. First-class accommodations on such ocean liners were equal to the finest hotels of the day.





But what about the not-so-rich on board, especially the huge number of immigrants making their way to America? They were labeled third-class, or steerage, passengers. Steerage was the lowest part of the ship, and accommodations there left much to be desired. They were crammed together in four-tiered bunks no more than eighteen inches wide. If they were lucky, there might be two toilets for every one-hundred passengers.

The great age of the ocean liner has passed. The likes of the *Queen Mary* and the original *Queen Elizabeth* sail no more. A second *Queen Elizabeth*, called *Queen Elizabeth II*, was launched in 1969, but it, like other passenger ships, was designed primarily for cruises. (Cruises are short vacation trips, or pleasure voyages around the world with stops at various ports along the way.) For this reason, the passenger ships of today are usually referred to as cruise ships.

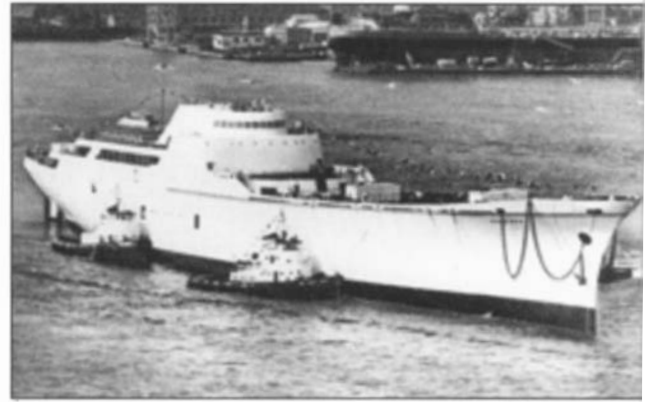
The atomic-powered merchant ship *Savannah*, with its swimming pool, promenade deck, and other conveniences, resembled a luxury liner more than a cargo ship.

### Nuclear-Powered Ships

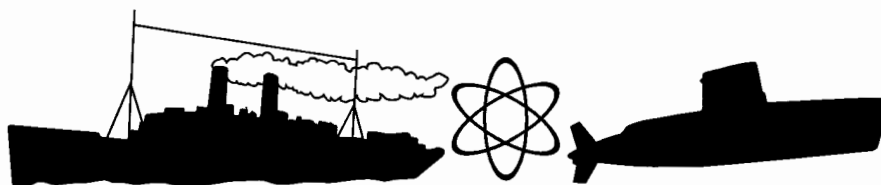
The means of powering ships changed after World War I, when diesel engines began to be used on some vessels. Then, in 1954, the American submarine *Nautilus* became the first ship to run on atomic energy. Four years later the *Savannah*, named after the steamship that had crossed the Atlantic in 1819, became the first nuclear-powered cargo ship to go into service.

The new *Savannah* looked more like a luxury liner than a cargo ship. She had comfortable passenger cabins, elevators, a swimming pool, and a promenade (walking) deck. Her builders hoped that she would turn out to be the wave of the future in shipping. But, to their disappointment, the ship proved expensive to operate. She required twice the crew of an ordinary freighter, and much of her space was taken up by the shielding surrounding her nuclear core.

Today, many naval ships, especially submarines and aircraft carriers, are driven by nuclear energy. But it remains to be seen whether atomic power with regard to cargo ships will become more practical in the future.



The nuclear-powered submarine *Nautilus* shown here beginning its trial run on January 17, 1955.



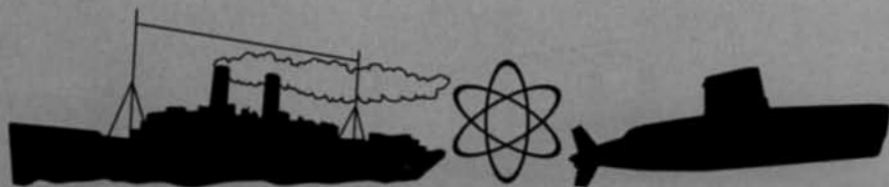


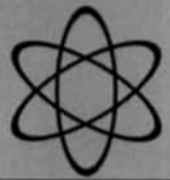
Name \_\_\_\_\_ Date \_\_\_\_\_

## Arrange in Chronological Order

Using the numbers 1–15, arrange the following events in the order in which they occurred.

- \_\_\_\_\_ The *Titanic* sinks.
- \_\_\_\_\_ Robert Fulton's *Clermont* makes its first run.
- \_\_\_\_\_ The British steamer *Archimedes* is fitted with a screw propeller.
- \_\_\_\_\_ James Watt invents the steam engine.
- \_\_\_\_\_ The nuclear-powered cargo ship *Savannah* is launched.
- \_\_\_\_\_ The *Sirius* crosses the Atlantic entirely under steam power.
- \_\_\_\_\_ Transatlantic airline service begins.
- \_\_\_\_\_ The steamship *Savannah* crosses the Atlantic.
- \_\_\_\_\_ The *Great Britain* becomes the first propeller-driven steamer to cross the Atlantic.
- \_\_\_\_\_ The atomic-powered submarine *Nautilus* goes into service.
- \_\_\_\_\_ The first American ships with iron hulls are built.
- \_\_\_\_\_ The *Queen Mary* and the *Queen Elizabeth I* make their last voyages.
- \_\_\_\_\_ The first ships made of steel appear.
- \_\_\_\_\_ The *Monumental City* is the first steamship to cross the Pacific Ocean.
- \_\_\_\_\_ John Ericsson introduces the screw propeller.



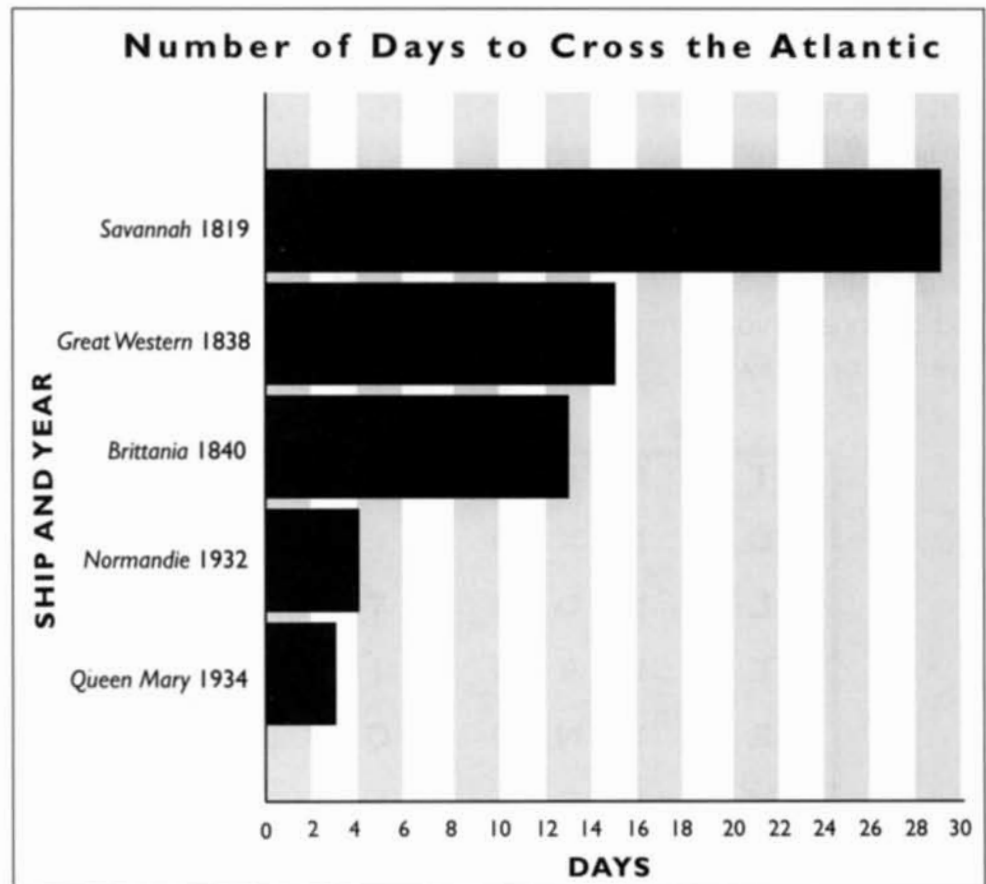


Name \_\_\_\_\_ Date \_\_\_\_\_

## Interpret a Bar Graph

If you want to show changes that have taken place over a period of time, a bar graph is a good way to do it.

This bar graph shows how the number of days required to cross the Atlantic Ocean was greatly reduced between the years 1819 and 1934. Use the information from the graph to answer the questions at the bottom of the page.

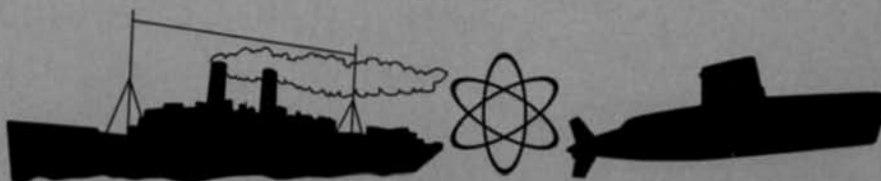


- How many years does the graph span? \_\_\_\_\_
- Between which years did the greatest reduction in time occur? \_\_\_\_\_
- The *Queen Mary* crossed the Atlantic Ocean almost ten times faster than the \_\_\_\_\_.
- The distance between New York City and London, England, is about 3,400 miles. How many miles each day did the following ships average?

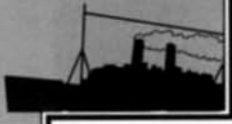
The *Savannah* \_\_\_\_\_

The *Great Western* \_\_\_\_\_

The *Normandie* \_\_\_\_\_





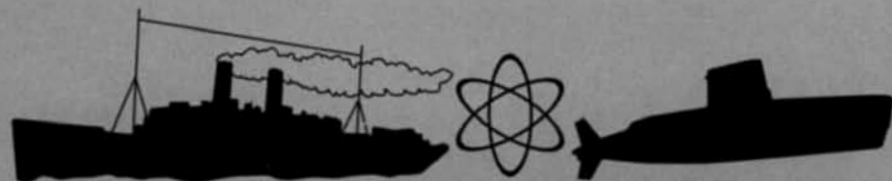


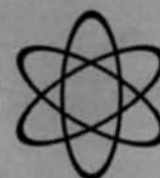
Name \_\_\_\_\_ Date \_\_\_\_\_

## Complete a Word Search

In the word box are the names of 15 ships that were mentioned in Chapter 9. Find and circle each in the word search. They run horizontally, vertically, and diagonally. None are inverted or backwards.

ARCHIMEDES	MONITOR	QUEEN MARY
CLERMONT	MONUMENTAL CITY	SAVANNAH
GREAT BRITAIN	NAUTILUS	SIRIUS
KITE	NORMANDIE	TITANIC
LEVIATHAN	QUEEN ELIZABETH	UNITED STATES





Name \_\_\_\_\_ Date \_\_\_\_\_

## Use Context Clues to Complete Sentences

Fill in the blanks in the sentences using the words in the word box.

airplane	event	miserable	power
carry	fortunate	much	replaced
equal	limited	occurred	sight
equipped	located	past	together

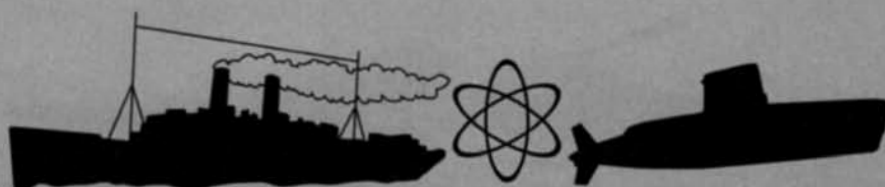
An important \_\_\_\_\_ in the history of ships \_\_\_\_\_ in 1819. In that year, the *Savannah* became the first ship to sail across the Atlantic Ocean under steam \_\_\_\_\_. Although it used its steam engine only part of the time, the *Savannah* nevertheless helped start a new era in transatlantic travel.

At first, steamships were \_\_\_\_\_ with paddle wheels. Then John Ericsson invented the screw propeller in 1837. Screw propellers made it possible for ships to go \_\_\_\_\_ faster. In a few short years, propellers \_\_\_\_\_ paddle wheels on ocean-going ships.

Before the age of the jet \_\_\_\_\_, luxurious ocean liners carried people back and forth across the Atlantic. First-class passengers enjoyed accommodations \_\_\_\_\_ to those offered by the grand hotels of the day. Liners were so large that a person could spend a week or more on board and never catch \_\_\_\_\_ of the ocean.

Third-class passengers were not as \_\_\_\_\_. They traveled in steerage, which was \_\_\_\_\_ in the lower part of a ship. They were crammed \_\_\_\_\_ in stacked beds and had to share \_\_\_\_\_ washing facilities. An Atlantic crossing in steerage was often a \_\_\_\_\_ experience.

Today, the great ocean liners are a thing of the \_\_\_\_\_. They have been replaced by cruise ships that \_\_\_\_\_ passengers to vacations spots around the world.





## Modern Airplanes and Jets

**T**he airplane really came of age after World War I. In just a few years after the fighting stopped, some of the world's most famous airlines had their humble beginnings. The Netherlands' KLM, Belgium's Sabena, and Germany's Lufthansa airlines were founded between 1919 and 1924. In the United States, United Airlines, Trans World Airlines (TWA), and American Airways (later American Airlines), got started a few years later.

Early air travel left much to be desired. The first airliners, especially in Europe, were nothing more than World War I bombers converted to passenger travel. Although they were fitted with such things as wicker chairs and window curtains to make passengers feel more secure, they were far from comfortable. Early planes vibrated severely, and the noise level generated by their engines was almost unbearable. In addition, they were unheated and subject to cold drafts. Given their shortcomings, it is a wonder that passengers braved any of those early flights.

### Barnstormers

Americans showed little desire to fly before the mid-1920s. Until then interest in aviation was kept alive by stunt flyers known as barnstormers. Barnstormers were daredevil pilots who performed crazy stunts in World War I biplanes. They entertained crowds at exhibitions and county fairs by walking on wings or by hanging upside-down from rope ladders to pick up their hats from the ground. They added to their income by taking people up for "joy hops."

### The DC-3

America's first modern airliner was the DC-3. The DC-3, built by the Douglas Aircraft Company, first rolled off the assembly line in 1936. It was one of the first streamlined planes, designed to move through the air with as little drag as possible. It accommodated twenty-one passengers and could maintain a cruise speed of 200 miles per hour.

Between 1936 and 1941, when the United States entered World War II, Douglas Aircraft built 455 DC-3s. This popular plane quickly became the most widely used airliner in the world. By 1938 it was carrying 95 percent of America's air passengers. One year later, 90 percent of airline trade throughout the world used the DC-3. The airlines of thirty other countries





included it among the planes in their fleets. Improbable as it seems, this reliable aircraft is still used throughout the world today.

## The Flying Boat

Since no airliner at first was capable of flying across oceans, a unique kind of airplane called the flying boat appeared. It enjoyed a brief success in the years leading up to World War II.

Flying boats were seaplanes. They took off and landed in the water. The first was Pan American World Airways S-40. The S-40 flying boat had four engines and was furnished with paneled walls, silk draperies, and upholstered chairs. It was soon surpassed in size by two other Pan American flying boats: the S-42 and the M-130. (*S* stood for Sikorsky and *M* for Martin, the companies that built the planes for Pan American.) When Pan American started flights across the Pacific from California to the Philippines in 1936, its flying boats could seat eighteen pampered and well-fed passengers.

The largest and last of the flying boats was the Boeing 314 Clipper, which came out in 1939. The 314 Clipper had two decks and could carry up to 74 passengers. The day of the flying boat ended when land planes capable of spanning the oceans were built.



The Boeing 314 flying boat, put into service by Pan American in 1939. The flying boat had a range of 3,500 miles and could attain a speed of 193 miles per hour.

## The First Ocean Spanners

The first airliners capable of flying nonstop across the Atlantic Ocean appeared near the end of World War II. They included the four-engined Douglas DC-4 and the Lockheed Constellation. The DC-4 could carry more than forty passengers and had a range of 2,140 miles. Its cruising speed was 227 miles per hour. The Constellation was larger, faster, and had a greater range. It could cruise at 313 miles an hour over a distance of 3,050 miles. At first built to carry forty passengers, later models that appeared could accommodate up to sixty-four.

## Larger, More Powerful Airliners

After the war larger airliners with more powerful engines were introduced. The DC-7, the Super Constellation, and the Boeing 377 Stratocruiser all could carry more than a hundred passengers. The fastest of this trio was the DC-7, whose cruising speed was 360 miles per hour. Next came the Stratocruiser at 340 miles per hour, followed by the Constellation at 327 miles per hour. The DC-7's range was 4,250 miles, the Super





Constellation's 3,100, and the Stratocruiser's 2,750. These three planes remained among the leaders in long flights until jet airliners came on the scene in the 1950s.

### The First Jets

Germany, Italy, Great Britain, and the United States began experimenting with jet engines as early as 1939. In 1944, near the end of World War II, Germany came out with a jet fighter plane (the Messerschmitt Me-262) that was far superior to other fighters of the time. Fortunately for the United

States and its allies, the Germans lacked sufficient fuel for the Me-262 to have had an impact on the war's outcome.

After the war Great Britain took the lead in putting a jet airliner into the air. In 1952 the De Havilland Company introduced the Comet. The Comet seated thirty-six people and cruised at a speed of 490 miles per hour. Tragically, it had serious flaws in design; its metal skin was not

strong enough to withstand the stress of cabin pressurization. All went well for several years until two Comets came apart in midair in 1954, killing all those on board. The plane was then grounded until De Havilland came out with an improved model that had a stronger fuselage (body).

### The Jet Comes of Age

The United States put its first jet airliner in the skies in 1958. That was the Boeing 707. Soon afterwards, the Douglas DC-8 and the Convair 880 appeared. The 707 and the DC-8 were capable of carrying up to 250 people at speeds of almost 600 miles per hour. All three were long-range jets used to ferry passengers across the oceans. At about the same time, such airliners as the Boeing 727 and the DC-9 started transporting passengers on shorter routes.

The world's first jumbo jet, Boeing's wide-bodied 747, went into service in 1970. The 747 can carry more than 400 passengers at about 595 miles per hour. It, and other jumbo jets built by foreign nations, can fly fourteen or more hours without refueling.

Today, the largest jetliner in the world is Boeing's twin-engine 777. It can carry up to 481 passengers at a cruising speed of 350 miles per hour. It is



A Boeing 377 Stratocruiser in flight. These double-deck planes, built to carry over 100 passengers, went into service between the West Coast and Hawaii in 1950.





slightly larger than two other jumbo jets: the Airbus A340-200 and the McDonnell Douglas MD-11.

## Supersonic Transports

In 1976 the Concorde, designed jointly by Great Britain and France, became one of two supersonic transports (SSTs) to start flying. (The other was built by the then Soviet Union.) Many people viewed the supersonic jet as the airplane of the future. It was capable of flying at almost 1,500 miles an hour, which is faster than the speed of sound. At such a speed, it could cross the Atlantic Ocean in two hours.

But the SST has had its critics. Because of its noise, fuel usage, and pollution, some U. S. airports, such as John F. Kennedy International in New York, at first would not permit the Concorde SST to use its facilities. On October 17, 1977, a Supreme Court ruling lifted the ban on SST flights into JFK International. Other flights were also approved on the condition that the final leg of the trip be flown at subsonic speeds (a speed less than that of sound).

## Helicopters

Helicopters are unique in that they can take off and land straight up and down. In addition, they can fly not only forward, but sideways and backward as well. They also can hover in the air like certain birds. Their usefulness lies in their not needing a runway for landing or takeoff. They can do either in a very small space, even from the top of a building.

The very first actual helicopter flight took place in 1907 when a strange-looking craft built by Frenchman Paul Cornu rose to a height of 6 feet and stayed in the air for 20 seconds. The first practical helicopter was built by Igor Sikorsky in 1939. Sikorsky was a Russian engineer who had emigrated to the United States in 1919. His helicopter was the type used by Allied forces during World War II.

Most helicopters fly between 80 and 160 miles per hour. In the 1950s, however, engineers started applying the jet engine to some modern types. These helicopters are lifted off the ground by rotary blades but use jet engines to move forward. They can attain speeds of up to 345 miles per hour.



A Pan American World Airways Boeing 707 takes off on September 7, 1958, en route to becoming the first American-built jet to fly the Atlantic.



Air France's first passenger-carrying Concorde, a supersonic jet aircraft. It carried 100 passengers and could fly at a speed of almost 1500 miles an hour.





## Keep a Joy-Hop Diary

Imagine yourself one of those thrill-seekers who has just completed a hop with a particularly daredevil stunt pilot. Write a diary entry describing your experience.

Dear Diary,



Name \_\_\_\_\_ Date \_\_\_\_\_



## Make an Airplane Mobile

You learned in Chapter 10 how the airplane evolved from the simple biplane of the Wright brothers to the faster-than-sound Concorde supersonic jet. With a few simple materials, you can make a mobile depicting changes that occurred in the design of airplanes during that time.

### Here Is What You Will Need:

1. Large clothes hanger
2. Construction paper or small index cards
3. Crayons or coloring pencils
4. Felt-tip pen
5. Hole punch
6. String
7. Some stiff wire (optional)

### Here Is What You Do:

1. Draw and color rough sketches of various types of airplanes on pieces of construction paper or small index cards. Cut the paper or cards to a size of 2" by 3½", or a little larger if you like. You decide which airplanes you want to display on your mobile.
2. On the back of each card containing a sketch of a particular airplane, write several facts describing it (size, speed, number of passengers it could carry, etc.).
3. Punch a hole at the top of each card.
4. Insert and tie a piece of string through the hole at the top of each card. Make your pieces of string different lengths so you can stagger your planes on the clothes hanger.
5. Attach the cards to the bottom of the clothes hanger.
6. Make a sign reading "Airplanes Through the Ages" and attach it to the top of the hanger.

To make a more detailed mobile, cut pieces of stiff wire in lengths of about 6 inches. Slightly bend each piece in the middle to give it a rainbow shape. Attach a card to each end of the wire strips. Tie different lengths of string to the middle of the pieces of wire and then hang the strips from the bottom of the clothes hanger.





Name \_\_\_\_\_ Date \_\_\_\_\_

## Make False Statements True

The word(s) in *italics* make each of these statements false. On the blank line provided, write the word(s) that make each statement a true sentence.

1. The very first airliners were World War I *fighter planes* converted to passenger service. \_\_\_\_\_
2. *Acrobats* were daredevil stunt pilots who entertained crowds during the 1920s. \_\_\_\_\_
3. America's first modern airliner was the DC-4. \_\_\_\_\_
4. TWA was the first American airline to use flying boats. \_\_\_\_\_
5. The DC-3 could carry *forty* passengers. \_\_\_\_\_
6. The largest of the flying boats was the *M-130*. \_\_\_\_\_
7. The *Lockheed* Aircraft Company built the popular DC-3. \_\_\_\_\_
8. *Great Britain* was the only country during World War II to produce a jet fighter plane. \_\_\_\_\_
9. The *Constellation* was the world's first jet airliner. \_\_\_\_\_
10. Airlines began flying passengers across the Atlantic Ocean shortly after *World War I*. \_\_\_\_\_
11. America's first jet liner was the DC-9. \_\_\_\_\_
12. The *Douglas* DC-8 was the world's first jumbo jet. \_\_\_\_\_
13. Great Britain and France built a supersonic jet together that they called the *Comet*. \_\_\_\_\_
14. Another country that built a supersonic jet in the 1970s was *Germany*. \_\_\_\_\_
15. Supersonic transports can fly at speeds of nearly 2,500 miles an hour. \_\_\_\_\_
16. SSTs were welcome at all U.S. airports. \_\_\_\_\_



Name \_\_\_\_\_ Date \_\_\_\_\_



## Solve Some Word Problems About Flight

1. If a Lockheed Vega's cruising speed was 135 miles per hour, how long did it take to fly from New York to Chicago, a distance of 714 miles? (Round your answer.) \_\_\_\_\_ hours
2. What is the air distance between Chicago and San Francisco if a Boeing 707 flying at a speed of 600 miles per hour made the trip in 3 hours? \_\_\_\_\_ miles
3. The distance between New York and London—in round numbers—is 3,500 miles. How much faster can the Concorde SST, flying at 1,500 miles an hour, make the trip than the Boeing 747, flying at 600 miles an hour? (Round your answer.) About \_\_\_\_\_ hours faster
4. Maximum speed for a DC-3 was 185 miles an hour. The Concorde SST can fly almost 1,500 miles an hour. How many times faster is the Concorde SST than the DC-3? (Round your answer.) About \_\_\_\_\_ times faster



## Rockets and Space Shuttles

**O**n March 16, 1926, American scientist Robert H. Goddard launched the first liquid-fuel rocket in history. The site was a farm in Auburn, Massachusetts. The 10-foot rocket rose to a height of 41 feet and crashed to the ground.

No one at the time seemed very impressed with Goddard's accomplishment. After all, it was the year 1926, and Americans had not yet fully accepted even the airplane. The biggest reaction to the launch came from local farmers in the Auburn area. They were concerned that a gadget such as Goddard's might come down on their families or their animals.

Undaunted, Goddard moved his experiments to the deserts of New Mexico. There he built larger and faster rockets. By the time World War II started in 1939, he could launch a rocket a mile into the air. Thanks to his efforts, American astronauts Neil Armstrong and Edwin Aldrin would walk on the moon only thirty years later.

### Unoccupied Satellites

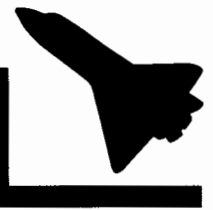
The first nation to make use of rockets was Germany. German scientists developed the powerful V-1 and V-2 rockets that caused much destruction during World War II. After the war many of these scientists were forced to relocate to the Soviet Union. Others came to the United States of their own free will. In both countries they helped start energetic space programs in the 1950s.

The Soviet Union won the initial race for space. On October 4, 1957, they launched the first human-made satellite to be put into orbit. They called it *Sputnik 1*. A few weeks later, they sent up *Sputnik 2*. But *Sputnik 2* was different. It contained a small dog named Laika. Laika made history by becoming the first living thing to travel in space.

While the Russians were celebrating their achievement, the United States was not sitting idly by. On January 31, 1958, *Explorer 1* was launched from Cape Canaveral, Florida. Newspaper headlines the following day shouted the news in large, bold print: "By Jupiter! It's Up!" (*Jupiter* was the name of the rocket that placed the satellite into orbit.) That same year, the National Aeronautics and Space Administration (NASA) was established by Congress to oversee the space program.

Russian scientists check the chamber that will be the home of Laika, the small dog sent into space by the Soviets on November 3, 1957.





## Space Travelers

About three years after the success of *Explorer 1*, the Russians regained the lead in space exploration. On April 12, 1961, they launched cosmonaut (astronaut) Yuri Gagarin into orbit in a spacecraft they called *Vostok 1*.

*Vostok 1* stayed up 1 hour and 48 minutes, circling the Earth one time. Over Africa Gagarin fired a small rocket that reduced the speed of his craft, causing it to reenter the atmosphere. He then parachuted to safety near the small Russian village of Smelkova in European Russia. After his historic flight, Major Gagarin made triumphal tours of several countries.

Three weeks after Gagarin's mission, America scored a first of its own. NASA did not duplicate the Russian's feat of putting a human in orbit, but they came close. On May 5 they launched astronaut Alan Shepard downrange in *Mercury 4* in a flight that lasted 15 minutes. Although Shepard's 302-mile flight over the Atlantic was suborbital (below orbit), it represented the first time an American had ridden in a spacecraft.

The United States caught up with the Russians again less than a year later. On February 20, 1962, Marine Lieutenant Colonel John H. Glenn, Jr., became the first American to be placed in orbit. Millions of viewers watched on television as his *Friendship 7* circled the Earth three times. Glenn's flight covered 81,000 miles and lasted 4 hours and 56 minutes. By the time he came down near Grand Turk Island in the Bahamas, he was a national hero.

John Glenn received well-deserved accolades from a grateful nation. More than 300,000 people stood in the rain to cheer him as he rode down Pennsylvania Avenue to speak before a joint session of Congress. A few days later, it was estimated that 4 million others lined the streets of New York City when he was feted (honored) with a ticker-tape parade. And in his hometown of New Concord, Ohio, more than 3,000 admirers showed up to meet him at the airport, while another 40,000 lined U.S. Highway 40 leading into town. Americans everywhere took pride in John Glenn's accomplishment.

Today, at 77 (in 1998), John Glenn is a well-respected senator from Ohio. He has served in the Senate since 1974. But John Glenn had one more dream to fulfill. When this book went to press, he had just ventured once again into the vast realm of space. Isn't that amazing for a person considered to be a "senior citizen"?



The Apollo 11 spacecraft lifts off from Cape Kennedy atop a Saturn rocket, July 16, 1969.

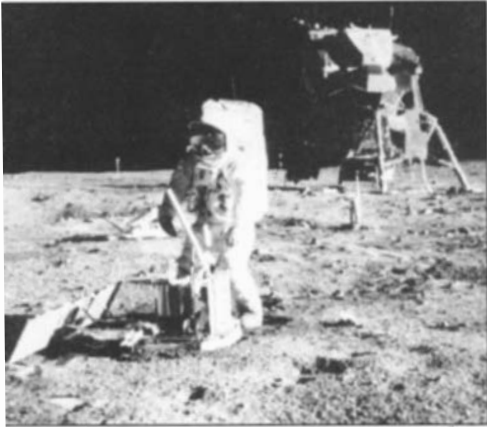






## Moon Walkers

The Soviet Union may have been first to put a human-occupied spacecraft into orbit, but it was the United States that won the race to the moon. After three earlier Apollo spacecraft had ventured close, *Apollo 11* succeeded in placing two astronauts on the moon's surface on July 20, 1969. Neil Armstrong and Edwin Aldrin landed in a lunar vehicle called the Eagle. A third astronaut, Michael Collins, remained above in the command module. Armstrong and Aldrin stayed on the moon's surface for 2½ hours, collecting rock and soil samples. They also planted the American flag before flying the Eagle back to dock with *Apollo 11* orbiting above.



Here Neil Armstrong becomes the first person to walk on the surface of the moon on July 20, 1969. Armstrong was commander of the *Apollo 11* mission.

Five other Apollo missions landed astronauts on the moon. A sixth, *Apollo 13*, almost ended in disaster when a fire from an electrical short circuit started about 55 hours after launch. Although the mission had to be scratched (canceled), the three astronauts aboard were able to return safely to Earth.

## Space Shuttles

America scored another space first in 1981. On April 12 the space shuttle *Columbia* blasted into orbit from Cape Canaveral (called Cape Kennedy from 1963 to 1973 to honor President Kennedy). Carrying astronauts John W. Young and Robert L. Crippen, the *Columbia* stayed up for 54 hours and orbited the Earth 36 times.

How does a space shuttle differ from a human-occupied spacecraft? The satellites in which John Glenn and others traveled through space were expensive and could be used only once. A space shuttle, on the other hand, can be used over and over again. Although it is sent into orbit in the same manner as a satellite, a shuttle returns to Earth and lands like a high-speed glider.

A space shuttle is about the size of a commercial airliner. It rides piggyback into space connected to a large fuel tank. The shuttle's three powerful engines and two solid-fuel rocket boosters (SRBs) lift the craft off the launch pad. After two minutes the SRBs fall off and parachute to the ocean below. Six minutes later, the fuel tank separates from the shuttle and it





too falls. The fuel tank is the only part of the package that cannot be used again.

A shuttle is divided into several sections. At the front is the cockpit for maneuvering the shuttle, as well as a section containing sleep stations, storage lockers, a toilet, and a galley for preparing meals. A large middle section may carry satellites to be placed into orbit, as well as other cargo. The rear section contains the shuttle's three engines.

Except for the *Challenger* disaster on January 28, 1986, which killed all seven crew members aboard shortly after blastoff, the United States has enjoyed tremendous success with its shuttle launches. The next step in the overall program is to use shuttles to ferry passengers and equipment back and forth between a permanent space station and Earth. After that, it is hoped a space station can be used to launch future flights to the moon, as well as to other planets. Such a possibility seems very likely in the not-too-distant future.



The space shuttle *Columbia* blasts off at Cape Canaveral on April 12, 1981. It represented the first lift-off of a reusable spacecraft in aviation history.

## Space Stations

The Russians placed the first space station in orbit in 1971. They called it Salyut 1. After several more Salyuts, they placed another station in orbit in 1986 that is still there. It is called Mir. American space shuttles have docked with Mir, and several of our astronauts have lived and worked aboard the station for many days. Shannon Lucid spent 188 days at the station in 1996. Russian cosmonauts have successfully traveled between Mir and Salyut 7, one of their other space stations.

The United States has not been as lucky when it comes to space stations. In 1973 NASA did succeed in putting Skylab into orbit, but it plunged back to Earth over Australia in 1979. Still, some work was accomplished aboard the station during its brief existence. Several crews of astronauts occupied it for a varying number of days, including one crew that stayed up for almost three months.

The future looks bright for space travel. With the success of the shuttle program, the capacity for transporting parts to build a permanent station in space is now a reality. All aboard for Mars!



Astronaut Shannon Lucid during her 188 days aboard the Russian space station Mir in 1996.





Name \_\_\_\_\_ Date \_\_\_\_\_

## Arrange in Chronological Order

Using the numbers 1–14, arrange the following events in the order in which they occurred.

- \_\_\_\_\_ Skylab is placed into orbit.
- \_\_\_\_\_ Alan Shepard cruises downrange for over 300 miles.
- \_\_\_\_\_ Shannon Lucid spends 188 days aboard the Russian space station Mir.
- \_\_\_\_\_ *Sputnik 1* is placed into orbit.
- \_\_\_\_\_ Robert Goddard launches history's first liquid-fuel rocket from a farm in Auburn, Massachusetts.
- \_\_\_\_\_ The American space station Skylab falls to earth.
- \_\_\_\_\_ The United States launches *Explorer 1*.
- \_\_\_\_\_ The *Challenger* blows up shortly after liftoff from Cape Canaveral.
- \_\_\_\_\_ Germany uses V-1 and V-2 rockets during World War II.
- \_\_\_\_\_ *Columbia*, the world's first space shuttle, is successfully launched from Cape Canaveral.
- \_\_\_\_\_ John Glenn circles the earth three times in *Friendship 7*.
- \_\_\_\_\_ The Russian dog Laika becomes the world's first space traveler.
- \_\_\_\_\_ Neil Armstrong and Edwin Aldrin walk on the moon.
- \_\_\_\_\_ Russian cosmonaut Yuri Gagarin becomes the first human to travel in space.

### Extension

How many total years (span of time) are represented by the events above? \_\_\_\_\_





Name \_\_\_\_\_ Date \_\_\_\_\_

## Make a Bulletin-Board Display

(A Teacher-Directed Activity)

Every student in class can participate in making a bulletin-board display highlighting significant events in the history of space exploration. Some suggested activities in which students can be assigned to work individually or in groups might include the following:

1. Draw, title, and color sketches of various spacecraft, rockets, and space stations:
  - a. Unoccupied satellites, such as *Sputnik 1* and *Explorer 1*
  - b. Human-occupied spacecraft, such as *Vostok 1* and *Friendship 7*
  - c. The Eagle, the lunar module used on the moon
  - d. The moon land rover used on later moon missions
  - e. The Skylab space station
  - f. The Russian space station Mir
  - g. Any rockets used to launch satellites, such as the Atlas and the Saturn
  - h. Space shuttles
2. Sketch and color pictures of famous astronauts (John Glenn, Sally Ride, Neil Armstrong, Shannon Lucid, Mae Jemison, etc.).
3. Make a time line depicting space highlights to go at the very top of the bulletin board.
4. Create newspaper front pages reporting on historic moments in space exploration.
5. Cut out letters for the title of the display.

### You Might Need:

- |  |                                |
|--|--------------------------------|
| 1. A large piece of bulletin board paper   | 4. Crayons or coloring pencils |
| 2. Construction paper, or any other type of paper suitable for sketching, drawing, and cutting out letters | 5. Glue                        |
| 3. Magic markers   | 6. Scissors                    |





Name \_\_\_\_\_ Date \_\_\_\_\_

## Use Your Critical Thinking Skills

Some questions do not have right or wrong answers. The responses you give to them may be no more than opinions. Opinions, however, are more valid if supported by facts or logical explanations.

Think about these questions and write your best answer to each on the lines provided. Continue on another sheet of paper if necessary.

1. Do you think humans in the future will live on other planets, such as Mars? Why or why not?

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2. Is the statement, "Dad, can I use the spaceplane Saturday night? I have a date with this real cool person on Venus," far-fetched or a real possibility in the future?

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3. Some people believe life forms resembling humans live on other planets. Do you agree or disagree with this assertion? Tell why you feel as you do.

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4. If there are humanlike beings on other planets, do you think they are intellectually superior or inferior to people on Earth? Give reasons why you feel as you do.

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# Answers to Activities

## Chapter 1

### Complete a Word Search



### Make Complete Sentences of Fragments

Students' answers will vary.

### Account for the Short Life Expectancy

Students' answers will vary but might include some of the following:

1. Limited knowledge of medicine; no antibiotics or other drugs; little time for leisure activities; no understanding that many diseases can be prevented.
2. Because so many children died, many of them while still only babies
3. Advanced medicines and antibiotics; better diet; use of vitamins and minerals; knowledgeable physicians and well-equipped hospitals

## Chapter 2

### Solve Some Road and Canal Math Problems

1. 91 hours
2. 20 miles
3. Students' word problems and answers will vary.

### Recall What You've Read

1. French and Indian War
2. Turnpikes
3. Wilderness Road
4. Philadelphia
5. The Cumberland or National Road
6. Maryland
7. Logs
8. New York state legislature
9. Irish
10. Albany, New York
11. 363
12. New York
13. four
14. four
15. Forbes Road

## Chapter 3

### Know Your Shipping Terms

1. F
2. H
3. G
4. J
5. M
6. A
7. N
8. D
9. I
10. L
11. O
12. B
13. C
14. E
15. K

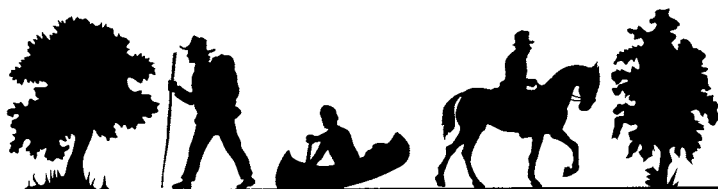
### Sail with Billy to California

gold; Panama; Atlantic; Horn; 13; Virginia; Richmond; Georgia; Atlanta; Ponce de Leon; West; Brazil; Chile; Peru; Mexico; months

### Make Inferences from What You Have Read

Answers will vary but might include the following:

1. Traveling by flatboat could sometimes be dangerous.
2. Flatboats could only travel downstream with the current.
3. The time required to travel that distance was also greatly reduced.
4. Some people thought the *Clermont* might very well blow up.







## Chapter 4

### Wagon and Carriage Crossword

Across: 3. Mail 6. One 9. Automobile  
12. Glass 14. Charlie

Down: 1. Blue 2. Victoria 4. Conestoga  
5. White 7. Buckboard 8. Concord  
10. Inns 11. Prairie 13. Shay

### Solve Some Word Problems

1. 26 2. \$75.15 \$5.43 3. 20

### Name Those Synonyms and Antonyms

Answers will vary but might include the following:

1. better; impair 2. littler; larger 3. bent;  
straight 4. block; allow 5. wide;  
narrow 6. uneven; smooth 7. weighty;  
light 8. forever; never 9. unusual;  
dull 10. fascinating; boring 11. frequently;  
seldom 12. elastic; rigid 13. favorite;  
unpopular 14. nearly; absolutely  
15. characteristic; atypical 16. cautious;  
careless 17. occasionally; always  
18. firm; soft

## Chapter 5

### Use Context Clues to Complete Sentences

strange; end; pulled; fuel; passengers; wheels;  
together; stopped; thrown; worry;  
burned; fire; flames; shield; problems;  
enjoyed

### Interpret a Bar Graph

1. 25.2 mph 2. 3 3. 10 hours 4. Almost  
3 hours 5. 14

## Chapter 6

### Solve an Automobile Puzzle

1. Nash 2. Duryea 3. Tin 4. Production  
5. assembly 6. Ford 7. Studebaker  
8. carriage 9. belt 10. Benz

### Make False Statements True

1. electricity 2. Charles and Frank Duryea  
3. tiller or handle 4. three 5. 10  
6. Model T 7. Henry Ford 8. Model T  
9. hand cranks 10. World War I  
11. horse-drawn streetcars  
12. trucks 13. inflated with air

### Draw Conclusions from Pictures

Answers will vary but might be similar to the following:

First Picture: Early automobiles often broke down or got stuck in mud.

Second Picture: Flat tires were a problem with early automobiles.

## Chapter 7

### Name Those Highways and Interstates

1. east and west; north and south 2. 95  
3. 5 4. 101 5. 10 6. 90 7. 35 8. HI;  
H2 9. 94 10. 441 11. 29

### Solve Some Word Problems

1. 25 2. 1,170 3. 9,500 4. Students'  
problems and answers will vary.

### Fill In a Venn Diagram

Students' answers will vary

## Chapter 8

### Early Flight Crossword

Across: 1. Blanchard 5. Rozier 6. Helium  
8. Montgolfier 10. Twelve  
12. Zeppelin 13. Dirigible  
Down: 2. Rooster 3. Kitty 4. Orville  
6. Hindenburg 7. Wise 9. Giffard  
11. kites

### Find Facts About Blimps and Zeppelins

Answers will vary but should be similar to the following:

1. Blimps are smaller; they do not have rigid frameworks; they were never intended as a means of transportation.
2. For advertising; for aerial sightseeing; to spot enemy subs in time of war.
3. The gas inside was lighter than air, causing the zeppelin to lift off the ground in the manner of a balloon.
4. Students' answers will vary.





## Chapter 9

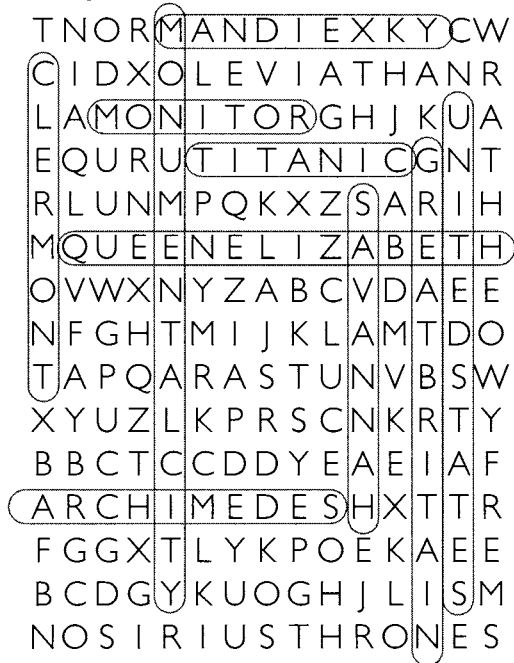
### Arrange in Chronological Order

11; 2; 6; 1; 14; 5; 12; 3; 7; 13; 9; 15; 10; 8; 4

### Interpret a Bar Graph

1. 115
2. 1819 to 1838
3. Savannah
4. Savannah, 117; Great Western, 227; Normandie, 850

### Complete a Word Search



### Use Context Clues to Complete Sentences

event; occurred; power; equipped; much;  
replaced; airplane; equal; sight; fortunate;  
located; together; limited; miserable; past;  
carry

## Chapter 10

### Make False Statements True

1. bombers
2. Barnstormers
3. DC-3
4. Pan American World Airways
5. twenty-one
6. Boeing 314 Clipper
7. Douglas
8. Germany
9. Comet
10. World War II
11. Boeing 707
12. Boeing 747
13. Concorde
14. the Soviet Union
15. 1,500
16. were not

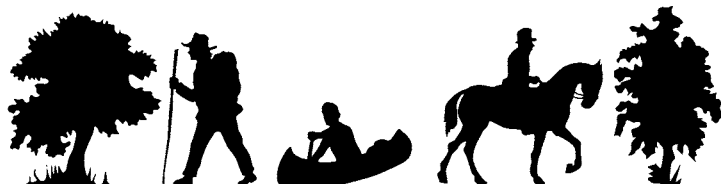
### Solve Some Word Problems About Flight

1. 5.3 hours
2. 1,800
3. 3½ hours
4. 8

## Chapter 11

### Arrange in Chronological Order

10; 7; 14; 3; 1; 11; 5; 13; 2; 12; 8; 4; 9; 6  
Extension: 70 years





## Additional Resources

### Books for Children

- Barrett, Norman S. *The Picture World of Astronauts*. New York: Franklin Watts, 1990.
- Evans, Arthur N. *The Automobile*. Minneapolis: Lerner Publications Company, 1985.
- Graham, Ian. *Transportation*. New York: Hampstead Press, 1989.
- Hakim, Joy. *A History of the U.S.: An Age of Extremes*. New York: Oxford University Press, 1994.
- Hazen, Walter A. *Everyday Life: Inventions*. Glenview, IL: Good Year Books, 1997.
- Kerrod, Robin. *Amazing Flying Machines*. New York: Alfred A. Knopf, 1992.
- Kettlecamp, Larry. *Living in Space*. New York: Morrow Junior Books, 1993.
- Levinson, Nancy Smiler. *Turn of the Century: Our Nation One Hundred Years Ago*. New York: Lodestar Books, 1994.

### Books for Adults

- Canby, Courtlandt. *A History of Flight. The New Illustrated Library of Science and Invention*. New York: Hawthorn Books Inc., Publishers, 1963.
- Clymer, Floyd. *Those Wonderful Old Automobiles*. New York: Bonanza Books, 1953.
- Fabre, Maurice. *A History of Land Transportation. The New Illustrated Library of Science and Invention*. London: Leisure Arts Limited Publishers, 1963.
- Groner, Alex, and the editors of American Heritage Business Week. *The History of American Business and Industry*. New York: American Heritage Publishing Co., Inc., 1972.
- Lewis, Jon E. *The Mammoth Book of the West*. New York: Carroll & Graf Publishers, Inc., 1996.
- Maddocks, Melvin, and the editors of Time-Life Books. *The Great Liners*. Alexandria, Virginia: Time-Life, Inc., 1978.
- Martin, J. H., and Geoffrey Bennett. *Pictorial History of Ships*. Secaucus, New Jersey: Chartwell Books, Inc., 1977.
- Munson, Kenneth. *Airliners Between the Wars: 1919–1939*. New York: The Macmillan Company, 1972.
- Munson, Kenneth. *Airliners Since 1946*. New York: The Macmillan Company, 1972.





