



400
QUESTIONS

QUIZ

ON RAILROADS AND RAILROADING

400
ANSWERS

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ANSWERS

**ADDITIONAL COPIES
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**ASSOCIATION OF
AMERICAN RAILROADS**

TRANSPORTATION BUILDING
WASHINGTON, D. C.

FOREWORD

This booklet is dedicated to the curiosity of the American people. Every day and every hour of the day railroad men and women are plied with questions about the railroads. In many instances they are able to supply the answers; in many other instances they do not have the necessary facts or figures conveniently at hand.

The following questions and answers have been compiled to provide railway patrons, railway employees and all other persons who are interested in the railroads with accurate and succinct facts about the railway industry, its organization, its history, its size, its physical plant, its investments, its capitalization, its operations, its accomplishments, and the part the railroads play as providers of transportation service, as fields of investment, as employers of labor, as purchasers of the products of industry and as contributors in taxes toward the support of federal, state, county and local governments.

The many facts herein contained will provide the reader with a wide range of information concerning one of America's basic industries and the place which it occupies in the nation's economic structure.

Association of American Railroads

Washington, D. C., July, 1940.

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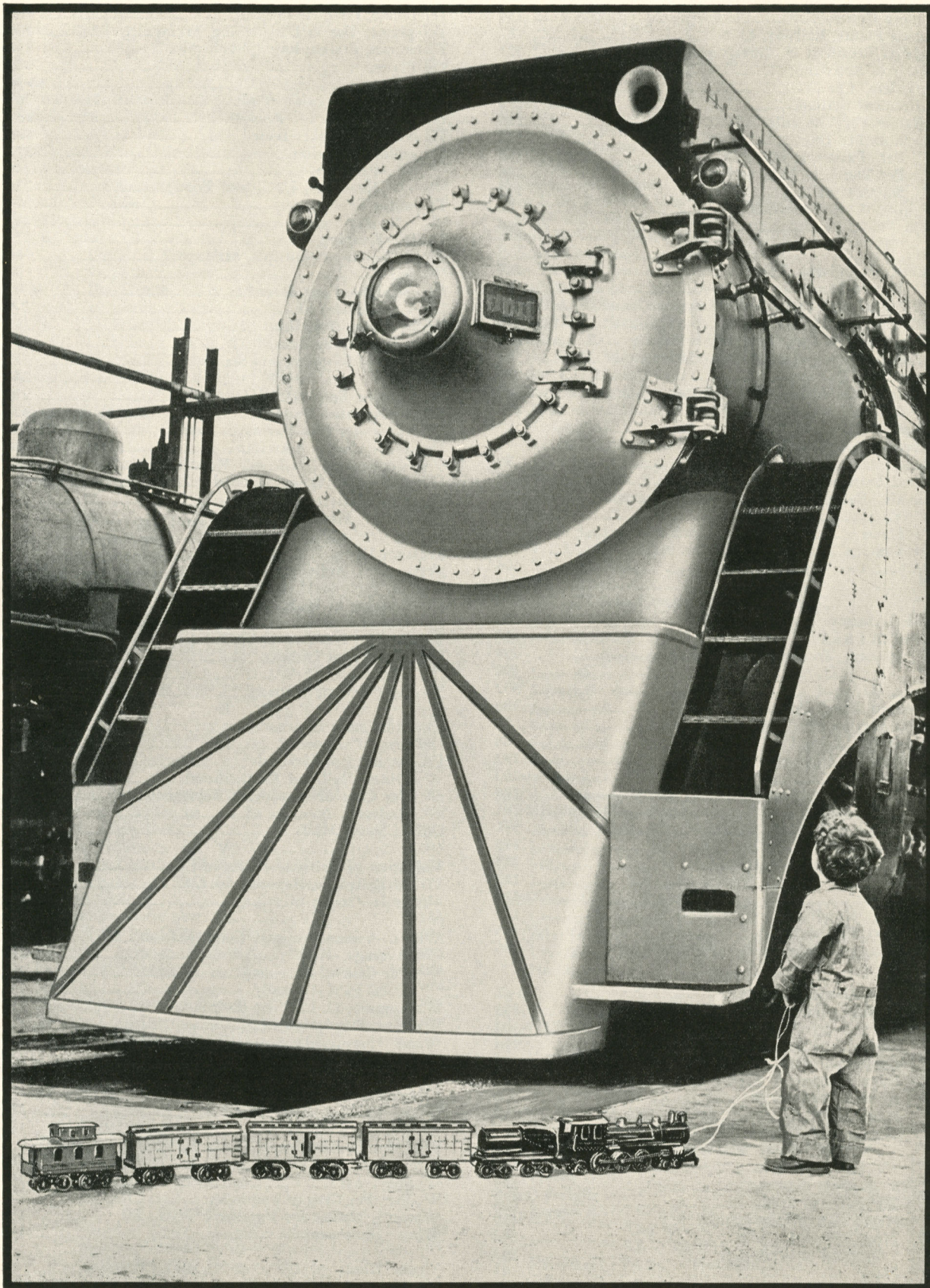
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THE RAILWAY PLANT

1. How many miles of railroad are there in the United States?

There were 236,842 miles of railroad in the United States at the beginning of 1939.

2. What is the total railway mileage of the world?

In 1937 there were 788,672 miles of railroad in the world.

3. How much of the world's railway mileage is in the United States?

With less than six per cent of the world's land area and less than six per cent of the world's population, the United States has about 30 per cent of the world's railway mileage.

4. How does the railway mileage of the United States compare with that of other countries?

The railway mileage of the United States is approximately 10 times that of Great Britain; 6 times that of France; $6\frac{1}{2}$ times that of Germany; 5 times that of Russia; $5\frac{1}{2}$ times that of India; 12 times that of Japan; 21 times that of Italy; and 37 times that of China. There is more railway mileage in the United States than there is in all of South America, Asia, Africa and Australia combined.

5. How does the United States compare with other countries in railway development on the basis of land area and population?

There is a mile of railroad in the United States for every thirteen square miles of land area; in the remainder of the world there is a mile of railroad for every 100 square miles of land area.

There is a mile of railroad in the United States for every 550 persons; in the remainder of the world there is a mile of railroad for every 3,277 persons.

6. What is the difference between miles of railroad and miles of track?

A mile of railroad may consist of a single track or it may consist of two, three or more parallel

tracks, and it may also include sidings, spur tracks and yard tracks. Thus, a mile of railroad may embrace several miles of tracks.

7. How many miles of railway track are there in the United States?

There were 420,118 miles of railway track in the United States at the beginning of 1939.

8. How many tracks would this form across the continent from coast to coast?

If all the railway tracks in the United States were so laid out, they would form 133 parallel tracks connecting New York with San Francisco.

9. If all railway tracks in the United States were extended in a single line, how long would it take a train, traveling at the rate of a mile-a-minute, to run from one end of the track to the other?

Two hundred and ninety-two days.

10. How many miles of railroad consists of two or more parallel tracks?

20,656 miles of railroad in the United States consisted of two or more parallel tracks at the beginning of 1939.

11. What states lead in railway mileage?

The ten states having the greatest railway mileage are: Texas, with 16,473 miles; Illinois, with 12,045 miles; Pennsylvania, with 10,617 miles; Iowa, with 9,082 miles; Kansas, with 8,667 miles; Ohio with 8,518 miles; Minnesota, with 8,463 miles; California, with 7,970 miles; New York, with 7,824 miles; and Michigan, with 7,352 miles. These figures are as of December 31, 1938, and do not include switching and terminal companies.

TRACK

12. What is the right-of-way?

The right-of-way is the strip of land, of varying widths, upon which the railroad and its facilities are built. It is wide enough to provide for tracks, drainage, signals, bridge abutments, telegraph and telephone lines, sidings, buildings and other needs.

13. What is a railroad cut?

When the right-of-way of a railroad is cut through a hill, knoll or slope to provide a road-way, the excavation is called a cut.

14. What is a railroad embankment?

A solid bank of earth, rock or other material built above the natural ground surface to form the roadbed of the railroad is called an embankment or fill.

15. What is ballast?

Ballast is material such as gravel, crushed rock and cinders, placed on the roadbed to drain water away from the ties, to spread the load over softer subgrade and provide an even bearing for the ties, to hold ties more firmly in place and to check the growth of grass and weeds. Ballasting improves drainage, lessens dust, reduces weeding and maintenance problems, adds to the stability of the road, and makes a smoother riding track.

16. What is meant by the bonding of rails?

A rail bond is an electrical conductor for bridging the joints between rails.

17. What is "continuous rail"?

Rails of standard length which are welded together at the ends to form a single rail hundreds or thousands of feet in length are known as "continuous rail." Among the advantages claimed for continuous rail over standard length rail are a smoother track, longer service life, reduced maintenance cost and greater safety.

18. What is the longest continuous rail now in actual service?

The longest continuous rail in service in 1940 is 7,700 feet in length, in the track of the Delaware & Hudson Railroad, near Schenectady, New York.

19. What is the cost of steel rails?

New steel rails laid in replacements by the railroads in 1939 cost an average of \$40.00 a ton at the rolling mills. Transportation expense, storage costs, loading and unloading costs and the cost of installation in track are additional.

20. How much rail is installed annually in the railroads of the United States?

Approximately 2,000,000 gross tons of steel rails, sufficient to build a track 10,000 miles long, are normally laid annually in replacements in the railroads of this country.

21. Who invented and perfected the process of making steel rails?

The original process of making steel rails was invented by Henry Bessemer, of England, and perfected by A. L. Holley, an American. Their inventions produced a steel rail with a life several times greater than that of iron rail. The open-hearth process, developed by William and Frederick Siemens of Germany, and improved by Samuel T. Wellman, an American, has now largely replaced the Bessemer process.

22. Have rails always been made of steel?

The earliest railroads in the United States were built of wooden rails capped with thin strips, or "straps," of iron to provide a running surface for the wheels. These were called "strap-rails." Iron rails 18 feet in length were imported from England as early as 1831, and by 1845 or 1850 most railroads were being built of iron rails. The first steel rails manufactured in the United States were rolled at the North Chicago Rolling Mills on May 25, 1865, and by 1880 about 30 per cent of all tracks in the United States was laid with steel rails. At the end of another ten years, 80 per cent of the country's mileage was equipped with steel rails, and by the late 1890's steel had almost completely replaced iron.

23. What are the different parts of the rail called?

The part of the rail which rests on the ties or the tie plates is the base. The top part of the rail upon which the wheels roll is the head. The part between the base and the head is the web.

24. What is the standard length of rail?

The present standard length of rail is 39 feet. Some railroads use 45-foot rails; some use 60-foot rails at street crossings. A few years ago the standard length was 33 ft., and before that it was 30 ft.

25. Has the weight of rail been increased in recent years?

Due to the gradual installation of heavier rail in replacements, the weight of rail in track throughout the United States was increased from an average of 82.89 pounds per yard in 1921 to 94.15 pounds per yard in 1938.

26. How much does rail weigh?

Rails ranging in weight from 50 to 152 pounds per yard are in use on the railroads of the United States. On trunk line railroads, rail weights range from 85 or 90 pounds upward. At the beginning of 1939, there were 100,405 miles of main-line railroad equipped with rail weighing 100 pounds or more per yard.

27. How are rails joined together in the track?

Rail ends are joined by means of two pieces of steel called angle bars, firmly held in place by bolts which pass through the rail web.

28. How are rails secured to the ground?

Rails are securely spiked to the cross-ties and the ties are firmly embedded in ballast or embankment.

29. What is the name and what are the purposes of the thin plates of steel between the rails and the ties?

They are called tie-plates. Their purposes are to provide the rail with a uniformly firm foundation and to prevent the rail from cutting into the ties under the heavy impact of trains. They prolong the life of the ties.

30. How many cross-ties are there in railway tracks throughout the United States?

There are approximately 1,172,000,000 cross-ties in railway track throughout the United States. In addition, about 28,500 miles of track are laid with switch and bridge ties.

31. How many cross-ties are required for a mile of railway track?

The number of cross-ties in the average mile of railway track at the beginning of 1939 was 2,994. The average spacing was, therefore, 21.2 inches, center to center.

32. What is meant by "tie treatment" or "treated ties"?

Cross-ties, switch-ties and bridge-ties which have been saturated with creosote, zinc chloride or other preservatives to prevent decay or destruction by insects are called "treated." The treatment more than doubles the service life of the ties. Bridge timbers, piling, poles and other woods are also treated in this manner before use.

33. What is the cost of a cross-tie?

The cost varies in different parts of the country, depending on kind of wood, distance hauled before being placed in the track and whether treated or untreated. The average treated cross-tie cost the railroads \$1.27 in 1938; the average untreated cross-tie cost 76 cents.

34. How many cross-ties do the railroads install in a year?

The railroads of the United States install about 50,000,000 cross-ties a year, on the average. Approximately 80 per cent of the cross-ties installed in replacements in recent years have been treated.

"Twin ribbons of steel" that form part of the world's greatest railway network. More than 20,000 miles of railroad in the United States consist of two or more parallel tracks.



35. What is meant by standard gauge?

Gauge is the space, in feet and inches, inside of the two parallel rails in a track, the gauge-line being $\frac{5}{8}$ of an inch below the top of the rail. In the United States and in many foreign countries the standard gauge is 4 feet $8\frac{1}{2}$ inches.

36. Was 4 feet $8\frac{1}{2}$ inches always the standard gauge in the United States?

In 1871, no fewer than nineteen different gauges, ranging from three feet to six feet, existed on the railroads of the United States, making it impossible for freight or passenger cars to be freely interchanged. The conversion of the Pacific Railroad of Missouri (now the Missouri Pacific) from 5 feet 6 inches to 4 feet $8\frac{1}{2}$ inches in 1868, and of the Ohio & Mississippi (now the Baltimore & Ohio) from 6 feet to 4 feet $8\frac{1}{2}$ inches in 1871, gave impetus to the standardization movement. By 1887 practically every important broad gauge railroad in the United States had changed to 4 feet $8\frac{1}{2}$ inches, which by that time had come to be known as the standard gauge.

37. Are all railroads in the United States now standard gauge?

Of 236,842 miles of railroad in this country at the beginning of 1939, 235,386 miles, or 99.4 per cent, were standard gauge lines and 1,456 miles were narrow gauge lines, mostly three feet. Some 113 miles of railroad tracks were equipped with three rails to accommodate both narrow and standard gauge equipment. The narrowest gauge is two feet, on the 8-mile Monson Railroad and the 16-mile Bridgton & Harrison Railway, both in Maine.

38. What was the broadest railway gauge ever used in the United States?

At one time—from 1867 to 1871—one could travel all the way from New York to St. Louis over railroads with a gauge of six feet—the broadest that ever existed on the North American Continent. The "Great Broad Gauge Route" was as follows: New York & Erie Railroad (now the Erie) from New York to Salamanca, New York; Atlantic & Great Western Railroad (now the Erie) from Salamanca to Dayton, Ohio; Cincinnati, Hamilton & Dayton Railroad (now the Baltimore & Ohio) from Dayton to Cincinnati; Ohio & Mississippi Railroad (now the Baltimore & Ohio) from Cincinnati to St. Louis. The gauge of the Albany &

Susquehanna Railroad (now the Delaware & Hudson) from Albany to Binghamton, New York, and the several lines of the Delaware, Lackawanna & Western Railroad was originally six feet.

39. Why was 4 feet $8\frac{1}{2}$ inches adopted as the standard gauge?

Ancient Roman chariots were built with a clearance of about 4 feet $8\frac{1}{2}$ inches between wheels. This was the width between wheels of the early European coaches and carts. Early English tramways, operated by horse power, were built to accommodate carts of this width, and the first English locomotives were built of this gauge. Some of the first railroads in the United States imported locomotives from England, and these locomotives were of the English gauge. The track was made to fit the English locomotives, and, since the English locomotives were considered the best in the world at that time, there seemed to be no reason why the English gauge should not be adopted by locomotive manufacturers and railway builders in this country. This strongly influenced the Delaware & Hudson, Baltimore & Ohio, Mohawk & Hudson and other railroads to adopt the 4 feet $8\frac{1}{2}$ inch gauge. Of 487 railroads in the United States in 1871, 307 were of the English gauge, and, since the mileage of English gauge roads exceeded that of all other railroads combined, that gauge was adopted as standard to enable free interchange of freight and passenger equipment.

40. What is the longest stretch of straight railway track in the United States?

A straight track, 78.86 miles in length, on the Seaboard Railway between Wilmington and Hamlet, North Carolina, is the longest stretch of track without a curve in the United States.

41. What are other long stretches of straight track in the United States?

Other stretches of straight track, or tangents, of 50 miles or over are: On the Rock Island Lines between Guymon, Oklahoma, and Dalhart, Texas, 71.94 miles; on the New York Central, between Air Line Junction, west of Toledo, Ohio, and Butler, Indiana, 68.49 miles; on the Monon Railroad between Brookston and Westville, Indiana, 64.52 miles; on the Illinois Central Railroad, between Edgewood and Akin Junction, Illinois, 62.96 miles; on the Atlantic Coast Line Railway,



Tens of thousands of maintenance crews are constantly engaged in keeping railway tracks in condition. Other thousands of crews maintain bridges, buildings, signals and other parts of the railway plant.

between Waycross and Kinderloup, Georgia, 60.10 miles; on the Seaboard Railway, between Okeechobee and West Palm Beach, Florida, 57.40 miles; on the Chicago and North Western Railway, between Vayland and Blunt, South Dakota, 53.85 miles; on the Denver & Rio Grande Western Railroad, between Villa Grove and Alamosa, Colorado, 52.82 miles; on the Northern Pacific Railroad, between Fargo and Peak, North Dakota, 51.20 miles; on the Southern Pacific Railroad, between Tagus and Slater, California, 50 miles.

42. What is unique about the long tangent (straight track) on the Denver & Rio Grande Western?

This tangent, nearly 53 miles in length, in the San Luis Valley of Colorado, runs through the heart of the Rocky Mountains and is surrounded by high and rugged ranges. Its elevation above sea level is 7,550 feet at Alamosa and 7,900 feet at Villa Grove. It was built in 1891.

43. What is railroad gradient?

The gradient, or grade, of a track is the rate of ascent or descent—the extent to which the track

deviates from a level surface. A perfectly level track has a zero grade. A climb of 2 feet in 100 feet of track is known as a 2 per cent grade. Terms commonly used: *Up grade*, an ascending grade; *Down grade*, a descending grade; *Grade crossing*, a crossing of one railroad with another railroad or with a highway at the same level.

44. What is the maximum grade on main line track?

Grades from 0.01 to 1.00 per cent predominate on main lines throughout the country. In mountainous territory, grades up to 2.2 per cent are sometimes necessary. Grades in excess of 2.2 per cent in main lines are uncommon.

45. What is the steepest railroad grade in the United States?

The steepest known grade on a standard steam railroad in this country is 5.89 per cent. This occurs on the Pennsylvania Railroad at Madison, Indiana, where the railroad ascends the Ohio River bank. The grade extends about 7,000 feet, and the climb is approximately 400 feet. Saddle-tank locomotives are operated on this track.

The steepest known grade on the main line of a standard steam railroad in this country is 4.7 per cent, at Saluda Hill, on the Southern Railway, in the Blue Ridge Mountains of North Carolina. Saluda Hill is located between Saluda and Melrose stations, about thirty-five miles south of Asheville.

On the winding 72-mile narrow-gauge Uintah Railway in Garfield County, Colorado, there was a 5-mile $7\frac{1}{2}$ per cent grade between Atchee and Baxter Pass, combined with numerous hairpin curves, the sharpest of which was 66° . The Interstate Commerce Commission authorized the abandonment of this railroad in 1938.

46. How are curvatures of track expressed?

Curvatures are expressed in degrees, minutes and seconds. A curve is a part of a circle. The sharper the curve, the smaller the circle and the shorter the radius.

47. What is the maximum curvature of main line track?

On important standard gauge railway lines, maximum curvatures of from 1° to 3° are not uncommon. Curves of 6° are met with occasionally; and, in rare instances, chiefly in mountainous territory, curves of 10° or 11° are encountered.

On some light traffic lines and branch lines sharper curvatures are common. On the 72-mile narrow-gauge Uintah Railway in western Colorado, abandoned since 1938, there were, in a stretch of thirteen miles, 233 curves varying from 4° to 66° , twenty-seven of which were sharper than 50° . The 66° curve, at Morrow Castle, Colorado, was originally 80° but was reduced several years before abandonment to accommodate Mallet locomotives.

48. What is the longest railroad curve in the United States?

The Pontchartrain Curve on the Illinois Central Railroad between Ruddock and Tunity, Louisiana, is believed to be the longest single railroad curve in the United States. With slight variations in degree, between eight and twelve minutes, this curve, skirting the western shore of Lake Pontchartrain, extends for 49,884 feet, or 9.45 miles.

Another notable curve, also skirting the shore of Lake Pontchartrain, is on the Southern Railway (New Orleans & Northeastern) approaching the city of New Orleans. This curve, varying from

four to six minutes, is almost exactly nine miles in length.

The longest perfectly uniform single curve is believed to be on the Texas & Pacific Railroad between Alexandria and Cheneyville, Louisiana. This curve is 30,100 feet, or 5.7 miles in length. It is a 10-minute curve throughout.

49. Why is the outer rail higher than the inner rail on curves?

The outer rail is elevated to balance the overturning forces that are set up by a train rounding a curve, for the same scientific reason that a circular track for motorcycle, bicycle or motorcar racing is tilted upward from the inner to the outer rim. This is required to resist the centrifugal forces of the moving train. The degree of curvature and the authorized train speed govern the extent of the elevation of the outer rail.

50. What is the highest altitude reached by a railroad line in the United States?

The highest point reached by a railroad in the United States is the summit of Pike's Peak in Colorado, 14,109 feet above sea level, reached by the Manitou & Pike's Peak (cog) Railroad.

51. What is the highest altitude reached by a *standard* steam railroad in the United States?

The highest point reached by a standard steam railroad in this country is at Ibex, Colorado, on the Denver & Rio Grande Western Railroad, where the elevation is 11,522 feet above sea level.

52. What other high altitudes are reached by railway lines in the United States?

The Colorado & Southern Railway (a part of the Burlington System) reaches an altitude of 11,319 feet at Climax, Colorado, and 10,207 feet at Leadville, Colorado. Both points are on narrow-gauge lines. The Denver & Rio Grande Western Railroad reaches altitudes of 10,856 feet at Marshall Pass, Colorado, (narrow gauge); 10,239 feet at Tennessee Pass, Colorado, (standard gauge); 10,200 feet at Leadville, Colorado, (standard gauge); 10,028 feet at Monarch, Colorado, (narrow gauge); and 10,015 feet at Cumbres Pass, Colorado, (narrow gauge).

53. How many railway tunnels are there in the United States and what is their total length?

There were 1,539 railway tunnels in this country in 1937. Their aggregate length was 320 miles.

54. What was the first railway tunnel in the United States?

The first railroad tunnel in this country was constructed in 1833, four miles east of Johnstown, Pennsylvania, for the Allegheny Portage Railroad (now a part of the Pennsylvania Railroad).

55. What is the oldest great railway tunnel in the United States?

The Hoosac Tunnel, on the Boston & Maine Railroad, under Hoosac Mountain, Massachusetts, was the first great railway tunnel built in the United States, and it is the oldest of the long railway tunnels now in use in this country. It was one of the most stupendous engineering feats of the period in which it was built. Twenty-five years were required for its construction. The tunnel is 4 miles 3,690 feet in length; was commenced in 1851; holed through November 27, 1873; completed so as to admit passage of cars February 9, 1875; used by Boston-Troy passenger trains October 1875; officially opened for business July 1, 1876; electrified May, 1911.

56. What is the longest railway tunnel in the United States?

The Cascade Tunnel, of the Great Northern Railroad, through the Cascade Mountains in Chelan and King Counties, Washington, is 41,152 feet (7.79 miles) in length, and is the longest railway tunnel in the Western Hemisphere. It was completed in 1929. In the construction of this tunnel, boring was started simultaneously at the eastern and western portals, nearly eight miles apart, and when the construction forces met in the center, after many months of continuous boring, they found that they were only a fraction of a foot out of perfect alignment.

57. What is the second longest railway tunnel in the United States?

The Moffat Tunnel, of the Denver & Salt Lake Railroad, under James Peak in Colorado, is 6 miles 600 feet in length, and is the second longest railway tunnel in the United States. The highest point

in the tunnel is 9,257 feet above sea level. Opened for railway traffic in 1928, the tunnel shortened the rail distance between Denver and Salt Lake City via the route of the Denver & Rio Grande Western by 173 miles.

58. How many railway bridges are there in this country?

In 1937 there were approximately 191,779 bridges, with an aggregate length of 3,860 miles, in the railway structure of the United States.

59. What is the longest railroad bridge in America?

The famous Lucin Cut-off, carrying the tracks of the Southern Pacific Railroad across Great Salt Lake in Utah, is the longest railroad bridge structure in the United States. It is of pile-trestle construction, 19 miles in length, and was completed in 1903.

60. When did iron and steel bridges come into use?

The first iron railroad bridge in the United States is believed to have been built for the Reading Railroad in 1845. In 1846-47 a boiler-plate tubular girder, 55 feet in length, was built at Bolton, Maryland, for the Baltimore & Ohio Railroad, and an iron Howe truss bridge, with 30-ft. spans, was built near Pittsfield, Mass., for the Boston & Albany Railroad (now the New York Central). The first all-steel railway bridge was a 2,700-ft. structure completed at Glasgow, Missouri, in 1879, for the Chicago & Alton Railroad.

61. What was the first railway bridge across the Mississippi River?

The Rock Island Railroad bridge at Davenport, Iowa, opened in 1856, was the first to span the Mississippi River. Built of wood, resting on stone piers, this 1,582-foot structure was described as "the mechanical wonder of the West." The first locomotive, the "Des Moines," crossed the bridge on April 21, 1856.

62. How many miles of telegraph and telephone wires are used to operate the railroads?

The railroads of the United States use 1,285,898 miles of telephone and telegraph wires in their operations. This would be sufficient to reach more

than fifty-one times around the globe at the equator.

63. How many telegraph or telephone poles are required per mile of line?

The number of poles per mile of line varies from 26 to 60 or more, depending on the number of wires to be carried, the kind of wood, the number of highway, track, bridge or other crossings to be made and other conditions.

The standard span lengths for pole lines, and the approximate number of poles per mile required for these spacings, are as follows:

Span Lengths in Feet	Approximate Number of Poles per Mile
88	60
100	53
130	40
150	35
175	30
200	26

64. Is there a difference between a *railroad* and a *railway*?

There is no distinction. The terms are used interchangeably in the United States. Of 137 Class I railroads in the United States, sixty-five use *railway* and sixty-nine use *railroad* in their corporate names. Three use neither. Most electric street, subway, elevated and interurban lines are called *railways*. In the British Empire, *railway* is used in preference to *railroad*.

65. What is meant by Class One, Class Two and Class Three railroads and switching and terminal companies?

For statistical purposes, railroads are divided into three classes, as follows: Class One railroads, each having operating revenues above \$1,000,000 a year; Class Two railroads, each having operating revenues above \$100,000 and not exceeding \$1,000,000 a year; and Class Three railroads, each having operating revenues up to \$100,000 a year. (Roman numerals—I, II and III—are usually used in designating them.) Switching and terminal companies include local switching railroads, industrial railroads, port railroads, stockyard railroads, bridge and ferry companies, union station companies and various other local railway companies not engaged in line-haul operations.

66. How many railway companies are in operation in the United States?

On January 1, 1940, there were 137 Class I; 187 Class II; 222 Class III line-haul railroads and 219 switching and terminal companies in operation in the United States—a total of 765 companies in the four groups.

67. What proportion of the total railway plant and activity is represented by Class I railroads?

In 1938, Class I line-haul railroads operated 93.68 per cent of the total railway mileage; represented 94.70 per cent of the recorded investment; owned 94.13 per cent of the locomotives; 98.17 per cent of the freight cars; 98.44 per cent of the passenger-train cars, performed 99.87 per cent of the passenger-miles and 99.39 per cent of the ton-miles; employed 94.10 per cent of the railway workers; paid 94.09 per cent of railway taxes; and reported 96.71 per cent of total operating revenues.

68. How many railroads in the United States operate more than 1,000 miles of road?

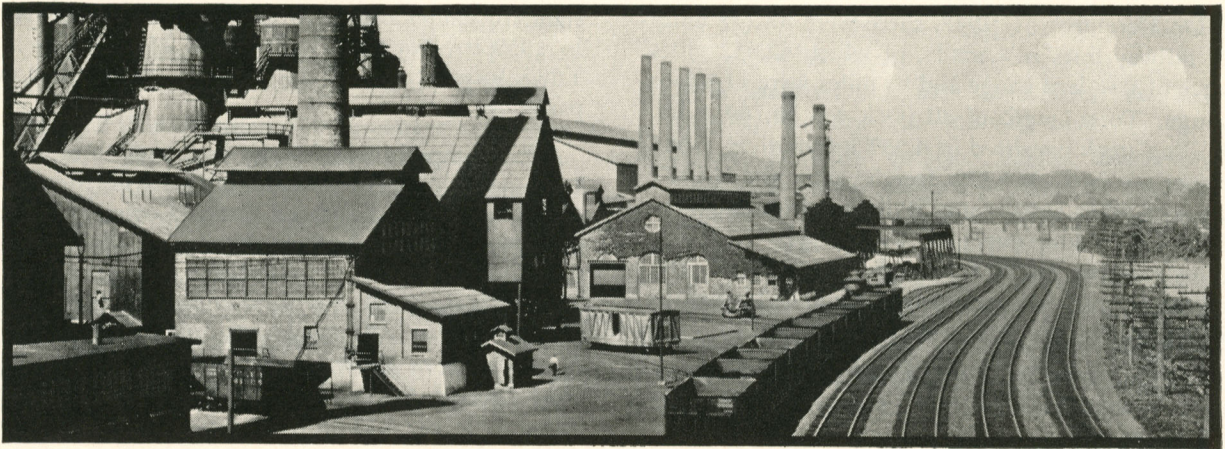
In January, 1940, there were forty-three railroads operating more than 1,000 miles of railroad each.

69. What is the world's greatest railroad center?

Chicago, Illinois, enjoys this distinction. The city is served by twenty-one Class I railroads and fourteen switching and terminal companies. These railroads—including some of the largest in the country, embrace more than two-thirds of the railway mileage of the United States. They own more than one-half of all the locomotives and cars and perform more than one-half of all the railway passenger, freight, express and mail service of the country. There are about 8,000 miles of railway trackage in the Chicago terminal district. Between 3,000 and 4,000 passenger and freight trains enter or leave the city daily.

70. What state has the largest number of railroad companies?

Pennsylvania, with seventy-three railway and switching and terminal companies, outranks all other states in the number of operating companies. Illinois ranks second with sixty-eight companies and Texas ranks third with sixty-four companies.



Industry and railway transportation go hand in hand. Thousands of manufacturing plants depend upon the railroads to bring them their raw materials and distribute their products to widely scattered markets

71. What is a line-haul railroad?

A line-haul railroad is a railroad that performs main line or trunk line common-carrier transportation service, as distinguished from a switching or terminal company.

72. What is a common carrier railroad?

A railroad which provides the general public with transportation service for compensation is a common carrier. A common carrier is required to carry all goods offered when accommodations are available, and when the fixed price for such service is tendered.

73. What is the shortest railroad in the United States?

The Valley Railroad, 1 mile in length, at Westline, McKean County, Penna., is the shortest line-haul railroad in the United States. This railroad derives its revenues entirely from freight and switching service. In 1938 the Valley Railroad owned one locomotive and employed six persons. It is an independent company, rated as a Class III road.

74. What are the shortest railroads in the United States performing freight, passenger, express and mail service?

The Beaufort & Morehead Railroad, 3.3 miles in length, between Beaufort and Morehead City, N. C., using equipment furnished by the Atlantic & North Carolina Railroad, is the shortest railroad

in the country performing the four kinds of service.

The shortest railroads operating their own equipment and performing all four services are the Schoharie Valley Railway, Schoharie, New York, (controlled by the Delaware & Hudson Railroad), and the Sandersville Railroad, an independent company, at Sandersville, Georgia, each 4.26 miles in length.

75. What is the largest railroad in the United States?

The answer to this question depends upon the basis of measurement. The Atchison, Topeka & Santa Fe Railway, with 13,456 miles of railroad, ranks first in miles of road operated. The New York Central Railroad, with 24,983 miles of track, ranks first in miles of track operated. The Pennsylvania Railroad ranks first in total investment (\$2,698,858,000), in revenue passenger-miles (3,147,223,000), in revenue ton-miles (34,745,746,000), in total revenues (\$430,931,000), in units of equipment owned (4,533 locomotives, 5,198 passenger cars, 237,998 freight cars) and in the number of employees (99,924). The figures are for 1939 and exclude railroads which are controlled but operated separately.

76. Give a brief description of the railroads of Canada.

The Dominion of Canada is served by two large railway systems, the government-owned Canadian National and the privately owned Canadian Pacific, and by thirty-two smaller railroads and switching and terminal companies.

On December 31, 1938, there were 42,742 miles of railway lines in Canada, of which 42,652 miles were of standard gauge and 90 miles were of 3-foot gauge. Total length of all track was 56,760 miles. Rolling stock consisted of 4,557 locomotives, 6,381 passenger cars, 168,329 freight cars and 14,677 units of other equipment. Railroad properties represented an investment of \$3,094,704,775. Their gross revenues in 1938 totaled \$336,833,400. The railroads provided employment to 127,824 persons at the end of the year.

On December 31, 1939, the Canadian National Railways operated 23,697 miles of railroad lines, of which 21,854 miles were in Canada and 1,842 miles were in the United States.

The Canadian Pacific Railway, on the same date, operated 22,217 miles of railroad lines, of which 16,863 miles were in Canada and 5,354 miles were in the United States.

Other important Canadian railroad lines are: the 923-mile Northern Alberta Railway, extending northeastwardly and northwestwardly from Edmonton, Alberta; the 515-mile Temiskaming & Northern Ontario Railway, owned by the Ontario Government, with main line extending from North Bay to Moosonee on Hudson Bay; the 348-mile Pacific Great Eastern Railway in central British Columbia; the 322-mile Algoma Central & Hudson Bay Railway, extending from Sault Ste. Marie on Lake Superior to Hearst, Ontario; the 113-mile Temiscouata Railway, extending from Riviere du Loup, on the St. Lawrence River, to Connors, on the St. John River; and the 111-mile Toronto, Hamilton & Buffalo Railway, in southern Ontario.

Railroads of the United States were operating the following road mileage in Canada on Dec. 31, 1938: The New York Central, 501 miles; Pere Marquette, 319 miles; Wabash, 245 miles; Great Northern, 223 miles; Northern Pacific, 74 miles; Maine Central, 5 miles; Pennsylvania, 2 miles.

77. What is the extent of Mexico's railway system?

Nineteen operating railroads in Mexico embrace approximately 12,150 miles of railway lines, of which 82 per cent is standard gauge and 18 per cent is narrow gauge. Equipment consists of approximately 1,340 locomotives; 21,000 freight cars and 1,200 passenger cars. About two-thirds of the railway mileage is state-owned. The state railways, known as the Ferrocarriles Nacionales de Mexico (National Railways of Mexico) operate 8,131 miles of railroad, of which 6,855 miles are

standard gauge and 1,276 miles are narrow gauge. In 1939 the National Railways of Mexico owned 1,006 locomotives, 15,954 freight cars and 820 passenger cars.

Other important Mexican railroads are: the 1,331-mile Southern Pacific Railroad of Mexico, controlled by the Southern Pacific Company, with main line extending from Nogales, Arizona, to Guadalajara; the 564-mile United Railroads of Yucatan (standard and narrow gauge) centering on the port of Progreso; the 496-mile Mexico North-Western Railway, with main line extending from Ciudad Juarez, opposite El Paso, Texas, to Tabalaopa; the 434-mile Mexican Railway (standard and narrow gauge) with main line, partly electrified, extending from Mexico City to the port of Vera Cruz; and the 332-mile Kansas City, Mexico and Oriente Railway, with main line extending from Ojinaga, opposite Presidio, Tex., to Sanchez and from San Pedro to Topolobampo on the Gulf of California.

78. What are some of the international aspects of American railway operations?

The 292,000-mile railway system of the United States, Canada and Mexico forms a vast and closely-knit transportation network embracing a large part of the North American Continent. Approximately 99 per cent of these lines are of uniform standard gauge, permitting the uninterrupted movement of trains from one country to another.

At forty-eight points on the Canadian-United States border and at eleven points on the Mexican-United States border, railroads cross from one country to the other or form connections with railroads operating across the border.

Canadian railroads own, control or operate about 7,200 miles of railroad in the United States, while railroads of the United States own, control or operate nearly 1,400 miles of railroad in Canada and about 1,550 miles of railroad in Mexico. Mexican railroads control 162 miles of railroad in the United States.

The twenty-two railroad companies listed below operate or participate in the operation of through passenger trains between important cities in the United States and Canada or Mexico: Boston & Maine; Canadian National; Canadian Pacific; Central Vermont; Chicago & North Western; Delaware & Hudson; Great Northern; Lehigh Valley; Maine Central; Missouri Pacific; National Railways of Mexico; New York, New Haven & Hartford; New York Central; Northern Pacific;

Pennsylvania; Quebec Central; Rutland; San Diego & Arizona Eastern; Soo Line; Southern Pacific; Texas & Pacific; and Toronto, Hamilton & Buffalo.

Altogether more than 150 passenger trains are operated daily across the Canadian and Mexican borders of the United States, providing through sleeping car, parlor car or coach service from United States cities to and from Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Winnipeg, Regina, Calgary, Edmonton, Vancouver and numerous other Canadian cities, and to and from Monterey, Torreon, Saltillo, San Luis Potosi, Aguas Calientes, Guaymas, Guadalajara, Mexico City and many other points in Old Mexico.

Railway tickets may be purchased at any ticket office in the United States, Canada or Mexico to any city or town reached by rail in the three countries.

79. What are some of the leading private freight car companies in the United States?

Generally speaking, any company other than an individual railroad company which owns railway cars for service on the railroads is known as a private car company. The ten private freight car companies owning the largest fleets of equipment as of April, 1940, are:

	<i>Cars</i>
Union Tank Car Co.....	39,000
Pacific Fruit Express Co.....	37,402
General American Transportation Corp.....	17,620
Fruit Growers Express Co.....	14,354
Merchants Despatch Transportation Corp.....	13,409
Union Refrigerator Transit Lines.....	7,403
Western Fruit Express Co.....	7,146
North American Car Corp.....	7,000
Sinclair Refining Co.....	6,490
Armour Car Lines.....	5,959

80. What do the various sign-posts along the railroad mean?

Land Monuments: Define the limits of the right-of-way.

"No Trespass" Signs: Used at points where trespassing is especially dangerous or undesirable.

Mile Posts: For identification and reference to locations.

Alignment Markers: To define the correct position of tangents, easement spirals and curves.

Grade Markers: Used to establish track elevations or superelevations.

Political Subdivision Signs: To indicate state and county boundry lines and city limits.

Maintenance Limits Markers: Define division of track ownership and maintenance by the railroads or industry and interchange tracks between railroads.

Bridge or Culvert Markers: Identify location of bridges, trestles and culverts.

Section Limits Signs: Mark the beginning and end of a maintenance section.

Snow Plow Markers: (Including flanger signs) Indicate obstruction to snow equipment. Flanger signs warn the operator to lift the flangers.

Speed Control Signs: Direct enginemen to reduce speed of trains under permissible timetable speed, including resume speed signs.

Whistle Posts: Located in advance of highway grade crossings, stations, railway crossings at grade and at other points where locomotive whistles are required to be sounded by rules or law.

Location Markers: Located in advance of hazards, such as railway crossings at grade, yard limits, drawbridges, junctions and stations.

By the turn of an electric switch, this huge bascule drawbridge lifts the rails skyward in a jiffy to admit the passage of river craft.



Close-clearance Markers: Used at points of close horizontal or vertical clearance, such as fixed structures beyond which equipment will not clear at turnouts.

Fire-risk Signs: To warn employees and others of inflammable material storage or underground passage of inflammables.

High-Voltage Signs: Indicate to employees and others the presence of high-tension wires.

81. What is a derail?

A derail or derailler is a device designed to guide cars, locomotives and other rolling stock off the rails at a selected location to avoid collisions or other accidents. Derails are used principally on spur tracks or sidings to prevent cars from fouling main line track. They are rarely used on main line tracks except in connection with interlocking plants at railroad crossings.

82. What is known as a slide detector fence?

To prevent train accidents due to falling rocks or earth slides in hilly or mountainous regions, electrically charged wire fences are made to serve as detectors. If a falling rock or an earth slide breaks one or more of the wires in the fence, a relay is released and "stop" signals are set up to halt a train approaching from either direction.

83. What are the various kinds of railroad yards?

There are (1) freight station and team track yards for the purpose of loading and unloading freight, (2) freight classification yards for the purpose of breaking up and making up trains, (3) storage yards for the storage of freight and passenger cars and locomotives not in use or awaiting repairs, and (4) service yards for cleaning, provisioning and preparing passenger train cars for the next run. Locomotive and car repair shops also have yards for outdoor repair work. Heavy materials which cannot conveniently be kept indoors are stored in supply yards adjacent to storehouses. Many large freight classification yards are equipped with gravity "humps," electrically operated switches, car retarders, floodlights for night operation and other modern improvements.

84. What is a "hump" in a freight yard?

In many large freight yards certain tracks are constructed at steep grades to enable cars to be released and shunted by gravity into various tracks for reclassification. The cars are pushed to the highest elevation of the track, or "hump", and released one at a time or in groups and sent rolling down the incline. The "hump" track branches into many classification tracks. By remote control, a towerman switches each car into its proper track.

85. What are car retarders?

In some freight classification yards, gravity and sorting tracks are equipped with electrically or pneumatically controlled snubbing devices, known as "car retarders," which enable a man located in a tower to slow down or stop the car by the movement of a lever. The car retarder is fitted with a set of movable brake "shoes," located between the rails. When applied by the tower man, these "shoes" act as brakes against the inside surfaces of the turning car wheels, retarding the speed of the car or bringing it to a halt, as desired. These devices obviate the necessity of brakemen riding the released cars and increase the safety, efficiency and speed of yard operations.

86. How much land is occupied by the railway plant?

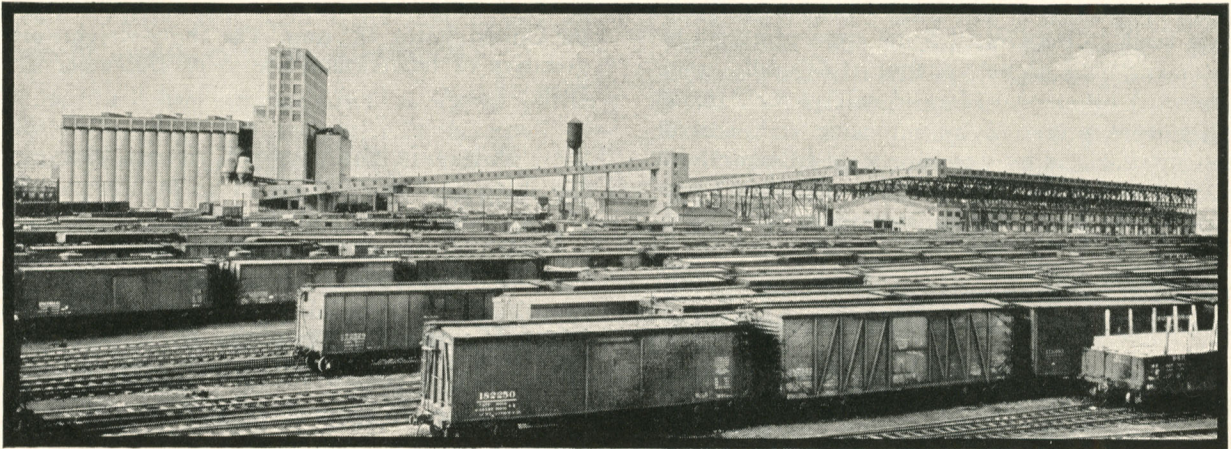
Approximately 4,000,000 acres of land are used by the railroads for rights-of-way, yards, shop, station grounds and other transportation purposes. This is equal to about one-sixth of the area of Indiana.

87. How many railway shop plants are there in this country?

The United States Census of Manufactures for 1935 reports 416 repair and erecting plants, commonly referred to as "railroad shops," owned and operated by the steam railroads of the United States, not including more than 1,100 smaller plants engaged in making light and running repairs. The 416 major shops referred to employed 144,300 workers and reported a total payroll of more than \$200,000,000 in 1935.

88. How many railway station buildings are there in the United States?

In a study made several years ago, it was found that there were approximately 50,000 passenger stations or combination passenger and freight stations, about 60,000 baggage, express, restaurant



Huge railway terminals, equipped with warehouses, elevators and loading and unloading facilities, are required to handle the large concentration of freight traffic at seaports and metropolitan centers.

and service buildings used in connection with passenger stations, and about 10,000 freight stations separate from passenger facilities.

89. How many cities and towns in the United States are served directly by one or more railroads?

According to a study of communities and population in 1930, 73,981 communities in the United States, embracing 93.7 per cent of the total population of the country, were served by one or more railroads.

90. What railroads operate electrified mileage in the United States?

At the beginning of 1939, twenty-five Class I line-haul railroads were operating electrically 2,922 miles of road and 6,855 miles of track, as follows:

Railroad	Miles of Road	Miles of Track
Baltimore & Ohio.....	3	9
Beaumont, Sour Lake & Western.....	27	35
Boston & Maine.....	8	21
Chicago, M., St. P. & P.....	661	901
Delaware, Lackawanna & Western.....	68	161
Great Northern.....	73	95
Illinois Central.....	10	156
Illinois Terminal.....	407	511
Lehigh Valley.....	12	24
Long Island.....	141	446
New York Central.....	93	473
New York Connecting.....	21	65
New York, New Haven & Hartford	128	642
Norfolk & Western.....	76	210

Norfolk Southern.....	42	58
Northwestern Pacific.....	21	42
Pennsylvania	673	2,158
Pennsylvania-Reading Seashore.....	44	76
Reading	84	198
Richmond, Fredericksburg & Pot.....	2	21
Southern Pacific.....	42
Spokane, Portland & Seattle.....	148	187
Staten Island Rapid Transit.....	22	45
Union Pacific.....	24	55
Virginian	134	224
	2,922	6,855

91. What is a catenary?

A catenary on an electrified railroad is the overhead structure, consisting of cross and longitudinal wires and cables, which holds the electrically charged trolley wire in firm position at an approximately uniform elevation above the track.

92. What is a pantagraph?

A pantagraph is a device attached to an electric locomotive or to the roof of a passenger car to collect electric current from an overhead trolley wire. Its function corresponds to that of a trolley arm on a street car. It consists of a collapsible, diamond-shaped, jointed frame operated by springs or compressed air, and having a suitable collector, or trolley contact, at the top.

93. How many miles of railroad track are protected by signal and train-control systems?

At the beginning of 1939, 95,345 miles of railroad track in the United States were protected by automatic block-signal systems, 45,649 miles were protected by manual block-signal systems, 14,358 miles were protected by automatic train-control systems, 2,051 miles were protected by centralized traffic-control systems, and 8,415 miles were protected by automatic cab-signal systems.

94. How many railway-highway grade crossings are there in this country?

On January 1, 1939, there were 231,400 highway-railway grade crossings in the United States.

95. What is a mail bag catcher?

Railway mail cars in which mail is sorted en route are equipped with movable iron arms, called mail bag catchers, which are swung outward to grab mail pouches suspended on mail cranes when the train is in motion. They are operated by railway mail clerks responsible for collecting mail en route.

96. Can water be taken into a locomotive tender while the train is in motion?

Water can be taken on without stopping the train by means of a narrow trough, or "track pan," several thousand feet long, midway between the rails of a railroad track. As a locomotive passes over the "pan" the fireman lowers a scoop under the tender, and the water is forced up into the tender by the speed of the locomotive. In sub-freezing temperatures the tank must be heated to prevent formation of ice. Such a device is practical only on lines of unusually heavy traffic.

LOCOMOTIVES AND CARS

97. How many locomotives are there on the railroads of the United States?

At the beginning of 1939 there were 46,544 locomotives in the United States, of which 45,210 were operated by steam; 882 were operated by electricity and 452 were operated by gasoline or oil.

98. What is the weight of a steam locomotive?

Weights of steam locomotives vary greatly. The average weight of a freight locomotive is 144 tons; that of a passenger locomotive, 130 tons; that of a switching locomotive 91 tons; that of all steam

locomotives in service on the Class I railroads of the United States, 132 tons. The above weights are exclusive of tenders and are as of December 31, 1938.

99. What is the weight of an electric locomotive?

In 1938, the average electric locomotive on Class I railroads weighed 152 tons.

100. To what extent has the power of the average steam locomotive increased in the last quarter-century?

The tractive power of the average steam locomotive on the Class I railroads of the United States was 29,956 pounds in 1913, and 50,659 pounds in 1939—an increase of 69 per cent.

101. How many parts are there in a locomotive?

The modern steam locomotive contains more than 7,500 parts.

102. What is the cost of a steam locomotive?

In 1938 the railroads of the United States installed 212 new steam locomotives at an average cost of \$147,721 each. The cost of new steam passenger locomotives installed ranged from \$129,755 to \$163,069 each, while that of steam freight locomotives ranged from \$139,889 to \$184,868 each.

103. What is the cost of an electric locomotive?

Average costs of electric and oil-electric locomotives purchased by the railroads during the 3-year period 1936-1938 were as follows: Electric passenger locomotives, \$247,458 each; electric switching locomotives, \$68,185 each; oil-electric passenger locomotives, \$203,407 each; oil-electric switching locomotives, \$76,577 each.

104. Are there any wood-burning locomotives in operation today?

The South Georgia Railway Company, operating between Adel, Georgia, and Perry, Florida, and the Live Oak, Perry & Gulf Railroad, operating between Live Oak and Scanlon, Florida, operate wood-burning locomotives.

105. How can the different types of steam locomotives be identified?

By the wheel arrangements, as shown in the following table. For instance, a Pacific type locomotive has two pairs (4) of small wheels in front, three pairs (6) of drivers followed by a single pair (2) of small wheels in the rear (not counting the tender). Thus, the engine is known as a 4-6-2, or Pacific type. The following table will enable one to identify nearly every locomotive operating on the American railroads. Always start at the front of the engine and read back:

<i>Wheel Arrangement</i>	<i>Front to Back</i>	<i>Type</i>
4-4-0	oo00	American
4-4-2	oo00o	Atlantic
4-6-0	oo000	Ten-Wheel
4-6-2	oo000o	Pacific
4-6-4	oo000oo	Hudson
4-8-0	oo0000	Twelve-Wheel
4-8-2	oo0000o	Mountain
4-8-4	oo0000oo	Northern
4-10-0	oo00000	Mastodon
4-10-2	oo00000o	Southern Pacific
4-12-2	oo000000o	Union Pacific
2-4-2	o00o	Columbia
2-6-0	o000	Mogul
2-6-2	o000o	Prairie
2-8-0	o0000	Consolidation
2-8-2	o0000o	Mikado
2-8-4	o0000oo	Berkshire
2-10-0	o00000	Decapod
2-10-2	o00000o	Santa Fe
2-10-4	o00000oo	Texas
0-6-0	000	6-Wheel Switcher
0-8-0	0000	8-Wheel Switcher
0-4-0	00	4-Wheel Switcher
4-8-8-2	oo0000 0000o	Mallet (articulated)
0-6-6-0	000 000	" "
2-6-6-0	o000 000	" "
2-6-6-2	o000 000o	" "
2-6-6-4	o000 000oo	" "
4-6-6-4	oo000 000oo	" "
0-8-8-0	0000 0000	" "
2-8-8-0	o0000 0000	" "
2-8-8-2	o0000 0000o	" "
2-10-10-2	o00000 00000o	" "
2-8-8-4	o0000 0000oo	Yellowstone
6-4-4-6	ooo00 00ooo	Pennsylvania
4-4-4-4	oo00 00oo	Baltimore & Ohio

106. What is the size of a locomotive firebox?

Sizes of fireboxes vary from less than 100 cubic feet in small passenger and switching locomotives

to as much as 866 cubic feet in the larger freight locomotives. The firebox of the passenger locomotive "American Railroads" (6-4-4-6) at the New York World's Fair, measures 660 cubic feet. The Yellowstone type locomotive of the Northern Pacific Railroad, measuring 20½ feet in length and 6½ feet in width, is large enough to hold an automobile with room to spare.

107. What is the water-carrying capacity of a locomotive tender?

The capacity of passenger locomotive tenders ranges from 4,500 to 24,500 gallons, with the average between 15,000 and 18,000 gallons. The capacity of tenders employed in freight service ranges from 7,000 to 30,000 gallons, the most common being from 16,000 to 22,000 gallons. The tender capacity for switching engines ranges from 7,000 to 19,000 gallons, with 9,000 to 10,000 gallons capacity the most commonly used.

108. How much boiler tubing is there in a steam locomotive?

The average road locomotive in service on the railroads of the United States has approximately one mile of boiler tubing. The aggregate length of boiler tubing in a Mikado type of locomotive is 1.058 miles; in a Yellowstone type, 1.100 miles; in a Santa Fe type, 1.281 miles.

109. How much labor goes into the construction of a steam locomotive?

The construction of a large steam locomotive provides employment equivalent to the work of 50 men for one year.

110. How many manufacturing plants contribute to the construction of a locomotive?

Materials from approximately 120 manufacturing plants go into the construction of a standard steam locomotive.

111. In what cities of the United States have steam locomotives been built?

Among the cities of the United States in which steam locomotives have been constructed are: Albany, N. Y., Alexandria, Va., Allegheny, Pa., Altoona, Pa., Baltimore, Md., Burlington, Ia., Charleston, S. C., Chester, Pa., Chicago, Ill., Cincinnati, Ohio, Davenport, Ia., Delano, Pa., Dun-

kirk, N. Y., Hillyard, Wis., Hoboken, N. J., Jersey City, N. J., Lancaster, Pa., Lima, Ohio, Lowell, Mass., Manchester, N. H., Newark, N. J., Newcastle, Del., New York City, Paterson, N. J., Philadelphia, Pa., Pine Bluff, Ark., Pittsburgh, Pa., Portland, Me., Providence, R. I., Richmond, Va., Roanoke, Va., Sacramento, Cal., Sayre, Pa., Schenectady, N. Y., Scranton, Pa., South Easton, Pa., Taunton, Mass., Vicksburg, Miss., Water Valley, Miss., Weatherly, Pa., White River Junction, Vt., Wilkes Barre, Pa., and York, Pa.

112. How much contact is there between the wheel of a locomotive or car and the rail?

Theoretically, the contact of an absolutely perfect wheel with an absolutely flat surface, if the materials of which the wheel and surface are made are incompressible, would be a thin line not much wider than the edge of a knife. However, all structural materials deform under load. Loaded wheels resting on a rail tend to flatten at the point of contact, and the tread of the rail tends to adjust itself to the curve of the wheel. Hence, the actual contact of wheel and rail is approximately the width of a chalk line.

113. What is the flange on a locomotive wheel or a car wheel and what is its purpose?

The flange is a projecting edge on the inside rim of a wheel. With the mate-wheel fitted in the same manner, the flanges keep the wheels on the rails.

PASSENGER TRAINS

114. How many passenger-train cars are operated on the American railroads?

There were 46,887 passenger-train cars on the Class I railroads of the United States at the beginning of 1939. Of the total, 17,914 were coaches; 13,631 were baggage, express and other non-passenger cars; 7,582 were parlor and sleeping cars; 1,572 were dining cars; 1,918 were U. S. Mail cars; 3,295 were combination coach cars; 360 were observation, club and lounge cars and 615 were other passenger-train cars. The Pullman Company owned 7,578 of these cars.

115. What is the length of a passenger car?

Passenger cars range in length from about 60 feet to 88 feet, the average length being approxi-

mately 72 feet, outside over-all measurements. Most of the newer passenger cars are from 75 to 85 feet in length.

116. How many drawings are required in the design of a railway passenger car?

From 100 to 400 separate drawings (tracings) are made by the railway company; around 400 are made by the manufacturer, and from 300 to 500 are made by the firms which supply special parts. From these tracings many hundreds of blue prints are made for the guidance of the builders.

117. How much does a railway passenger-train car weigh?

Weights of passenger train cars vary considerably. Average weights on December 31, 1938, were as follows: standard coaches, 60.70 tons; baggage, express and other non-passenger cars, 52.19 tons; dining cars, 83.17 tons; club, lounge and observation cars, 77.07 tons; parlor cars, 69.91 tons; mail cars, 61.43 tons; Pullman sleeping cars, 83.25 tons.

118. How many passengers could be seated in all steam railway passenger cars at one time?

There were 29,101 passenger-carrying cars in operation on the railroads of the United States, with Pullman cars included, at the beginning of 1939. Their aggregate seating capacity was 1,738,645.

119. When was steam heat introduced in passenger trains?

Steam heated passenger cars, doing away with stoves or hot water heaters, were introduced in 1881. The system was greatly improved in 1903 by the introduction of the vapor system of heating.

120. When were all-steel passenger train cars introduced?

The first all-steel baggage car was introduced in 1904; the first all-steel express car in 1905; the first all-steel postal car in 1905; and the first all-steel passenger coach in 1906.

121. What is the cost of passenger-train cars?

The average cost of passenger-carrying cars installed by the railroads in the 3-years 1937-1939 was \$53,922 each. Average cost figures for different types of cars were: coaches, \$50,770 each;

combination coach-baggage-mail cars, \$37,710; parlor cars, \$50,360; dining cars, \$73,419; club, lounge and observation cars, \$75,193; sleeping cars, \$85,250 each. The cost of postal cars averaged \$32,194 each; baggage cars, \$14,248 each.

122. When were light-weight streamline passenger trains successfully introduced in the United States?

The first successful trains of this type were operated in 1934.

The Union Pacific aluminum alloy streamliner M-10,000, later christened the "City of Salina," equipped with a distillate - electric locomotive, was delivered to the Union Pacific by the manufacturer at Chicago on February 12, 1934. During the next few months the train made a 12,625-mile exhibition tour of the United States. It visited sixty-five cities and was visited by 1,196,000 persons. It was later one of the stellar attractions at the Century of Progress Exposition, Chicago. In a special test run the train attained a maximum speed of 111 miles per hour. On January 31, 1935, the train was placed in regular daily operation between Kansas City, Missouri, and Salina, Kansas.

The stainless steel streamliner "Pioneer Zephyr" of the Chicago, Burlington & Quincy Railroad, the first train of this type to use Diesel power and the first to be placed in scheduled passenger service, was delivered by the manufacturer at Philadelphia on April 18, 1934. On May 26, 1934, during an extended exhibition tour, the "Zephyr" ran from Denver to Chicago, a distance of 1,015 miles, in 13 hours 5 minutes, an average speed of 77.5 miles an hour. It attained a maximum speed at one point of 112.5 miles an hour. On November 11, 1934, the train made its initial run in scheduled passenger service between Kansas City, Missouri, and Lincoln, Nebraska. It was transferred to the St. Louis-Burlington run on April 30, 1940.

123. How many streamline passenger trains were placed in operation in the six-year period, 1934-1939?

One hundred eight streamline passenger trains were placed in scheduled service on the railroads of the United States from November 11, 1934, to December 31, 1939, as follows: one in 1934, ten in 1935, thirteen in 1936, twenty-four in 1937, thirty-nine in 1938, and twenty-one in 1939.

124. What is the cost of a streamline passenger train?

Light-weight, Diesel-powered, air-conditioned streamline passenger trains have cost from \$273,000 to \$1,450,000 each, depending on size of power unit, length of train and other factors. The cost of seventeen streamline trains purchased by the railroads in 1937-1938 averaged \$742,000 each.

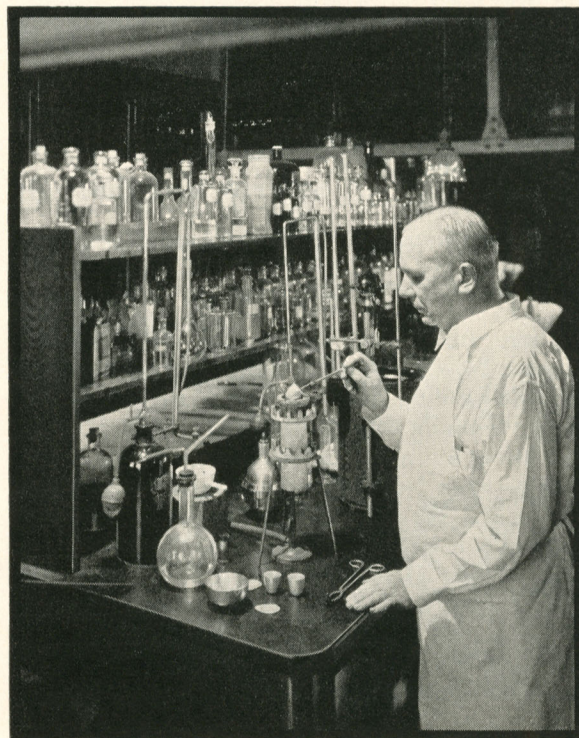
125. When was fluorescent lighting introduced in railway passenger trains?

The first passenger car equipped with fluorescent lights was operated on the New York Central Railroad in 1938. The first passenger train to be equipped with fluorescent lighting throughout was the Streamliner "General Pershing" of the Burlington Railroad, placed in scheduled service between St. Louis and Kansas City on April 30, 1939.

126. What progress has been made in air-conditioning of passenger cars?

This development began in earnest in 1927. In that year the first air-conditioned Pullman sleeping car, the "Jacksonville," was placed in experimental service. In 1929, the Baltimore & Ohio Railroad installed an air-conditioned coach, and in 1930

Chemist at work in a railroad laboratory. Scientific research looking toward increased efficiency and economies is constantly in progress.



air-conditioned dining cars were introduced on the Santa Fe and Baltimore & Ohio railroads. The first fully air-conditioned sleeping car trains were placed in service on the Baltimore & Ohio and Chesapeake & Ohio railroads in April, 1932. Thenceforth the spread of air-conditioned equipment was rapid. By the end of 1933, there were 648 air-conditioned passenger cars in the United States. The number increased to 2,526 in 1934, 5,878 in 1935, 8,078 in 1936, 10,325 in 1937, 10,977 in 1938, and on January 1, 1940, there were 11,715 air-conditioned passenger cars in operation. Almost all cars regularly assigned to through trains, as well as many cars on local trains, are now air-conditioned.

127. What is the cost of air-conditioning a passenger-train car?

Average costs of air-conditioning systems, installed, range from \$4,000 to \$8,500, depending upon type of installation and other factors.

128. How many passenger trains are designated by names?

There are about 700 passenger trains operated by the railroads of the United States which bear names, many of them world-famous.

129. Where can a list of named passenger trains be obtained?

Such a list may be obtained from the Association of American Railroads, Transportation Building, Washington, D. C.

130. Are there any passenger trains named for women?

There are three: the "Nellie Bly," running between New York and Atlantic City on the Pennsylvania-Reading Seashore Lines; the "Ann Rutledge," running between Chicago and St. Louis on the Alton Railroad, and "The Pocahontas," running between Norfolk and Cincinnati and Columbus on the Norfolk & Western Railway. Nellie Bly was a newspaper woman who, in 1889, established a new globe-girdling record of 72 $\frac{1}{4}$ days. Ann Rutledge was a tavern-keeper's daughter whose name is linked romantically with that of Abraham Lincoln. Pocahontas was an Indian princess who is said to have saved the life of Captain John Smith. She later married John Rolfe.

FREIGHT TRAIN EQUIPMENT

131. How many freight cars are operated on the American railroads?

At the beginning of 1939, the railroads of the United States owned 1,754,160 freight-train cars, and private car companies, industrial firms and others owned 285,069 freight-carrying cars, making 2,039,229 freight-carrying cars in all.

132. What is the length of a freight car?

Freight cars vary in length from about 34 feet to 75 feet, the average length being about 43 feet, outside over-all measurements.

133. What is the cubic capacity of a box car?

The capacity of 320,000 box cars owned by ten leading railroad systems in the United States ranges from 2,001 to 6,176 cubic feet, the average being 3,102 cubic feet.

134. How much has the capacity of freight cars increased in recent years?

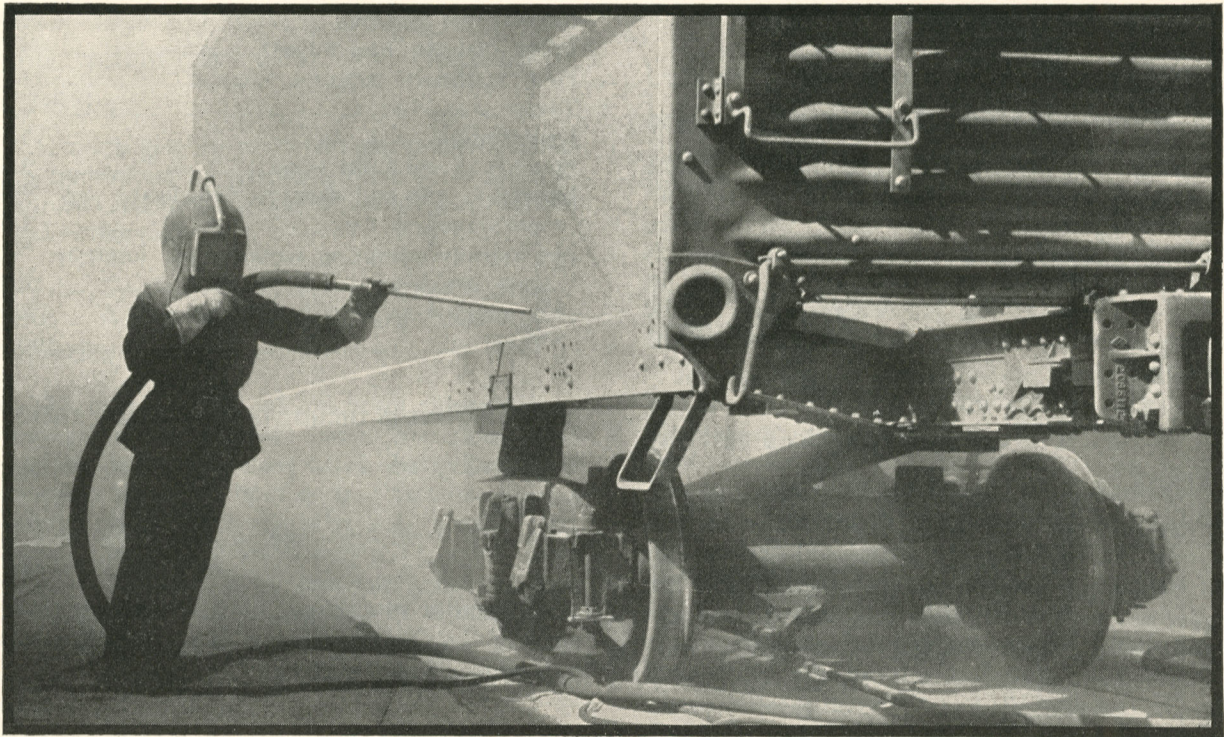
The capacity of the average railway-owned freight car in service increased from 36.9 tons in 1911 to 42.5 tons in 1921, to 47.0 tons in 1931 and to 49.8 tons in 1939. The increase from 1911 to 1939 was 35 per cent.

135. How many refrigerator cars are there in the United States?

At the beginning of 1939 there were 147,187 refrigerator cars in this country. Of these, 123,955 were owned by private car companies, including railroad owned and controlled car lines, and industrial firms, and 23,232 were owned by individual railroads.

136. What is a car dumper, and how does it work?

A car dumper is a mechanical device installed in a railroad track or tipple which grips an open-top freight car, holding it firmly on the track, and tips it upside down, dumping its contents, and then restoring the car to an upright position, kicks it forward to make ready for the next car. Car dumpers, are used for transferring coal, ore, sulphur and other bulk commodities from open-top cars into holds of vessels. It is also used at



No, this is not a "Man from Mars," but a "sand-blaster" man removing rust from old box car frames by the sand-blowing process. A diver's helmet equipped with a special filter protects eyes and lungs.

terminals for transferring bulk materials from one car to another, and at industrial plants for unloading bulk materials.

137. What is meant by "work equipment" in railway service?

Work equipment is rolling stock designed especially for the construction and maintenance of the railroad, such as locomotive cranes, derrick cars, pile-drivers, steam-shovels, rail-unloaders, dump cars, ballast-spreaders, ditchers, weed-burners, inspection cars, instruction cars, dynamometer cars, clearance cars, scale-test cars, hand cars, track-sweepers, rail-defect detectors, scaffold cars, camp cars, supply cars and snow-plows.

138. How much labor goes into the construction of a railway box car?

The building of a box car provides approximately 2,000 man-hours of work (equivalent to about one year's work for one man), not including the labor required in the production of the steel and other materials which go into the construction.

139. Do the railroads provide special equipment for special traffic?

There are many kinds of freight and express cars, each especially adapted to handling certain commodities. Among them are: flat cars, box cars, automobile cars, furniture cars, container cars, coal hopper cars, gondola cars, refrigerator cars, tank cars, livestock cars, horse cars, milk cars, poultry cars and logging cars.

140. How much floating equipment do the railroads operate?

At the beginning of 1939 the railroads of the United States had in service 1,989 steamboats, tugboats, barges, car floats, ferries and other units of floating equipment.

141. How many manufacturing establishments are engaged in the construction of railway cars?

The United States Census of Manufactures reports 154 establishments engaged in the manufacture of railway cars in 1937. During that year these establishments employed an average of 44,970 persons; paid \$68,347,000 in salaries and wages; spent \$226,505,000 for materials and supplies, fuel and other purchased items, and produced equipment valued at \$335,322,000.

RAILWAY OPERATIONS

142. How many trains are operated daily on the American railroads?

An estimate based on operations in 1938 put the number of passenger trains at 18,000 and the number of freight trains at 15,200 daily. On this basis, a passenger train starts on its run somewhere in the United States every 4.8 seconds, and a freight train starts on its run somewhere in the United States every 5.7 seconds, day and night, on the average.

143. What is an average day's railway service?

For each day of 1939 the Class I railroads performed the equivalent of moving 913,546,000 tons of freight one mile and 62,075,000 passengers one mile, not to mention their extensive express and mail traffic. In providing this service, they performed the equivalent of moving 59,647,000 freight cars one mile and 7,935,000 passenger-train cars one mile. For each day of 1939 they provided 6,821,000 man-hours of employment and paid out \$5,439,000 in wages, \$974,459 in taxes, and \$2,455,000 for fuel, materials and supplies.

144. What are the average daily revenues of the railroads of the United States?

Revenues vary from year to year. In 1939, Class I operating revenues averaged \$10,945,400 a day.

145. Where does the average railroad dollar come from?

The average dollar earned by the Class I railroads in 1939 was derived from the following sources:

	Cents
Freight operations.....	81.4
Passenger operations.....	10.4
Express	1.4
United States Mail.....	2.5
All other sources.....	4.3
Total.....	100.0

146. Where does the average dollar earned from railway operations go?

The average dollar earned from railway operations in 1939 was distributed as follows:

	Cents
Labor (salaries and wages).....	44.1
Fuel, materials, supplies, etc.....	22.4
Taxes	8.9
Depreciation	5.1
Equipment and joint rents.....	3.3
Insurance, loss and damage, injuries to persons, pensions, etc.....	1.5
Net railway operating income (for interest, rents, dividends, etc.).....	14.7
Total.....	100.0

147. What is meant by operating ratio?

Operating ratio is the percentage which total operating expenses bear to total operating revenues. For instance, if a railroad's total operating revenues for a given period are \$10,000,000 and its total operating expenses are \$7,500,000, its operating ratio is 75 per cent. The actual operating ratio of the Class I railroads of the United States as a whole in 1939 was 73.05 per cent.

148. What is the cost of stopping and starting a train?

Statistics compiled in 1935, based upon previous years, indicated costs of from 84 cents to \$2.80 for stopping and starting a passenger train, and from \$1.00 to \$4.80 for stopping and starting a freight train, depending upon length and weight of train, size of crew and other factors. Labor and other costs have since increased, and present-day costs would probably be greater.

149. What is a locomotive run?

A locomotive run in railway service is what might be termed a "day's work" for a locomotive. In other words, it is the operation of a locomotive from its starting terminal, station or yard to its terminating terminal, station or yard. A run may be between points on one division, or from a point on one division to a point on another division. It is usually between two important terminals, but many locomotives double back on their runs, making a round trip from a terminal or station to the end of the line or some intermediate point and back. In other instances a run may cover the movement of a locomotive back and forth several times over a few miles of track.

Due to greatly increased operating efficiency in the last ten or fifteen years, many locomotive runs have been increased from 100 or 200 miles to several hundred miles in length.

150. How extensively are the telephone and telegraph used in dispatching trains?

At the beginning of 1939, train orders were being transmitted by telephone on 148,211 miles of railroad, and by telegraph on 86,709 miles of railroad in this country.

151. What do the different locomotive whistles mean?

The standard code of operating rules, in force throughout the United States, prescribes many engine whistle signals, of which the following are extensively used:

Approaching public grade crossing — Two long, one short, one long.

Approaching station, junction or railroad crossing — One long.

Alarm for persons or animals on track — Succession of short toots.

Apply brakes, stop — One short whistle.

Release brakes, proceed—Two long whistles.

Flagman protect rear of train—One long, three short.

Flagman return from west or south—Four long.

Flagman return from east or north—Five long.

Call for signals — Four short.

Back up (when standing) — Three short.

Stop at next station (when running) — Three short.

152. What do the various bell-cord signals means?

The bell-cord communicating signals from train to engine cab are:

Two shorts: When standing, start.

Two shorts: When running, stop at once.

Three shorts: When standing, back up.

Three shorts: When running, stop at next passenger station.

Four shorts: When standing, apply or release air brakes.

Four shorts: When running, reduce speed.

Five shorts: When standing, recall flagman.

Five shorts: When running, increase speed.

Six shorts: When running, increase train heat.

One short, one long, one short: Shut off train heat.

One long: When running, brakes sticking; look back for hand signals.

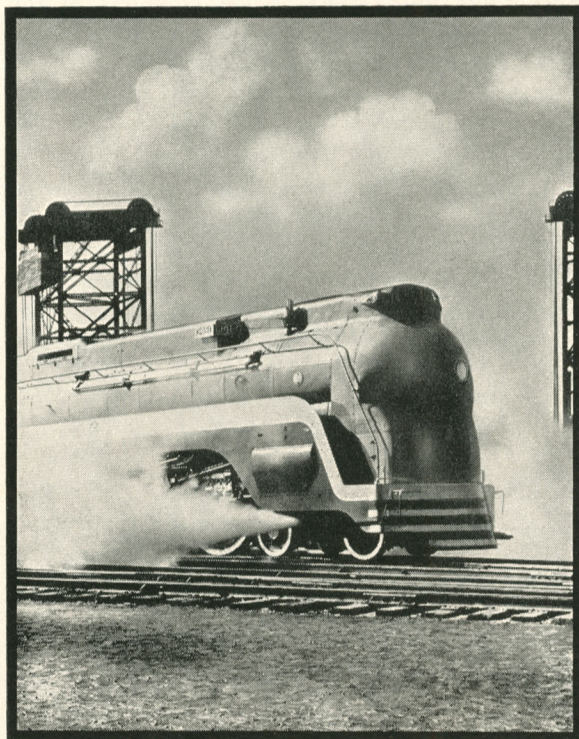
153. What are the standard hand, flag and lantern signals in railway train service?

A hand, flag or lantern swung across the track means *stop*; held horizontally at arm's length, *reduce* speed; raised and lowered vertically, *proceed*; swung vertically in a circle at half arm's length across track, *back up*; swung horizontally above head, when standing, *apply air brakes*; held at arm's length above head, when standing, *release air brakes*.

154. What is remote control in railway operations?

Remote control is a term used to designate the control, usually by electricity, of railway signals, switches and other devices from a tower room or

In streamline garb and geared to new speeds, the steam locomotive is demonstrating its ability to keep abreast of the ever-changing times.



other point located some distance away from the actual scene of train operations. A remote control system may be confined to a yard or terminal, or it may apply to main-line operations over more than 100 miles of road.

155. Have casualties at railway-highway grade crossings been reduced?

The number of persons who met death in highway-grade crossing accidents in the United States was reduced from 2,568 in 1928 to 1,398 in 1939. The number of casualties per 10,000 motor vehicles registered was reduced in the same period from 3.42 to 1.61.

156. Are many accidents at highway-railway grade crossings caused by automobiles running into the sides of trains?

Thirty-six out of every 100 automobile accidents at highway-railway grade crossings in 1939 were due to automobiles running into the sides of trains.

157. How much would it cost to separate all railway-highway grade crossing in the United States?

The average cost of eliminating grade crossings by the construction of underpasses or overhead bridges is in the neighborhood of \$85,000 each. Since there are 231,400 grade crossings in the country, the total cost of separating all grades would be in the neighborhood of \$19,700,000,000. This is equal to about three-fourths of the total railway investment in the United States.

158. How many trespassers on railway property are fatally injured in a year?

The number of trespassers killed ranged from 2,352 to 2,892 annually during the 16-year period ended December 31, 1939.

159. What is the safety record of the railroads with reference to the transportation of explosives?

Approximately 500,000,000 pounds of high explosives, including dynamite, black and smokeless powder, explosive ammunition and blasting caps, were transported by the railroads of the United States in 1939 without accident, death or injury. This was the thirteenth consecutive year in which the railroads hung up a perfect safety record in the handling of explosives.

160. In what research activities are the railroads engaged?

More than 170 technical committees of the Association of American Railroads are at work on numerous problems in connection with railroad operations in efforts to reduce operating costs, increase safety and bring about further improvements in plant, equipment and service. Many individual railroads are conducting independent research with the same objects in view.

161. What are the requirements of the railroads with reference to the regulation of watches?

The standard rule is that watches must not vary more than 30 seconds per week from perfect time. On most railroads, watches must be submitted for inspection once a month and compared with designated standard clocks before the start of each day's work. The watch inspection rule applies to officers and employees of the operating and mechanical departments, including superintendents, dispatchers, station agents, engineers, conductors and other trainmen, telegraphers, yard crews and foremen, signal workers, roundhouse foremen, hostlers and maintenance of way employees.

PASSENGER SERVICE

162. What country leads the world in high speed passenger trains?

The United States has the largest number of high-speed passenger trains of any country in the world.

163. Have passenger-train speeds been increased in recent years?

In 1930 there were only a few passenger-train runs in the United States with schedules calling for a mile-a-minute or faster, start to stop. These runs covered 1,100 route-miles. In 1936, there were 644 passenger-train runs of a mile-a-minute or faster, covering 40,205 route-miles, of which 29,310 route-miles were on a daily schedule basis. By 1940, the number of mile-a-minute runs had increased to 1,200, with 70,140 route-miles, of which 60,062 were on a daily schedule basis.

164. What is the longest non-stop passenger run in the United States?

The Union Pacific Diesel-powered streamliner "City of Los Angeles", which runs non-stop for 324.5 miles between Salt Lake City, Utah, and Caliente, Nevada.

165. What is the fastest scheduled passenger-train run in the United States?

The country's fastest scheduled run is made by the Diesel-powered Streamliner "Morning Zephyr" (No. 21) of the Chicago, Burlington & Quincy Railroad, which covers 54.6 miles from East Dubuque, Ill., to Prairie du Chien, Wis., at an average speed of 84 miles an hour, start to stop.

166. What is the common unit of measurement for passenger transportation?

The passenger-mile, which represents the movement of one passenger one mile.

167. How much do the railroads charge for carrying a passenger a mile?

Charges vary according to the character of service. Standard one-way coach fares range from 1½ to 2 cents a mile; generally speaking, one-way fares for travel in standard Pullman cars are 3 cents a mile, plus the cost of reserved space. Fares for travel in Pullman tourist sleeping cars (operated on Western roads) are lower than standard sleeping car fares. Many round trip and excursion fares are less per mile than standard one-way fares. The average amount collected by the railroads for all classes of services in 1939 was 1.84 cents per passenger mile.

168. How does the cost of railway travel compare with that of former years?

In 1939 the railroads carried passengers one mile for an average, as stated above, of 1.84 cents, compared with 2.81 cents in 1929, 2.54 cents in 1919, 1.93 cents in 1909, and 1.98 cents in 1899. Since 1935 the average revenue per passenger-mile has been lower than in any previous period in railway history.

169. What is the Travel Credit Plan?

On May 20, 1940, sixty-six railroads in the United States, in cooperation with the Travelers' Credit Corporation, began selling railroad tickets, Pullman accommodations and all-expense

tours on an installment basis, known as the Travel Credit Plan. Under this plan, the purchase must amount to \$50 or more. Applications for travel credit may be made at any ticket office or to any authorized travel agent of one of the cooperating railroads. No co-signers are required. Upon acceptance, the applicant is notified that his transportation is ready. All inquiries are completed within twenty-four hours. A nominal service charge is made. No down payment is required. Payments are made in monthly installments.

170. How much passenger service did the railways provide for \$1.00 in various years?

In 1921, the railroads carried the average passenger 32 miles for his dollar; in 1925 they carried him 34 miles; in 1930 they carried him 37 miles; in 1935 they carried him 52 miles; in 1939 they carried him 54 miles.

171. Why are railway fares less per mile for travel in coaches than in sleeping cars?

Each year millions of discriminating Americans enjoy the luxury and comforts of Pullman travel.



The difference is due to the wide differences in weight, capacity and occupancy of coaches and sleeping cars and to the differences in cost of providing and handling the two types of equipment. The average capacity of a coach is 78 passengers; that of a sleeping car is 26. The average gross weight of a coach is 61 tons, while that of a sleeping car is 83 tons. The railroads carry more than twice as many tons of equipment for each sleeping car passenger as they carry for each coach passenger.

172. What are the costs of different kinds of Pullman accommodations on a 300-mile journey?

On an average 300-mile overnight railway journey, Pullman accommodations cost, on the average, about \$2.65 for a lower berth; \$2.00 for an upper berth; \$3.55 for a single occupancy section; \$3.70 for a roomette for one; \$4.20 for a duplex room for one; \$4.75 for a bedroom for one or \$5.25 for a bedroom for two; \$6.60 for a drawing room for one, or \$9.45 for a drawing room for two or more.

173. What are tourist sleeping cars, and how do they differ from standard sleeping cars?

On many Western passenger trains, Pullman tourist sleeping cars are provided for travelers who wish to economize. Tourist sleeping cars are of the same general design as standard Pullman sleeping cars, except that the furnishings are plainer. Many of them were formerly standard sleepers. Most tourist sleepers have sixteen sections and are air-conditioned.

174. What are the comparative costs of reserved space in standard and tourist sleeping cars?

Tourist sleeping car rates are slightly more than one-half the rates for standard sleeping car space. For instance, where the cost of a standard berth is \$5.00, the cost of a tourist berth is approximately \$2.65.

175. What is the average journey of a Pullman passenger?

In 1938 Pullman passengers traveled an average of 532 miles each.

176. How many miles does a Pullman car travel in a year?

In 1939 cars operated by the Pullman Company traveled an average distance of 161,914 miles each—equal to fifty trips between New York and San Francisco.

177. What is a year's supply of linen for the Pullman Company?

In 1938 the Pullman Company purchased 220,-528 sheets, 157,780 pillow cases, 455,829 hand towels, 24,318 head-rest covers, 136,692 napkins and 3,260 table cloths.

178. How much linen stock does a Pullman car carry?

For a round trip of one night in each direction, the usual linen stock for a standard Pullman sleeping car consists of about 500 pieces, made up of 160 sheets, 120 pillow slips, 200 towels, five porters' coats and six laundry bags. In addition, there are two pillows and two blankets for each berth.

179. How many meals are annually served in railway dining cars?

Railway dining cars prepare and serve about 25,000,000 meals a year.

180. How much linen, china and other equipment is required to outfit a dining car?

A dining car, fully equipped, carries approximately the following stock, not including food and provisions: 600 table cloths, 2,000 napkins, 1,000 towels, 650 pieces of chinaware, 700 pieces of silverware, 240 pieces of glassware, 300 items of pantry and kitchenware, 200 aprons and 150 waiters' coats.

181. What is the size of a dining car kitchen?

Dining car kitchens range from 13½ to 17 feet in length and from 6 to 7 feet in width.

182. What is a limited train?

A limited train has been defined as a passenger train meeting one or more of the following specifications: (1) bearing a distinctive trade name; (2) operating at an overall speed of 40 miles per hour or more for distances of over 200 miles; (3) operated for distances over 300 miles with scheduled stops at intervals averaging not less than 50 miles each.

183. What is suburban or commuter traffic?

In the larger cities railroads provide frequent train service to and from outlying residential districts or suburban communities. This is called suburban or commuter traffic, and those who use the trains regularly are known as commuters. Suburban trains carry large numbers of commuters to and from the downtown business and shopping districts. They also carry many passengers for short distances in the outlying districts. Special suburban or commuter tickets are sold for ten rides or more; some railroads sell monthly suburban tickets. In such cities as New York, Chicago, Boston, Philadelphia and San Francisco, suburban traffic is very large.

184. What proportion of railway passenger traffic is commuter business?

In 1939, commuter passenger traffic represented 51.2 per cent of all passengers carried, 17.7 per cent of total passenger-miles of service and 9.8 per cent of total passenger revenues of Class I railroads.

185. What is the average distance traveled by railway passengers in the United States?

The average journey per passenger on the railroads of this country in 1939 was 50.2 miles. For suburban and commuter travel in metropolitan districts the average trip was 17.4 miles. For other travel, it was 84.8 miles.

186. How do the big-league baseball players travel between cities?

During the baseball season and on training tours, players in the big leagues and their substitutes make the long and frequent trips between cities in extra Pullman sleeping cars attached to regular passenger trains. An entire sleeping car is usually required to accommodate each team, and during the World Series special trains are sometimes required to accommodate the league officers, players, newspaper correspondents and guests.

187. How safe is railway travel?

The railway passenger train provides the safest form of travel known to man. In the ten-year period 1930-1939, the railroads performed 210,-

251,501,000 passenger-miles of service and had 123 passenger fatalities in train accidents. For each passenger fatality during this period the railroads performed 1,709,000,000 passenger-miles of service.

On this basis, the danger of being fatally injured while traveling on a railway passenger train is so remote that if one were to take an average journey of 50 miles each day, his expectancy of life—if it rested solely upon passenger train accidents—would be 93,700 years, or 96 times the age attained by Methuselah.

188. How many timetables are issued by the railroads in the course of a year?

It is estimated that the railroads of the United States issue and distribute 80,000,000 timetables annually to keep the traveling public informed concerning passenger train schedules.

189. From what cities can one travel to all parts of the United States without changing trains?

Through passenger trains or through sleeping cars are operated from Chicago and St. Louis to all parts of the country. Through sleeper service is also provided from Chicago or St. Louis to important cities in Canada and Mexico.

190. What is known as "The White House on Wheels"?

This name is applied to the special passenger train used by the President of the United States and his entourage.

191. Why do Presidents of the United States always make land journeys of any distance by rail?

Since the days of Zachary Taylor, every President of the United States has made all land journeys of any considerable distance by rail. This is because the railway passenger train is by far the safest and most reliable mode of travel. Moreover, it affords an opportunity to rest and sleep in comfort and without unnecessary fatigue. With its spaciousness and cleanliness, with its dining car, sleeping compartments, and with facilities for holding conferences, dictating speeches, entertaining guests and so on, the railway passenger train provides comforts and conveniences which no other mode of transportation offers.

192. What did Channing Pollock say about railway passenger travel?

The noted author, playwright and lecturer recently said: "At the conclusion of my fifteenth consecutive year as a lecturer, I am moved to write you of a remarkable record for which you are largely responsible. Traveling entirely by rail, I have delivered more than 2,000 lectures, each in a different place, without missing or being late for one. During this time I have 'pinch-hit' for at least two dozen other men who had taken the chance of journeying by motor car, motor bus, or airplane. In addition, I should hesitate to put a value on the work I have done in railway trains that could not possibly have been accomplished in any other conveyance."

HEAD-END TRAFFIC

193. What is "head-end" traffic?

Mail, express, baggage, newspapers and milk in cans, usually transported in cars nearest the locomotive, are known to railroad men as "head-end" traffic.

194. What is the volume of United States mail handled by the railroads?

It is estimated that 5,707,000,000 pounds of mail were handled by the Post Office Department in the year ended June 30, 1939, of which over 5,300,000,000 pounds, or nearly 93 per cent, were handled by the railroads.

195. How many pieces of mail are handled by the Railway Mail Service of the Post Office Department?

The Postmaster General reported that 16,237,959,729 pieces of mail of all classes, including redistributions, were handled by the Railway Mail Service during the year ended June 30, 1939.

196. On what basis are the railroads paid for the transportation of United States mails?

Railroads are paid on a space basis, regardless of the weight of mail carried. A railroad enters into a contract with the Post Office Department to carry a specified number of mail cars daily in specified trains over a specified route. Mail cars are owned by the railroads, but are built according to Post Office Department specifications. On many light traffic lines, where full-sized mail cars are not required, the railroads provide compartments or space in baggage, express or combination

cars for the handling of mail. Railroads which were built with land-grant aid carry United States mails for 20 per cent less than standard space rates.

197. What proportion of United States postal service revenues goes to the railroad for mail transportation?

For transporting United States mails during the year ended June 30, 1939, the railroads received 13.9 per cent, or about one-seventh, of total ordinary postal revenues. Ordinary postal revenues do not include receipts from postal savings and post office money orders. The above figures include payments for carrying parcel post and second and third class mails, as well as first class letter mail on which the postage is 3 cents or more. For carrying first class mail, the railroads receive an average of about 1/5 of 1 cent per letter, or approximately 1/15 of the postal revenues collected by the government on this class of mail.

198. How many federal government employees are assigned to Railway Mail Service?

The personnel of the Railway Mail Service on June 30, 1939, consisted of 19,964 officers and employees, of whom 18,911 were postal clerks.

199. Can letters and other United States mail be posted in any standard railway mail car?

Yes, if bearing the proper postage. Each standard mail car, used for collecting and distributing mail enroute, is equipped with two mail drops, one on either side, and letters and other mail deposited in these drops receive prompt attention.

200. What was the cost of sending mail across the continent before the introduction of railway transportation?

The Pony Express, inaugurated in the spring of 1860, first charged \$5.00 for each letter of one-half ounce or less. The charge was later reduced to \$2.50 a half ounce, and finally, in consideration of a government subsidy, the price was reduced to \$1.00 a half ounce. These prices were in addition to the regular United States postage.

201. What is the extent of Railway Express Agency operations?

The Railway Express Agency, which provides the American people with express service, conducts



A modern railway express terminal in a large American city, showing some of the twelve thousand pick-up and delivery trucks owned and operated by the Railway Express Agency.

business through 23,000 offices and uses in its operations more than 201,000 miles of railway lines, 21,000 miles of steamship lines, 41,000 miles of air lines, and 14,000 miles of motor-truck lines. The Express Agency owns and operates a fleet of around 12,000 motor trucks for the pick-up, transfer and delivery of express shipments. Fifty-seven thousand persons are employed in the performance of its far-flung transportation service. More than 148,000,000 separate shipments were handled by the Express Agency in 1939. Although its principal operations are in the United States, Railway Express Agency, through its connections, provides patrons with international service.

202. What is the service of the Railway Express Agency?

With its co-ordinated system of fast railway, airway, steamship and motor-truck service, the Railway Express Agency provides the American people with speedy and dependable express transportation throughout the United States and in foreign lands. The Agency handles a great diversity of traffic, in packages, boxes, crates, cases, bags, cans, cages, cartons and other containers, and in specially built or equipped cars. Its services include

the transportation of wild animals for zoos and circuses; birds, dogs, cats and other family pets; race horses; fish; plants and flowers; strawberries, motion picture films; hats; gowns; precious stones; jewelry; musical instruments; furniture; clothing, shoes and an endless variety of other articles, large and small, perishable and non-perishable, fragile and unbreakable, animate and inanimate.

The Agency performs complete pick-up and delivery service, collecting shipments without extra charge from homes, offices, factories and other places of business and delivering them to the doors of consignees in important towns and cities in all parts of the country. In addition to its own pick-up system, the Agency has an arrangement with the Western Union Telegraph Company whereby express shipments are accepted at any Western Union office or are called for by Western Union messengers at no extra cost to the shipper.

203. Are express shipments moved in passenger trains?

For more than a century, express shipments have been carried in passenger trains on the American railroads. The customary location of the express car is behind the locomotive. Railway Express

Agency traffic moves in about 10,000 passenger trains daily. Many trains which handle express shipments exclusively are operated between the larger cities at passenger train speeds.

204. What is the meaning of "C. O. D." and how did the term originate?

The familiar initials "C. O. D.," meaning "collect on delivery," originated in New England in 1841 when a shipper asked the express company to collect payment for the goods from the consignee at the time of delivery. Today, some 5,000,000 shipments by Railway Express Agency and large numbers of L. C. L. freight shipments are forwarded annually C. O. D., i.e., each with an accompanying invoice to be paid to the express agency or railroad at the time of delivery. The amount collected is forwarded promptly to the shipper.

205. How much baggage may be checked free on each passenger ticket?

On a full-fare ticket, the maximum free baggage allowance is usually 150 pounds; on a half-fare ticket, 75 pounds. A charge is made for excess weights.

FREIGHT SERVICE

206. What railway figure is widely used as a reliable business index?

Many business analysts regard carloadings as one of the best current indicators of business activity. Weekly carloading figures are released each Thursday by the Association of American Railroads and are published in daily newspapers throughout the United States.

207. What have been minimum and maximum weekly carloadings since the World War period?

During the week ended December 30, 1932, in the midst of the depression, carloadings on Class I railroads totaled only 405,301 cars, the lowest since weekly carloading records began to be kept in 1918. The greatest number of carloadings reported for any week was 1,208,878 cars during the week ended October 29, 1926.

208. What is an L. C. L. shipment?

Any shipment of freight which is too small to move on a carload rate is called an L. C. L. ship-

ment, the initials meaning literally "less than carload." Such shipments, usually consisting of crates, cartons, boxes, barrels, etc., are handled in package cars with other L. C. L. shipments.

209. How are freight commodity statistics reported by the railroads?

Under Interstate Commerce Commission regulations, each railroad reports carload freight traffic statistics by classes of commodities handled as follows: *Group I*, Products of Agriculture, with 42 sub-classifications; *Group II*, Animals and Animal Products, with 22 sub-classifications; *Group III*, Products of Mines, with 18 sub-classifications; *Group IV*, Products of Forests, with 12 sub-classifications; *Group V*, Manufactures and Miscellaneous, with 62 sub-classifications. All L. C. L. (less-than-carload) freight is reported separately as *Group VI*.

210. What percentage of total freight traffic is represented by each commodity group?

Class I railroad freight tonnage in 1939 was distributed as follows: Products of agriculture, 10.3 per cent of total carried; animals and products, 1.9 per cent; products of mines, 52.5 per cent; products of forests, 5.9 per cent; manufactures and miscellaneous, 27.7 per cent; L. C. L. freight, 1.7 per cent.

211. What is the leading freight commodity handled by the railroads of the United States?

Bituminous coal ranks first in carloadings, tonnage and revenues. In 1939 the Class I railroads originated 4,762,775 carloads, consisting of 259,991,634 tons, of bituminous coal. Approximately one-sixth of the freight revenues of the American railroads is derived from bituminous coal traffic.

212. What is a common measurement of railway freight service?

The ton-mile. This represents the transportation of one ton of freight one mile.

213. How many ton-miles of freight service do the railroads perform in a year?

Ton-miles vary from year to year. In 1929, the Class I railroads of the United States performed 447,321,561,129 ton-miles of service—the greatest volume of traffic on record. The volume dropped during the depression to 233,977,008,859 ton-miles in 1932 and increased to 333,444,199,000 ton-miles in 1939.

214. How many ton-miles of freight service do the railroads perform for each individual in the United States?

In 1939 the Class I railroads of the United States performed the equivalent of carrying a ton of freight 2,565 miles (from Maine to New Mexico) for every man, woman and child in the United States.

215. What is an average carload of freight, expressed in tons?

The carload varies, depending upon the commodity. Average tons per car by important commodities in 1939 were as follows:

All commodities	36.8
Bituminous coal.....	54.6
Petroleum	27.9
Wheat	45.5
Corn	42.4
Cotton in bales.....	15.7
Potatoes	17.4
Tobacco	11.1
Apples	16.8
Oranges and grapefruit.....	17.7
Bananas	10.7
Cattle and calves.....	11.3
Hogs, single deck.....	8.0
Hogs, double deck.....	13.0
Eggs	11.4
Butter	12.4
Lumber	27.1
Sugar	35.2

216. How much do the railroads charge for carrying a ton of freight one mile?

Freight charges vary, depending upon the commodity, the distance hauled and the amount of care and risk involved. Since 1932 the amount received by the Class I railroads for freight transportation has averaged less than one cent per ton-mile. In 1939 the average revenue was 9.74 mills per ton-mile, compared with 10.76 mills in 1929 and 12.75 mills in 1921. Thus, the average level of freight charges was 24 per cent lower in 1939 than in 1921.

217. Of the total freight car movement, what proportion is loaded and what proportion is empty?

For each loaded freight car moved 100 miles in 1938, the railroads hauled an empty freight car 62 miles.

218. What is the "average haul" of freight?

The "average haul" is the distance which the average ton of revenue freight is carried by the railroads. In 1938 the average haul of all revenue freight on all railroads as a system was 356 miles.

219. What is a car-mile?

The transportation of a car one mile, known as a "car-mile," is the unit of a car movement employed in computing train service costs and efficiency.

220. How does a railroad company keep track of its wandering freight cars?

Sorting United States mail in a railway Post Office car. Railroads have been the nation's principal mail carriers for nearly a century.



Every railroad has a Car Record Office which, by means of daily reports from agents, keeps a complete up-to-date record of the movements of all freight cars on its own lines, regardless of ownership, and all of its own cars on "foreign" railroads. When a car moves from one railroad to another, the agent at the point of interchange reports the fact to the Car Record Offices of the railroads concerned, including the railroad which owns the car. Thus the location of every freight car is known to the Car Service organizations and its movements and wanderings become a matter of permanent record.

221. Has the speed of freight trains been increased?

The average speed of freight trains in the United States was 62 per cent faster in 1939 than in 1920. In 1939 the average distance traveled per train in each 24-hour period was 400 miles, compared with 247 miles in 1920. These figures represent the average time required for the movement of all freight trains between terminals, including all stops and delays enroute.

222. How rapidly can modern air brakes be applied to a freight train?

The rate of emergency brake action in the modern "AB" brake is 930 feet per second. Thus, brakes can be applied throughout the length of a mile-long train in less than six seconds.

223. Do the railroads need as many cars now to handle a given amount of traffic as they did during the World War period?

No. Due to the fact that the tractive power of the average locomotive is 43 per cent greater, the capacity of the average freight car is 20 per cent greater, the speed of freight trains is 62 per cent greater now than then, and because of other improvements in railway plant and operations, the railroads could now handle the 1918 freight traffic with several hundred thousand fewer freight cars than were then required.

224. What percentage of the nation's railway freight traffic is moved in scheduled trains?

It is estimated that from 85 to 90 per cent of the freight handled by the railroads of the United States moves in scheduled trains.

225. How much progress have the railroads made in the reduction of losses of and damages to freight shipments?

As a result of increased railway efficiency and the cooperation of shippers in the use of better packing methods, loss and damage payments per carload of freight handled were reduced 77 per cent from 1921 to 1939.

226. How many carloads of fruits and vegetables are transported annually by the railroads of the United States?

In 1939 the railroads of the United States transported 976,334 carloads of fruits and vegetables for distances ranging from a few miles to more than 3,000 miles. A large part of this movement was under refrigeration.

227. What is an interchange point?

Any junction point where freight or passenger cars are transferred from one railroad to another is an interchange point. All cars and other equipment thus transferred are recorded and reported each day.

228. What is a connecting line?

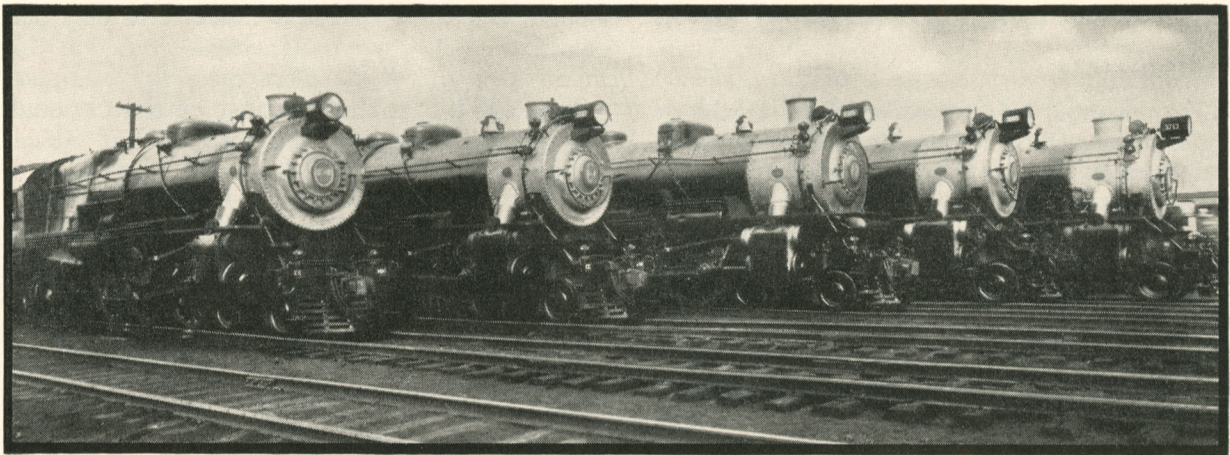
A railroad which has a physical connection or a connection by means of a switching line, with another railroad is a connecting line. Each railroad keeps a record of traffic originating on its own lines and traffic received from connections.

229. What is perishable freight or express?

Many freight and express shipments which require special care in transit to prevent freezing or spoiling are known as perishable shipments. Perishables include fresh meats and other packing house products, fresh fish, eggs, dairy products and a wide variety of fresh fruits and vegetables. Most of these shipments are handled in refrigerator cars in which temperatures can be controlled.

230. How many carloads of foodstuffs and fuel are delivered by the railroads daily in New York City and vicinity?

The railroads deliver approximately 4,000 carloads of foodstuffs and fuel in New York City and suburbs every twenty-four hours, on the average.



Like alert racing thoroughbreds at the post, these powerful titans wait for the "go" signal. A century of engineering research has gone into the production of the modern steam locomotive.

231. What is meant by the terms consignor and consignee?

The shipper of freight or express is the consignor, and the person or firm to which the shipment is made is the consignee.

232. What is a bill of lading?

A bill of lading is a receipt given by a freight agent for property received to be transported. It is a contract between the shipper and the railroad, covering the shipment from point of origin to point of destination.

233. What is meant by demurrage?

A consignor or consignee is usually allowed two days' free time in which to load or unload a carload of freight. Thereafter a demurrage charge is made by the railroad for each 24 hours the car is held. On the fifth demurrage day the charge is substantially increased.

234. What is meant by "per diem"?

"Per diem" is a Latin phrase meaning "by the day." It is used by the railroads to designate the amount per day which is paid by one railroad to another railroad for the use of a freight car. The present per diem rate is \$1.00, with certain penalties for tardy reporting. Payments for the use of cars owned by private car companies are generally on a mileage rate basis instead of a per diem basis, the mileage rate varying with the type of car.

235. What is a tariff in railway service?

A tariff is the railroads' published price list from which there can be no deviation. It shows the

charges which the railroad can make for transporting various classes and types of commodities, between specific points, for switching cars and for performing various other services. It also contains rules and regulations governing railway service.

236. How do American railway freight charges compare with those of foreign countries?

The average charge per ton-mile on the railroads of the United States is the lowest in the world with the single exception of Japan, where labor costs are far below those of this country. Average charges in several important countries are as follows:

Country	Year Ending	Av. Revenue per ton-mile (cents)
Great Britain ¹	Dec. 31, 1937	2.406
Denmark ³	Mar. 31, 1938	2.320
Italy ³	June 30, 1936	2.226
Australia ³	June 30, 1937	2.185
Germany ³	Dec. 31, 1937	2.160
France ²	Dec. 31, 1937	1.953
Union of South Africa ³	Mar. 31, 1938	1.728
Norway ³	June 30, 1938	1.692
Sweden ³	Dec. 31, 1937	1.312
British India ²	Mar. 31, 1938	1.004
Canada ²	Dec. 31, 1937	0.997
United States ¹	Dec. 31, 1938	0.983
Japan ³	Mar. 31, 1937	0.674

¹ All railroads, privately owned and operated.

² All railroads, both state and private lines.

³ State operated railroads only.

237. What is meant by freight classification?

The numerous kinds of commodities, articles or goods are classified for the purpose of applying freight rates. It is not practical for the railroads to publish specific rates on all of the thousands of different articles or commodities between the thousands of shipping points in the United States. Tariffs are greatly simplified by dividing such articles into classes and establishing rates for the various classes. These are called class rates, and the several groupings of articles are called classifications.

238. What are the three freight classification territories?

In the making of freight classification, the United States is divided into three geographical territories: the *Official Territory*, east of the Mississippi River and north of the Ohio and Potomac Rivers; the *Southern Territory*, south of the Ohio and Potomac Rivers and east of the Mississippi River; and the *Western Territory*, west of the Mississippi River.

239. What are joint freight rates?

Joint freight rates are rates which apply to shipments moving over the lines of more than one railroad, revenues from which are divided between the interested railroads on an agreed basis.

240. What is the difference between a class rate and a commodity rate in freight service?

A class rate is a published freight rate applying to any one of many articles in a certain freight classification.

A commodity rate is a special published rate applying to a specified commodity between certain points.

241. What is the heaviest freight shipment on record?

The heaviest freight shipment on record was a converter weighing 367,000 pounds, which was shipped from the General Electric Works in Schenectady, N. Y., to the Potomac Electric Power Company, District of Columbia, March 21-22, 1935. Including the car, the shipment weighed 473,900 pounds. Because of clearance limits, it was necessary to give the shipment a special routing. On

one bridge the load had a clearance of only one inch.

242. What is the purpose of the car seal in freight or express service?

The car seal is used to prevent or to detect illegal entry into a car. Each seal is numbered and bears the name of the railroad by which it is applied. A record is kept of each seal issued.

243. What is meant by pick-up and delivery service?

The transportation by the railroads or their agents of packages, cartons and other L. C. L. (less-than-car lot) freight shipments, to and from manufacturing plants, stores, warehouses and other places of business not located on railway tracks is known as pick-up and delivery service, or collection-and-delivery service. Pick-up and delivery service has the effect of extending railway freight service to the doors of shippers and consignees in many American cities.

244. When was pick-up and delivery service established in the United States?

Although there are isolated instances of store-door pick-up and delivery dating back to 1867, the present widespread pick-up and delivery service was inaugurated on a few lines in the Southwest in 1931, and extended to Western lines in December, 1935, and to Eastern and Southern territories in November, 1936.

ORGANIZATION AND PERSONNEL

245. How many persons does it take to operate the American railroads?

The number of persons required to run the railroads increases or decreases according to railway traffic and earnings. When railway revenues were at their peak, in 1926, the Class I railroads employed an average of 1,779,275 persons. In 1933, the low year of the depression, when railway revenues were at their lowest, they employed an average of 971,196 persons. In 1939, the average number of persons employed was 987,943.

246. Do all railroads have similar departmental organizations?

Each railroad company shapes its organization to fit its particular requirements. A small railroad

may have only a few officers and employees and a very simple departmental set-up. A large railway company, with many thousands of employees and doing a business of many millions of dollars annually, has a much more extensive organization, with several major departments and many minor departments, divisions and bureaus.

247. What are the different departments of a railroad?

Generally speaking, the railroad organization is grouped in nine major departments—Executive, Operating, Engineering and Maintenance of Way, Mechanical, Traffic, Law, Treasury, Accounting, and Purchasing and Stores. On most railroads the Engineering and Maintenance and Mechanical departments are branches of the Operating Department.

248. What are the responsibilities of the chief executive officer of the railroad?

The Executive Department is headed by the President and includes his staff of assistants. The President is the responsible head of the railway organization. He is accountable to the Board of Directors and to the stockholders for the property and its efficient operation. He is expected to safeguard the financial condition of the company and to manage the property so that it will render satisfactory service to the public and meet its financial obligations. Having risen usually from the ranks, he is a man of seasoned judgment and wide experience in railway affairs. Since the success or failure of his administration depends in large measure upon the ability, enterprise and integrity of his principal officers and his staff of assistants, he must be a master in judging men and must exercise great care in selecting his subordinate officers.

249. What are the functions of the Operating Department?

The Operating Department, usually headed by a Vice President or a General Manager, is, with respect to the number of persons employed, the largest department on the railroad. This department operates the trains, the freight stations, the passenger stations, and usually attends to the maintenance of the railway plant. Under the Vice President or General Manager on the larger railroads are the General Superintendents and other operating officers responsible for the efficient operation of trains. Each General Superintendent is in gen-

eral charge of a certain part of the railroad. Under each General Superintendent are Division Superintendents, each in charge of a division of the railroad. Under the Division Superintendents are trainmasters, dispatchers and various minor division officers. Station and train service employees, such as station agents, locomotive engineers and firemen, conductors, brakemen, flagmen and trainmen are assigned to a division and report to the division officers.

250. What are the functions of the Engineering and Maintenance Department?

The Engineering and Maintenance Department, usually headed by a Chief Engineer, is charged with the construction and maintenance of fixed property, such as roadway, tracks, yards, bridges, station and shop buildings, coaling and water stations and numerous other facilities. Under the Chief Engineer on the larger railroads are the Engineer of Construction, Engineer of Maintenance of Way, Engineer of Bridges, Engineer of Buildings and other general engineering officers. Under the Engineer of Maintenance of Way are District Engineers and Division Engineers, and under the Division Engineers are Roadmasters, each in charge of the maintenance of a certain part of the division. Reporting to the Roadmaster are the Section Foremen, each assigned to the maintenance of a certain section of road.

251. What are the functions of the Mechanical Department?

The Mechanical Department, usually headed by a Chief Mechanical Officer or a Superintendent of Motive Power, is responsible for the maintenance of the railroad's rolling stock—locomotives, passenger and freight cars and work equipment—and for the operation of locomotive and car shops. A few railroads are equipped to build their own locomotives, and many railroads build freight cars in their own shops. All railroads maintain shops for the repair of locomotives and cars. Among the major officers of this department are the Mechanical Engineer, the Engineer of Tests, the Electrical Engineer, the Superintendent Car Department and other men with technical or special training. Each railway shop is in charge of a Master Mechanic, who reports to the Superintendent of Motive Power. Shop forces include general foremen, foremen, machinists, boilermakers, patternmakers, blacksmiths, and numerous other craftsmen.

252. What are the duties of the Traffic Department?

The Traffic Department, usually headed by a Vice President or Chief Traffic Officer, is the sales department of the railroad. It has charge of the solicitation of freight and passenger business, the securing of new industries and the development of new traffic for the railroad. This department also establishes freight rates and passenger fares, fixes prices of other railway services and negotiates with other railroads for the division of joint rates. On many railroads the Traffic Department is made up of a Freight Department and a Passenger Department. The Freight Department includes several sub-departments, each specializing in some branch of traffic work, such as solicitation, rates, tariffs and divisions, coal, coke and ore, industrial, agricultural, livestock and perishable freight traffic. The Passenger Department of many railroads includes sub-departments which look after specialized activities such as dining car service, mail and express service, milk traffic, baggage and advertising.

253. What are the duties of the Law Department?

The Law Department, usually headed by a Vice President or a General Counsel, is responsible for the proper handling of all matters in which special knowledge of law is required. It not only handles matters before courts, state railroad commissions, the Interstate Commerce Commission and legislative committees, but also all other legal matters such as the drafting of contracts and agreements, deeds and other documents. The head of the Law Department usually has, in addition to his regular duties, general supervision over personal injury claims, property damage claims and tax matters.

254. Who looks after the money?

The Treasury Department, headed by the Treasurer of the company, receives and disburses money, checks and vouchers, issues or approves checks and vouchers, attends to the banking, issues pay-checks, keeps the record of stockholders and bondholders, and performs numerous other duties having to do with the financial affairs of the railroad.

255. What are the duties of the Accounting Department?

The Accounting Department, usually headed by a Vice President or a Comptroller, performs the

vast accounting work required in connection with railway operations. It portrays in figures the operations of the railroad and its financial position. The auditing of departmental and station accounts, bills, vouchers and payrolls, the compilation of statistics and the preparation of statistical and financial reports are among the numerous duties of this department.

256. Who does the buying for the railroad?

This is the special function of the Purchasing and Stores Department. The Purchasing Agent, General Storekeeper and their staffs are charged with the responsibility of keeping the railroad supplied with thousands upon thousands of different materials and articles. They attend to the proper storage and distribution of materials, keep the inventories, place orders, fill requisitions, issue vouchers and perform numerous other duties incident to buying, storing and distributing fuel, materials and supplies required for the efficient operation of a railroad.

257. How many persons are required to keep railway tracks and equipment in repair?

Track repair men, bridge and signal maintainers and other employees engaged in maintaining the roadway and other fixed property numbered 201,943 in 1939. Shop employees and others engaged in keeping locomotives, cars and other movable equipment in repair and in handling railway supplies numbered 264,161 in 1939.

258. How much are railway employees paid in salaries and wages?

The total railway payroll increases or decreases with the rise and decline of railway traffic and earnings. In 1926, the year in which railway earnings were the highest, the Class I railway payroll totaled \$2,946,114,000. In the depression year 1933 it fell off to \$1,403,841,000. In 1939 it amounted to \$1,864,000,000.

259. How are railway train service employees paid?

Enginemen, firemen, conductors, and brakemen are paid on the basis of miles run. If it takes longer than a certain time to run the miles so paid for, they are paid for any hours over that certain time, in addition to the mileage pay.



The modern all-steel air-conditioned passenger coach, with controlled temperature and constant flow of filtered fresh air, combined with improved seating and lighting, provides maximum travel comfort.

In road freight train service, a basic day's work for pay purposes is 100 miles or less or 8 hours or less. If a run exceeds 100 miles, an employee receives additional compensation of 1/100th of his basic day's pay for each mile run. If time consumed in running the miles averages more than one hour for each 12½ miles paid for, overtime payment at time and one-half is made for excess hours consumed.

In through passenger service, a basic day's work for pay purposes for engineers and firemen is 100 miles or less or 5 hours or less, while that for conductors and trainmen is 150 miles or less or 7½ hours or less. For mileage in excess of those amounts they receive additional pay on a pro rata basis.

260. What part of the railroad dollar is paid out in wages?

Forty-four and one-tenth cents out of every dollar taken in by the Class I railroads in 1939 was paid out in wages.

261. What is the average hourly wage of railway employees?

The average hourly compensation of Class I railway employees in 1939 was 74.8 cents.

262. How much does the average railroad employee receive in wages in the course of a year?

The average annual compensation of Class I railway employees in 1939 was \$1,886.

263. What are the ten leading railway occupational groups?

Based upon the number of persons employed, the ten leading occupational groups in railroad service are, ranked in the order listed: (1) Sectionmen, (2) clerks, (3) skilled trades helpers employed in the maintenance of equipment and stores, (4) car builders and repairmen, (5) road freight brakemen and flagmen, (6) yard brakemen and yard helpers, (7) machinists, (8) gang and section foremen, (9) extra gang men, (10) road freight firemen and helpers. These ten groups include about 45 per cent of all railroad employees.

264. What is meant by seniority in railway service?

Seniority refers to the greater length of service of one employee as compared with that of another employee in the same occupational group on the same railroad. Brown became a locomotive engi-

neer in 1908; Green in 1910. Both have worked for the railroad continuously since then. Hence, Brown has two years' seniority over Green and is entitled to preferential treatment in the assignment of locomotive runs.

265. How many railway employees are there for each locomotive in service?

There are approximately twenty-three railway employees for each locomotive in active service on the railroads of the United States.

266. What is known as "Rule G" in railway operations?

Rule G of the Standard Code of Operating Rules prohibits the use of intoxicants or narcotics by train service employees, station employees, dispatchers, telegraphers and other employees whose duties affect train operations. Early railroad rule books carried the prohibition in one form or another, and in 1897 the American Railway Association adopted Rule G (or Rule 7 as it was first known).

267. What constitutes a train crew?

Generally speaking, the train crew of a steam-powered freight train consists of a conductor, a locomotive engineer, a fireman, and one or two brakemen or flagmen.

The train crew of a steam-powered passenger train usually consists of a conductor, a locomotive engineer, a fireman, and a brakeman or flagman. A baggageman is sometimes required.

268. How many persons are employed in the operation of a long-distance passenger train?

The number of persons required to operate a long-distance passenger train varies according to the length of the run and the character of the train. On a train running between Chicago and the Pacific Coast, conductors, trainmen, engineers, firemen and baggagemen change several times enroute. In addition to regular train crews, there are mail clerks (if mail is carried), a Pullman conductor, several Pullman porters, club car attendants, dining car stewards, cooks, several waiters and sometimes a stewardess. Altogether, from thirty to fifty different persons may be employed on such a run.

269. What is the average age of railway employees?

The average age of railway employees in 1937 was approximately 42 years, according to the Railway Retirement Board.

270. What do the stars and bars on the sleeves of conductors', trainmen's and flagmen's uniforms signify?

On most railroads the star represents twenty-five years of service, and each bar, or stripe, represents five years of service. Hence, three bars indicate that the wearer has been in the service of the railroad for fifteen or more years; four bars indicate twenty or more years of service; a star and two bars indicate thirty-five or more years of service.

271. What is the oldest railway employees' brotherhood or union?

The Grand International Brotherhood of Locomotive Engineers, which was organized in 1863 at Detroit, Michigan, as the Brotherhood of the Footboard, is the oldest railway labor organization in the United States.

272. What percentage of all railway employees are represented by labor unions?

It is estimated that between 85 and 90 per cent of all regular railway employees are represented by labor unions.

273. How many railway employees' unions are there in the United States?

There are twenty-one so-called "standard" railway labor unions and brotherhoods in this country. Twenty of them belong to the Railway Labor Executives' Association.

274. How are disputes between the railroads and their employees settled?

Most of them are settled by direct negotiations between representatives of employees and individual railroads. Under the Railroad Labor Act amended June 21, 1934, disputes which cannot be settled by direct negotiations may be referred by either party in the dispute to the proper division of the National Railroad Adjustment Board, whose

duties are to interpret the rules and working conditions on the individual railroads.

The Railroad Labor Act also created the National Mediation Board to act as mediator in disputes which are not properly referable to the National Railroad Adjustment Board. On the invitation of either party in the dispute, or upon acceptance by either party of its proffer of services, the National Mediation Board seeks to effect a settlement by mediation. If such efforts fail, the Mediation Board may suggest arbitration. If arbitration is accepted, a board of arbitration is appointed to hear the case and decide the issue. If arbitration is not acceptable to both parties in the dispute, and if interruption of transportation service is threatened, the Mediation Board so notifies the President of the United States, and he may appoint an Emergency Fact Finding Board to investigate and report. The Board's findings do not constitute an award and do not have to be accepted by either party. The law allows the board thirty days in which to complete its inquiry and submit its findings to the President, during which period neither party is permitted to take action to enforce its demands.

275. What per cent of all railway employees are women?

Women employees constitute about 3 per cent of all railway workers, according to statistics compiled by the Railroad Retirement Board.

276. What are the functions of the Railroad Retirement Board?

The Railroad Retirement Board is the federal government agency charged with (1) the administration of the retirement system for railroad employees under the provision of the Railroad Retirement Act, approved June 24, 1937, and (2) the administration of the system of unemployment insurance for railway employees under the provisions of the Railroad Unemployment Insurance Act, approved June 25, 1938.

277. Where are the headquarters and regional offices of the Railroad Retirement Board?

The Board maintains headquarters in Washington, D. C., and regional offices in New York, Cleveland, Chicago, Atlanta, Minneapolis, Kansas City, Dallas, Denver, Seattle and San Francisco. In addition, district manager's offices are located in fifty-three cities.

278. How many retired railway employees are receiving pensions or benefit payments under the Railroad Retirement Act?

On May 31, 1940, there were 143,208 persons receiving pensions under the Railroad Retirement Act, aggregate monthly disbursements amounting to \$9,044,984.

279. How many railroads maintained pensions systems for their employees prior to the enactment of the Railroad Retirement Act?

Pension systems were in effect on 75 railroads of the United States when the Railroad Retirement Act was passed. Several of these systems had been in operation for more than a quarter of a century.

280. Why do train service employees wear uniforms?

The "Standard Code of Operating Rules" provides that employees on train service duty "must wear the prescribed badge and uniform and be neat in appearance." A uniformed employee is at once identified by the traveling public as a representative of the railroad.

281. Have most railway executives come up from the ranks?

An analysis of the careers of presidents and chief executive officers of twenty-nine leading American railway systems shows that eleven of them started their railway careers in minor engineering positions, four started as telegraph operators, four as clerks, three as messenger boys, one as an attorney, one as manager of a small railroad, one as a stenographer, one as an office boy, one as a car agent, one as a claim adjuster and one as a track laborer. On the average, railway presidents reach their positions after thirty years of railway experience.

INVESTMENT & CAPITALIZATION

282. What is the total investment in the railroads of the United States?

The recorded investment in railroad property at the beginning of 1939 was \$26,556,693,907.

283. What is the average investment per mile of railroad?

At the beginning of 1939, the average mile of railroad in the United States, together with its proportion of other tracks, yards, buildings, locomotives, cars, shops and other appurtenances, represented a recorded investment of \$108,871.

284. Has the investment in the railway plant per employee increased?

The railway investment per employee nearly trebled in the 30-year period 1908-1938, increasing from \$9,200 in 1908 to \$10,000 in 1918, \$14,700 in 1928 and \$26,700 in 1938.

285. What is meant by railway capitalization?

The outstanding stocks and bonds constitute the capitalization of a railroad.

286. What is the total amount of railway securities outstanding in the hands of the public?

At the beginning of 1939, the total par value of railway stocks, bonds and other securities in the hands of the public was \$18,606,000,000, of which \$7,108,000,000 represented stock and \$11,498,000,000 represented bonds and other funded securities.

287. What is the capitalization per mile of railroad?

For each mile of railroad (including locomotives, cars and other property), the par value of all railway stocks in the hands of the public on January 1, 1939, was \$30,011, and that of all bonds and other funded obligations was \$48,547—a total outstanding capitalization of \$78,558 a mile, on the average.

288. What is the margin between the recorded investment in railroads and their outstanding capitalization?

The recorded investment in the railroads of the United States as a whole is approximately \$7,951,000,000 greater than the aggregate par value of all stocks, bonds and other securities outstanding in the hands of the public.

289. How much has been spent by the federal government and the railroads to find the value of railway property?

From the time the Federal Valuation Act was passed, in 1913, to the end of 1939, the federal government spent \$51,293,625 and the railroads spent \$156,766,202, or a combined total of \$208,059,827 to find the value of the railroads and to keep the valuations up to date.

290. What value does the federal government place upon the railroads?

The Interstate Commerce Commission reported a final value for all railroads of the United States of \$20,988,000,000 as of January 1, 1938, after allowing for depreciation and other factors.

291. How many railway stockholders (owners) are there in the United States?

The Class I railroads of the United States reported 887,492 stockholders at the end of 1938. Most of these are individuals; although many firms, institutions and estates are included.

292. How many shares of stock are held by the average stockholder?

Railway stockholders held an average of 92 shares each on December 31, 1938.

293. Are railway stocks more widely owned now than in former years?

There has been a marked increase in the number of railway stockholders in the last three decades, as indicated below:

<i>Railroad</i>	<i>Number of Stockholders</i>		
	1904	1918	1939
Baltimore & Ohio.....	7,132	32,066	39,339
Boston & Maine.....	7,402	7,155	13,394
Chesapeake & Ohio.....	1,478	7,220	59,852
Great Northern.....	383	30,468	30,896
Illinois Central.....	9,123	11,324	18,318
Louisville & Nashville..	1,672	5,154	7,184
New Haven.....	10,842	25,048	26,098
New York Central.....	11,781	31,767	63,165
Norfolk & Western.....	2,911	9,847	13,545
Northern Pacific.....	368	27,338	29,867
Pennsylvania.....	44,175	110,765	209,346
Santa Fe.....	17,823	49,796	53,803
Southern Pacific.....	2,424	38,502	44,446
Union Pacific.....	14,256	36,953	50,112
Total, 15 railroads.....	135,879	437,080	659,365

294. How many railway bondholders are there?

It is estimated that there are approximately 1,000,000 railway bondholders in the United States.

295. What is the average rate of interest paid by the railroads on outstanding bonds?

Approximately $4\frac{1}{2}$ per cent per annum.

296. What part of the total investment in railroads consists of fixed property and what part consists of equipment?

Approximately three-fourths of the total investment in railway property consists of land, roadway, bridges, buildings, tunnels, signal systems, shops, stations and other fixed property, and one-fourth consists of locomotives, passenger and freight cars and other mobile units of equipment, commonly called "rolling stock."

TAXES

297. Who gets the larger share of railway earnings, the stockholders or the tax collectors?

For every dollar which the railroads paid to their stockholders in dividends in 1939, they paid \$2.82 in taxes to federal, state and local governments.

298. What is the annual tax bill of the railroads?

In 1939, federal, state and local taxes paid by all steam railroads, including switching and terminal companies, amounted to approximately \$380,000,000. This is at the rate of more than \$1,040,000 a day.

299. Do railroads pay other than property and income taxes?

Railroads pay many kinds of federal, state and local taxes. Their federal taxes include: capital stock taxes, excess profit taxes, income taxes, social security taxes (unemployment and pension), gasoline and oil taxes, electrical energy taxes, liquor and tobacco taxes, documentary stamp taxes, and telephone and telegram taxes. Their state and local taxes include: general property taxes, franchise taxes, gasoline taxes, sales taxes, income taxes, excise taxes, gross earnings taxes, inspection, license and motor vehicle fees, liquor and beverage taxes and special assessments.

300. Have railway taxes increased in recent years?

Railway taxes in 1939 were approximately 50 per cent higher than in 1935.

301. What part of the railway dollar goes to pay taxes?

Out of every dollar which the Class I railroads received from the public for the transportation of passengers, freight, express and mails in 1939, 8.9 cents, or nearly one-eleventh, was paid in taxes to the federal, state and local governments.

302. How much work do the railroads do to earn taxes?

The Class I railroads performed 36,517,000,000 ton-miles of freight service in 1939 to earn enough money to pay their taxes.

303. How many days of the year do the railroads work to support federal, state and local governments?

In 1939 the total receipts of the Class I railroads for $32\frac{1}{2}$ days were required to pay taxes. This compares with 23 days in 1929.

Luxurious air-conditioned passenger trains glide on glistening rails through hundreds of miles of Western America's scenic wonderland.



304. What proportion of railway taxes goes to support public education?

About 30 per cent of all railway taxes go to support the public schools. It is estimated that school taxes paid by the Class I railroads are sufficient to defray the annual cost of providing common school education for 1,300,000 boys and girls in the United States.

305. Where can a yearbook of railway information be obtained?

A handy little volume of railroad facts, containing much statistical data on the railroads of the United States, may be obtained free of charge from the Committee on Public Relations of the Eastern Railroads, 143 Liberty Street, New York City, or from the Western Railways Committee on Public Relations, 105 West Adams Street, Chicago, Illinois, or from the Association of American Railroads, Transportation Building, Washington, D. C.

RAILROADS AS BUYERS

306. Why are the railroads called "America's Twenty Per Cent Industry"?

The value of railway stocks and bonds represents approximately 20 per cent of the total par value of all corporation securities listed on the stock exchanges. Railroads normally purchase approximately 20 per cent of the nation's bituminous coal and fuel oil and nearly 20 per cent of the nation's lumber and iron and steel products.

307. What is the Railway Supply Industry?

The railway supply industry consists of thousands of manufacturing companies and other enterprises engaged in whole or in part in producing and supplying the railroads with equipment, locomotive and car parts, iron and steel products, building materials, machinery, tools, fuel and other needs in great variety.

308. Are the railroads big buyers of the products of industry?

Railroads are among the largest buyers and consumers in America. Their shopping list includes more than 70,000 distinct items ranging from soap to steam locomotives, from toothpicks to telephone poles, from box cars to bituminous coal. In the five years 1935-1939, they spent an average of \$260,000,000 a year for fuel; \$73,100,000 a year for forest products; \$243,200,000 a year for iron

and steel products, and \$166,600,000 a year for other products—a total average expenditure of \$742,900,000 a year for all items, not including large sums spent annually for new equipment and for additions and betterments to fixed property.

309. How widespread are railway purchases?

In 1937 the railroads made important purchases in no fewer than 12,174 cities and towns in the United States. Purchases were reported in 2,638 of 3,072 counties in the forty-eight states.

310. How much have the railroads of the United States spent for additions and betterments to their properties in recent years?

From 1930 to 1939 inclusive, the Class I railroads invested an average of \$320,442,500 a year, or a total of \$3,204,425,000 of new capital in improvements to their properties. This was in addition to their expenditures for maintenance.

311. How much do the railroads usually have invested in materials and supplies?

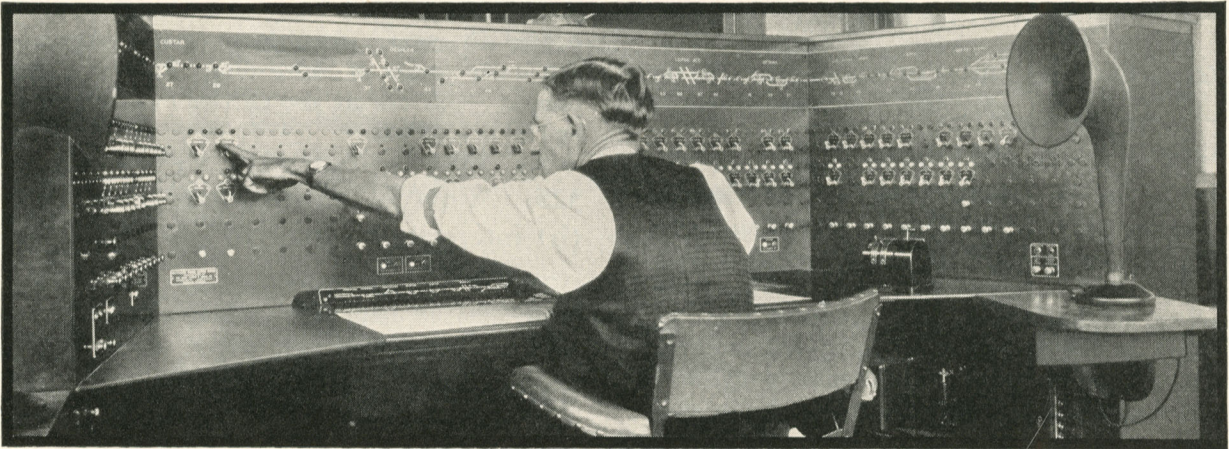
The value of year-end inventories of materials and supplies in railway storehouses and storage yards averaged \$333,000,000 during the ten-year period 1930-1939.

312. How extensive is the use of ice in railway operations?

It is estimated that more than 16,000,000 tons of ice are used annually by the railroads of the United States. Of this quantity, 13,000,000 tons are used in refrigerator car service and 3,000,000 tons are used in dining cars, commissaries, restaurants, offices, passenger cars, stations, shops, storehouses and in other ways. Loaded 30 tons to the car, the annual ice requirements of the railroads would fill 533,000 freight cars, or enough to reach in train formation nearly one and one-half times across the continent.

313. What progress have the railroads made toward fuel conservation?

From 1921 to 1938 the amount of coal (or its equivalent) consumed in locomotives was reduced from 162 pounds to 115 pounds for each 1,000 ton-miles of freight service performed, and from 17.7 pounds to 14.9 pounds for each passenger-car-mile



From a central electric control board such as this, train movements over a hundred miles or more of railway lines may be directed. Light signals show the location and progress of each train.

of service performed. This resulted in fuel savings of 29 per cent in freight service and 16 per cent in passenger service.

314. How much water is consumed by the American railroads?

Approximately 600,000,000,000 gallons of water are required annually to quench the thirst of locomotives and to supply other needs of the railroads of the United States. This would be sufficient to fill a channel 600 feet in width and 9 feet deep reaching from New York to San Francisco.

315. Does water treatment add to locomotive efficiency?

Railroads have found that water which is properly treated chemically greatly increases the efficiency of locomotives and the life of boilers and tubes. Chemical treatment of water prevents erosions or corrosions within the boilers and tubes, reduces the frequency of boiler washings and saves the railroads millions of dollars annually.

316. What distance will a freight locomotive travel while consuming a ton of coal?

The distance depends upon the locomotive, the weather, the train load and other factors, but the average locomotive in road freight train service consumes one ton of coal for each 8.9 miles of travel.

317. How much coal is consumed in locomotives in a year?

Railway locomotives consumed 75,155,000 tons of coal in 1939. They have consumed as much as 139,000,000 tons in a year.

318. How many coal miners are engaged in supplying fuel for steam locomotives?

Based on a coal production of 800 tons per year for each person employed, more than 94,000 coal mine workers were employed to produce the coal consumed by locomotives in 1939.

319. How much fuel oil and other petroleum products do the railroads use in a year?

It is estimated that the Class I railroads consume nearly one-fifth of all the fuel oil used in the United States, besides large quantities of gasoline and lubricating oils and other petroleum products. In 1938, Class I railway purchases of fuel oil totaled 2,426,000,000 gallons, and their purchases of gasoline totaled 46,265,000 gallons.

320. How much do the railroads spend for various types of fuel?

The total expenditures of Class I railroads for fuel for all purposes in 1939 were as follows:

Bituminous coal	\$193,079,000
Anthracite coal	4,925,000
Fuel oil	52,334,000
Gasoline	4,203,000
All other (coke, wood, etc.) . .	2,732,000
	<hr/>
	\$257,273,000

MISCELLANEOUS

321. Do railroads promote industrial and agricultural development in their territories?

Many large railroads maintain departments which devote their full time to promoting industrial and agricultural developments in their territories. These departments, manned by industrial and agricultural experts, are active in locating new manufacturing plants, mining enterprises and business establishments in communities along their lines and in cooperating with farmers in introducing new and profitable crops and better farming methods, improving livestock and dairy herds, developing markets and otherwise aiding agriculture and industry.

322. What is the Interstate Commerce Commission?

The Interstate Commerce Commission is the agency of the Federal Government which carries out the provisions of the Interstate Commerce Act and other federal laws regulating railroads and certain other carriers engaged in interstate commerce. The Interstate Commerce Commission was created by the Interstate Commerce Act, approved February 4, 1887, effective April 5, 1887.

323. In what ways are the railroads regulated by the Federal Government?

Under the Interstate Commerce Act and subsequent amendments, the railroads are regulated as to freight rates, passenger fares, charges for switching and other incidental services, publication of tariffs, issuance of stocks, bonds and other securities, extensions of lines, abandonments, consolidations, sales, leases and purchases of other properties, accounting rules and practices, pooling of services, interlocking directorships, safety appliances, supply of equipment, equipment standards and appliances, hours of service for labor, minimum wages, and in other ways.

324. Are the railroads regulated by the States as well as by the Federal Government?

Numerous state laws regulating the railroads are in force. Forty-seven of the forty-eight states have regulatory commissions which exercise considerable control over railroads within their respective states.

In addition, there are many state bureaus or agencies which exercise control over railway taxation and other phases of railroading. Railway operations are also affected in various ways by city ordinances.

325. What is (a) intrastate commerce; (b) interstate commerce?

Traffic which is handled from the point of origin to the point of destination entirely within the confines of a single state is intrastate commerce.

Traffic which originates in one state and terminates in another state, or which moves between points in the same state via a route that takes it through another state, is interstate commerce.

326. Is a railroad whose operations are confined to a single state subject to regulation by the Federal Government under the Interstate Commerce Act?

When such a railroad engages in interstate or foreign commerce—that is, when it handles traffic which originates in or is destined to some other state or a foreign country—it is subject to federal regulation under the Interstate Commerce Act.

327. How many reports are required of the railroads by federal and state agencies?

Approximately 888 different reports are required each year by the forty-eight state governments and the Federal Government. Ten reports are daily, six are weekly, 294 are monthly, 73 are quarterly or semi-annually, 402 are on an annual basis, and 103 are for special purposes, the number and frequency depending upon developments and occurrences in the industry.

328. What is The American Short Line Railroad Association?

The American Short Line Railroad Association, with headquarters in Washington, D. C., is an organization representing 305 steam and electric railway companies in the United States. Its member railroads range from 1 mile to more than 2,500 miles in length and have an aggregate investment of approximately \$750,000,000. Together these railroads employ more than 34,000 persons, have a payroll in excess of \$55,000,000 a year, and do an annual business of more than \$100,000,000.

329. What are some outstanding periodicals in the railway transportation field?

Official Guide of the Railways
Official Railway Equipment Register
Pocket List of Railroad Officials
Railroad Magazine
Railway Age
Railway Electrical Engineer
Railway Engineering and Maintenance
Railway Mechanical Engineer
Railway Purchases and Stores
Railway Signaling
Traffic World

330. What is the Association of American Railroads?

The Association of American Railroads is the central coordinating agency of the American railway industry. In June, 1940, the Association's membership consisted of 214 railroad companies, as follows: 125 Class I railroads, 35 Class II railroads, 16 Class III railroads, 23 switching and terminal companies, 4 electric railroads and one leased line, all in the United States; 5 Canadian railroads and 5 Mexican railroads. The 204 railroads in the United States embraced 236,903 miles of railroad, or approximately 99 per cent of all railway mileage in the country. In addition, associate membership is held by 181 railway companies, embracing 75,826 miles of railroad in the United States and in foreign countries.

331. What is the world's largest railroad library?

The world's largest library on railroad subjects is located in the Transportation Building, Washington, D. C., and is maintained by the Bureau of Railway Economics of the Association of American Railroads. It is extensively used by railroad men, research workers and by the general public.

332. Where can a bibliography of railway literature be obtained?

The Association of American Railroads, Washington, D. C., issues for free distribution a bibliography of "Railway Literature for Young People" listing more than 200 story books, histories, statistical and financial reviews, encyclopedias, railway and travel periodicals, books on model railroading and other publications relating to the American railroads.

333. Where is there a glossary of railway terms?

There is no complete glossary of railway terms, but the following books, articles and documents contain general or specialized glossaries:

Car Builders' Cyclopedia, 1937.

Locomotive Encyclopedia, 1938.

Railway Engineering and Maintenance Cyclopedia, 1939.

Manual-American Railway Engineering Association.

Manual-Mechanical Division, Association of American Railroads.

Manual-Signal Section, Association of American Railroads.

Traffic Glossary, 1924, by R. E. Riley.

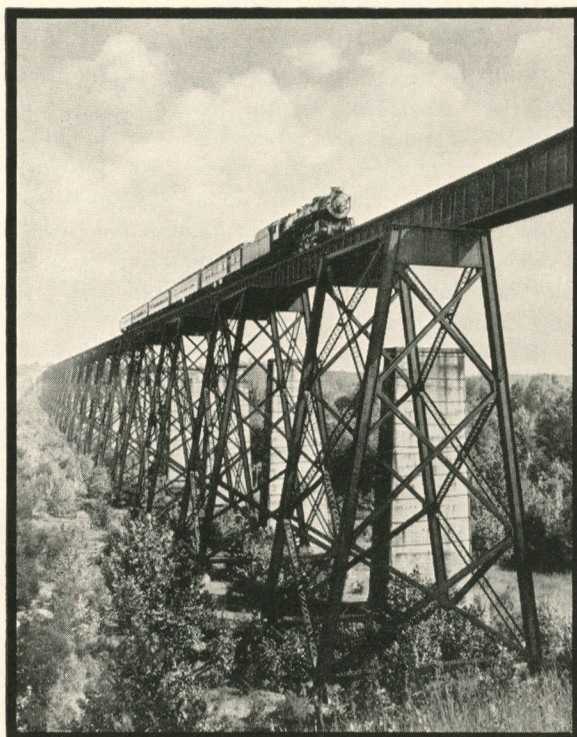
Passenger Traffic Report of Federal Coordinator of Transportation, 1935, pp. 257-272.

Freight Traffic Red Book (Published annually).

A Transportation Glossary for Students, 1929, by H. G. Brady.

Freight Terminals and Trains, 1925, by John A. Droege.

***A steel passenger train on a bridge of steel.
The American railroads spend many millions
of dollars annually for iron and steel products.***



Interstate Commerce Commission. Statistics of Railways in the United States, 1932, pp. 257-266: "Glossary of Railway Statistical Terms." Supplement No. 1, 1933, p. 257.

Uniform System of Accounts for Steam Railroads. Prescribed by the Interstate Commerce Commission and published by the Accounting Division, Association of American Railroads, 1936.

Analysis of Railroad Operations, 1925, by J. L. White.

334. Has a list of motion pictures relating to the railroads been compiled?

The Association of American Railroads, Washington, D. C., has compiled a list of more than 200 motion pictures owned by or relating to the railroads of the United States and Canada. The list will be furnished free upon request.

335. How many model railroad enthusiasts are there in the United States?

In an article in *Scientific American* (April, 1940), R. T. Griebbling estimates that there are 100,000 model railroad hobbyists in the United States. He estimates that these model railroaders collectively own and operate enough trackage to reach from New York to San Antonio, Texas. Their total investment in trains and tracks is around \$10,000,000.

336. Has a statistical survey of model railroad fans been made?

A "census" taken in 1940 by the magazine *Model Railroading*, covering about 2,000 model railroad hobbyists, disclosed that the average age of the devotees was between 30 and 35 years. Almost 60 per cent of them were between 25 and 40 years of age. Annual income of about 45 per cent of those canvassed was between \$1,000 and \$3,000; 5 per cent had incomes of less than \$1,000; 9 per cent had incomes of more than \$5,000. Of the 2,000 hobbyists reporting, 15.5 per cent were semi-professional people; 11.7 per cent were brokers, traders and merchants; 10.6 per cent were students; 10.3 per cent belonged to skilled trades; 9.6 per cent were engineers; 9.4 per cent were professional men; 7.6 per cent were executives; 7.2 per cent were office workers; 5.4 per cent were salesmen; 2.8 per cent were teachers and 1.1 per cent were farmers.

RAILWAY HISTORY

337. What was the first rail-road or tramway in the United States?

The first road of rails in the United States is said to have been a short inclined track used as early as 1795 to convey brick and other clay products from kilns on Beacon Hill, Boston, to a street below. In 1807, Silas Whitney built a short railway at the same location. The rails were of wood.

338. What were other early tramways in the United States?

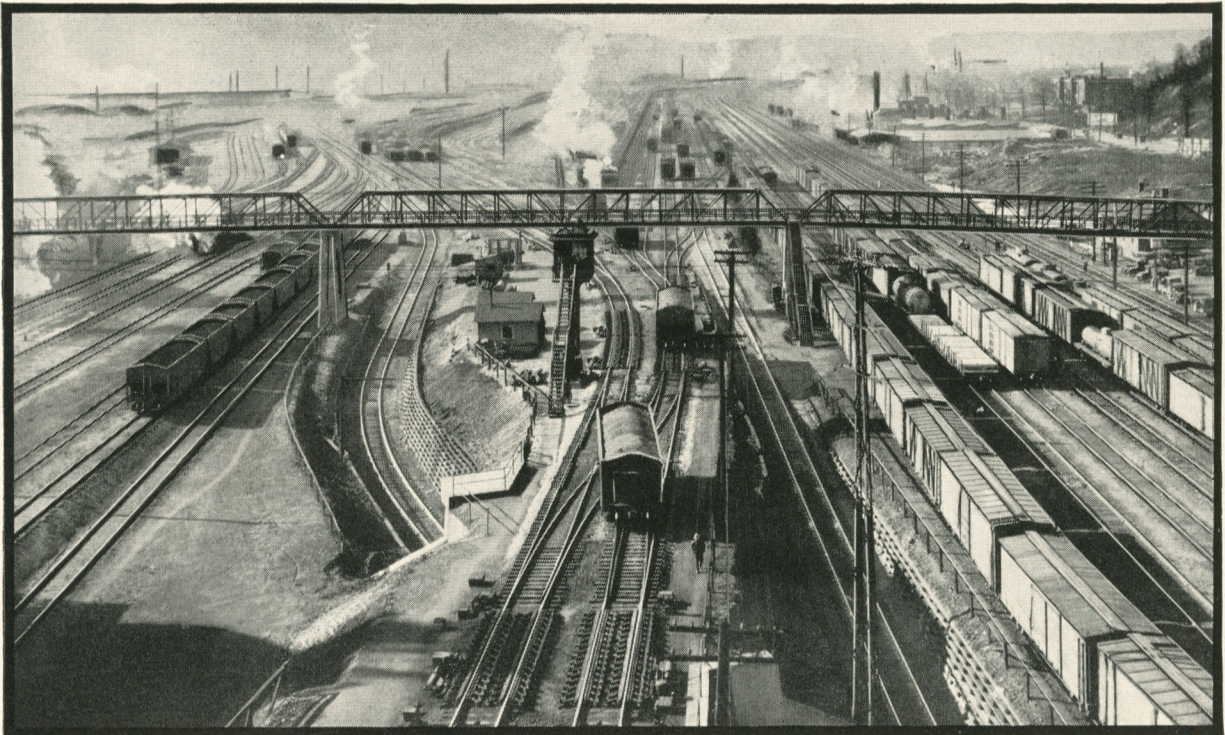
In 1809 Thomas Leiper built a tramway to connect his quarry at Crum Creek, Delaware County, Pennsylvania, with tidewater on Ridley Creek, less than a mile away. About 1810 a tramroad was constructed on Falling Creek, Chesterfield County, Virginia, to furnish transportation for a powder mill. In 1818 a tramroad was built at Bear Creek Furnace, Armstrong County, Pennsylvania. In 1825 a tramroad was built at Nashua, New Hampshire.

339. What was the first railway charter in the United States?

In 1815, John Stevens, of Hoboken, obtained a charter from the State of New Jersey to build and operate a steam railroad between New Brunswick and Trenton, New Jersey. The charter expired without the railroad being built, but the idea persisted and on March 7, 1832, the New Jersey Railroad & Transportation Company (now a part of the Pennsylvania Railroad) was chartered to build across the state. On January 1, 1839, the railroad was opened between New Brunswick and Trenton.

340. What was the first railway company to build and operate a railroad in the United States?

The Granite Railway Company, incorporated by the Massachusetts legislature March 4, 1826, and still in existence, was the first railway corporation actually to build and operate a railroad in this country. The Granite Railway, about 2 miles in length, was built by Gridley Bryant to convey huge blocks and columns of granite from the quarry in Quincy to Milton, on the Neponset River, for use in the construction of Bunker Hill Monument. The road was opened October 7, 1826. The roadbed was built of crushed granite; the sleepers were stone; the rails, set 5 feet apart, were wood capped with iron. Horses supplied the motive power for many years. In 1846 the company was authorized to use steam power and transport passengers and merchandise. In 1871 the Old Colony Railroad (now a part of the New York, New Haven & Hart-



Modern railroading is precision railroading. Bewildering as it all appears to the uninitiated, train and car movements in the busy freight classification yards proceed with clock-like regularity and efficiency.

ford) acquired the right-of-way and extended the road to Atlantic Station, and passenger trains began running over the road on October 9 of that year.

341. Who built the first steam locomotives in this country?

As early as 1804, Oliver Evans, pioneer steam engine builder, of Philadelphia, amazed the world with his wonderful "Orukter Amphibolos," which was propelled through water and over land by steam power.

The first steam engine to run on rails in America was built by John Stevens in 1825 and was operated on a circular experimental track on his estate at Hoboken, New Jersey. Neither Evans' contraption nor Stevens' engine was ever put to practical use.

The first American locomotive actually to be operated on a common-carrier railroad in the United States was the "Tom Thumb," an experimental engine, built in 1829 by Peter Cooper, New York ironmaster, and given a trial run on the Baltimore & Ohio Railroad, at Baltimore, in September of that year. Its famous race, August 25,

1830, with a horse-drawn car, which the latter won, added a colorful chapter to American railway history.

342. Who was Horatio Allen, and what was his contribution to early railway history?

Horatio Allen was a popular and influential young railroad engineer in pioneer days. In 1828, while in the employ of the Delaware & Hudson Canal Company, Allen was sent to England to inspect the British railways and to purchase locomotives. The three locomotives which he purchased were the first European locomotives brought to America. The "America" arrived at New York on January 15, 1829, and the "Stourbridge Lion" arrived May 13, 1829. Of his third locomotive, the "Delaware," nothing is known. The "Stourbridge Lion," operated by Allen, made a trial run at Honesdale, Pennsylvania, on August 9, 1829, but was found to be too heavy for the track and was converted to stationary use. Horatio Allen was later Chief Engineer of the South Carolina Railroad (now the Southern), the pioneer railroad of the South. He lived to see a railway network from coast to coast.

343. What were the first locomotives to be placed in service on the American railroads?

The first locomotive to be placed in regular service on any American railroad was the "Best Friend of Charleston," built at the West Point Foundry, New York. It was placed in service on the South Carolina Railroad (now the Southern) at Charleston, S. C., December 25, 1830.

The second locomotive, the "West Point," built at West Point Foundry, was placed in service on the South Carolina Railroad July 15, 1831.

The "De Witt Clinton," the first locomotive in New York State, also built at West Point Foundry, made its initial run on the Mohawk & Hudson Railroad (now part of the New York Central) from Albany to Schenectady, August 9, 1831.

The "York," built by Phineas Davis, York, Penna., was tried out on the Baltimore & Ohio Railroad July 12, 1831, and was placed in service at Baltimore shortly thereafter.

The "John Bull," built in England, was delivered to the Camden & Amboy Railroad (now a part of the Pennsylvania) August 31, 1831, and was placed in regular service at Bordentown, N. J., November 12, 1831. This was the first locomotive to run on the present Pennsylvania Railroad lines.

344. What year marked the beginning of the railway era in America?

The railway era dates from 1830. In that year the first common carrier railroads were operated, notably, the Baltimore & Ohio and the South Carolina railroads. Railway charters were granted in Massachusetts, Pennsylvania, Ohio, Virginia, Kentucky and Louisiana. Several railroads were under construction, and by the end of the year there were twenty-three miles of railroad in operation in the United States.

345. How has the railway mileage of this country grown since 1830?

From 23 miles of completed railroad in 1830, the railway mileage of the United States increased to 2,818 miles in 1840; 9,021 miles in 1850; 30,626 miles in 1860; 52,922 miles in 1870; 93,262 miles in 1880; 163,597 miles in 1890; 193,346 miles in 1900; 240,293 miles in 1910; and 252,845 miles in 1920. In 1930 there were 249,052 miles of railroad in the United States, and at the beginning of 1939 there were 236,842 miles. Mileage of all track increased from 115,647 miles in 1880 to 199,876

miles in 1890; to 258,784 miles in 1900; to 351,767 miles in 1910; to 406,580 miles in 1920, and to 429,883 miles in 1930, and declined to 410,118 miles at the beginning of 1939.

346. What signer of the Declaration of Independence was identified with American railway history?

On July 4, 1828, Charles Carroll, of Carrollton, 91 years of age, the only living signer of the Declaration of Independence, participated in the historic ceremony of the laying of the first stone in the construction of the Baltimore & Ohio Railroad at Baltimore, Maryland. The Revolutionary patriot delivered a speech on that occasion in which he said: "I consider this among the most important acts of my life; second only to my signing the Declaration of Independence, if even it be second to that."

347. What was the first common carrier railroad in the United States?

The first railroad to serve as a public conveyer of passengers and freight was the Baltimore & Ohio. The first revenue passengers were carried on January 7, 1830. The road was opened for regular freight and passenger traffic between Baltimore and Ellicott's Mills, Maryland, a distance of about 13 miles, on May 24, 1830. Horses were originally used for motive power.

348. What railroads experimented with tread-mills for motive power?

In the early stages of their development, both the Baltimore & Ohio Railroad and the South Carolina Railroad tried cars with tread-mills driven by horses. It is reported that the strange contrivance tried out by the Baltimore & Ohio was condemned after it had been derailed by a trespassing cow.

349. Were sails ever used for the propulsion of railway cars?

Experimental cars equipped with sails were tried out on both the South Carolina Railroad and the Baltimore & Ohio Railroad.

350. What was the pioneer railroad of the Mississippi Valley?

The Pontchartrain Railroad, a 5-mile line extending from Elysian Fields Street, New Orleans, to the shore of Lake Pontchartrain at Milneburg,



The electric kitchen of a modern railway dining car is a study in efficiency and space utilization. From its well-stocked larder, expert chefs prepare dishes that satisfy the most fastidious appetites.

was the first railroad in the Mississippi Valley. It was chartered January 20, 1830, and was opened for horse-power operation April 23, 1831. Its first steam locomotive, the "Pontchartrain," was built in England and placed in regular service September 17, 1832. For many years, until its abandonment in 1935, the road was a part of the Louisville & Nashville Railroad.

351. What was the first railway-highway grade crossing separation in American history?

An overpass truss bridge carrying a highway over the Baltimore & Ohio Railroad about 2 $\frac{1}{4}$ miles from Baltimore, built by Colonel Stephen H. Long and completed early in 1830, is believed to be the first railway-highway grade crossing separation in American history. The bridge embodied a new engineering principle and was patented by Colonel Long on March 6, 1830.

352. What was the origin of the railway spike now in common use?

Spikes of various designs were used from the earliest period of railway development, but the

hooked-head spike, which is used today by railroads throughout the world to fasten steel rails to cross-ties, was designed in 1831 by Robert L. Stevens, the first president of the Camden and Amboy (now a part of the Pennsylvania) Railroad in New Jersey.

353. When were United States mails first carried by rail?

The first known instance of United States mail being transported by rail occurred on the South Carolina Railroad, extending westward from Charleston, S. C., in November, 1831. On or about January 1, 1832, the Baltimore & Ohio Railroad began carrying mail between Baltimore and Frederick, Md. Shortly after the opening of the Baltimore & Ohio Railroad between Baltimore and Washington in 1835, a car was fitted with a compartment for carrying United States mails between the two cities. The postmaster in Washington and the postmaster in Baltimore each had a key to the mail compartment. On July 7, 1838, an act of Congress made all railroads official post routes.

354. When was the locomotive cab introduced?

The first locomotive equipped with a cab—"a very crude cab"—was the "Samuel D. Ingham" built by Eastwick & Harrison of Philadelphia, for the Beaver Meadow Railroad (now the Lehigh Valley) in Pennsylvania in 1835-36. This was the first locomotive to be operated on what is now the Lehigh Valley Railroad.

355. What was the origin of the cow-catcher?

This strictly American feature was the invention of Isaac Dripps, a young mechanical engineer employed by the Camden & Amboy Railroad in New Jersey (now a part of the Pennsylvania Railroad) in the early 1830s. So many cows trespassed upon the railroad that Dripps decided to install on the front end of the locomotive a small truck supporting two iron spears. The Dripps device was effective, but it was fatal to the cows. To avoid damage suits, he substituted a cross-wise bar much like the present-day bumper on an automobile, and from this evolved the present V-shaped cowcatcher.

356. What is the story of the headlight?

In the early days of railroading, trains ran only in daylight hours, and headlights were unknown. As the railroads developed, however, night operations became increasingly necessary, and inventive minds went to work to devise ways of illuminating the track ahead. The first crude step was taken under the direction of Horatio Allen, then with the South Carolina Railroad in South Carolina. He attached a small flat car to the front of the locomotive, covered the car with a heavy layer of sand on which he kept a bonfire of pine knots burning. In other instances, large candles protected by glass cases, fitted with reflectors, were used. Whale oil was extensively used in the 1840's and 1850's. After the discovery of petroleum in 1859, kerosene lamps took the place of candles and whale-oil lamps. Then came gas lights, fed from storage tanks, and finally electricity. The first patent for an electric headlight was issued to Leonidas G. Woolley May 3, 1881, and several electric headlights were in use in 1884. Since the introduction of electric lighting, great progress has been made. Today locomotive headlights are powerful searchlights.

357. When did steam railway transportation reach the city of Washington?

The formal opening of the Washington Branch of the Baltimore & Ohio Railroad, between Baltimore and the Nation's Capital, was celebrated on

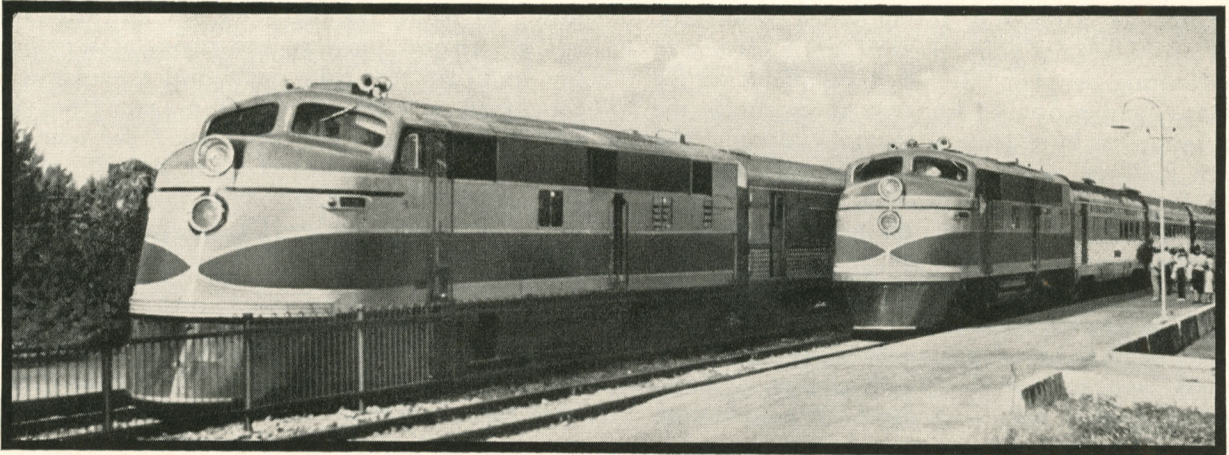
August 25, 1835. Four gayly bedecked passenger trains from Baltimore, drawn by locomotives appropriately named "George Washington," "John Adams," "Thomas Jefferson" and "James Madison" and bearing a distinguished company, entered Washington on that day. In the early days, trains made the 40-mile run between Baltimore and Washington in about 2½ hours. By 1838, it was possible to journey all the way from Washington to New York by rail, but with a few changes of cars enroute.

358. What was the origin of railway express service in America?

William F. Harnden, pioneer passenger train conductor, after a few years in the service of the Boston & Worcester Railroad (now a part of the New York Central) conceived the idea of becoming a messenger for banking houses, merchants and other business interests in New York and Boston. He entered into a contract with the Boston & Providence Railroad (now the New York, New Haven & Hartford) and a steamship plying between New York and Providence, to carry on his messenger business over their lines. Starting on March 4, 1839, with a large carpet-bag, Harnden traveled regularly between New York and Boston, the world's first express messenger. His business grew rapidly; a special package car was put into service; offices were opened in New York and Boston; assistants were employed; the service was extended to Philadelphia and other cities, until Harnden & Company became an international institution. In the meantime many competitive enterprises were started. Harnden died in 1845, but the express business which he founded grew with the development of the railroads and the country.

359. When were the Great Lakes and the Atlantic Seaboard first linked by rail?

The New York & Erie Railroad (now the Erie) was completed and opened from New York to Dunkirk, New York, on Lake Erie, May 15, 1851, forming the first trunk line railroad linking an Atlantic port with the Great Lakes. The event was widely celebrated; addresses were delivered by President Millard Fillmore, Daniel Webster, Stephan A. Douglas and others; a procession marched through New York City "amid such a din of cannon and tin horns as the city did not again hear until the Civil War." The New York & Erie was at that time the longest railroad in the world. It was built of six-foot gauge, the broadest on the American continent.



Streamliners -- Symbols of the Modern Railway Era. These fleet-footed "greyhounds of the rails" frequently clip off from 75 to 90 miles an hour. They are capable of speeds in excess of 100 miles an hour.

360. When did the "Iron Horse" reach Chicago?

The first locomotive to reach Chicago (the world's greatest railroad center) was the "Pioneer," which arrived by the sailing vessel "Buffalo" October 10, 1848, for service on the **Galena & Chicago Union Railroad** (now the **Chicago & North Western**). The "Pioneer" made its initial run out of Chicago on November 20 of that year, and by 1850 it was running as far west as Elgin. This historic locomotive is now preserved in the **Museum of Science and Industry in Chicago**. The first train from the East entered Chicago over the **Northern Indiana Railroad** (now the **New York Central**) in the spring of 1852.

361. In the early days of railroading, were rates and fares higher or lower than at present?

They were much higher. Doggett's "Railroad Guide and Gazette of 1848" gives the average revenue per ton-mile as 8.97 cents for first-class freight and 6.16 cents for second-class freight, contrasted with an average of less than 1 cent per ton-mile in 1939. Revenue per passenger-mile was reported by Doggett as 3.51 cents, contrasted with 1.84 cents in 1939.

362. What was the first telegraph message?

The first telegraph message "What hath God wrought?" was written by the inventor Samuel F. B. Morse and sent by Annie Ellsworth, daughter

of the United States Patent Commissioner, from Washington, D. C., to Alfred Vail at the Baltimore & Ohio station in Baltimore, Maryland, on May 24, 1844.

363. What is the first known instance of the telegraph being used for directing train operations?

One of the earliest telegraph lines built for commercial use closely followed the Erie Railroad tracks across New York State. On September 22, 1851, Charles Minot, Superintendent of the Erie, was on a west-bound train which drew into a siding at Turner (now Harriman), New York, to allow an east-bound train to pass. The train was late. Minot went to the telegraph office and wired ahead to locate the missing train. Learning that the train had not arrived at Goshen, thirteen miles west, Minot sent a telegram ordering that the train be held there. He then ordered the waiting train to proceed to Goshen where it would meet the east-bound train. The locomotive engineer is said to have refused to take such a risk. Thereupon Minot climbed into the cab, drove the engine to Goshen where the east-bound train was waiting. This is the first instance on record of the telegraph being used for train dispatching.

364. Who was called the "Father of the Pacific Railroad"?

The first man of prominence to advocate a railroad to the Pacific Coast was Asa Whitney, a New York merchant and world traveler, who advanced the idea while most of the territory west of the

Mississippi River was an uncharted wilderness. Whitney devoted years of effort and a fortune in promoting his plan. He issued pamphlets on the subject and petitioned Congress to encourage the construction by a grant of land. Whitney's "Pacific Railroad" was to extend from a point on Lake Michigan as directly as possible to the mouth of the Columbia River on the Pacific Ocean. "I have undertaken this mighty work," he said, "because I know someone's whole life must be sacrificed to it." His fortune spent in an effort to promote the plan, Whitney eked out an existence in his last years as a milk peddler in Washington, D. C., where he died before his dream of a transcontinental railroad had been realized.

365. When was steam railway transportation introduced west of the Mississippi River?

The first locomotive to turn a wheel west of the Mississippi River was "Pacific Number 3" of the Pacific Railroad of Missouri (now the Missouri Pacific), operated a few miles out of St. Louis on December 9, 1852.

366. What proportion of the railway mileage of the United States received federal land-grant aid?

Of 236,842 miles of railroad in the United States, about 18,000 miles, or $7\frac{1}{2}$ per cent, received land-grant aid from the Federal Government. About $92\frac{1}{2}$ per cent of the present railway mileage was built without Federal land-grant aid.

367. Were federal land-grants gifts to the railroads?

No. In return for the lands granted, the land-grant railroads carry United States Government troops and property for 50 per cent less than standard rates and United States mails for 20 per cent less than standard rates. The repayments in freight, passenger, express and mail rate reductions now approximate \$10,000,000 a year.

368. What was the first federal land-grant to aid in railway construction?

The first railroad land grant, approved September 20, 1850, conveyed 2,595,133 acres of federal land to the State of Illinois. The state chartered the Illinois Central Railroad Company February 10, 1851, and transferred the grant to the rail-

road. In return for the grant, the railroad carries government property and troops at a reduction of 50 per cent from established rates, United States mails at a reduction of 20 per cent from established rates, and pays the State 7 per cent of its gross revenues in lieu of other taxes.

369. Did the Federal Government and the State of Illinois profit from the land grant?

Both reaped a handsome profit. At the time of the Illinois grant, in 1850, the Federal Government owned more than 11,000,000 acres of wild land in Illinois which had been on the market for years, without purchasers, at \$1.25 an acre. At the open market price, the Illinois Central Railroad could have bought the land-grant acreage for \$3,244,000. To the end of 1938, the railroad had paid the Federal Government more than \$11,000,000 in reduced rates on government freight, express and mail shipments and troops, on account of the land grant, and has paid the State of Illinois more than \$96,000,000 in gross revenue tax. Had the railroad paid property taxes as non-land-grant railroads pay in Illinois, its taxes would have totaled approximately \$63,000,000, or \$33,000,000 less than they were. Therefore, to the end of 1938, the railroad had paid the Federal Government and the State of Illinois \$44,000,000 for the lands received, or more than thirteen times what the Government asked and had been unable to get for the lands prior to the passage of the land-grant act.

370. What are the facts concerning federal bond aid to pioneer Western railroads?

In the 1860's the Federal Government made loans totaling \$64,623,512 in bonds to six pioneer Western railroads to hasten their construction. The loans bore interest at 6 per cent per annum. Repayments of principal, plus interest, totaled \$169,209,169.

371. What Presidents of the United States were former railroad men?

James Buchanan, fifteenth President of the United States (1857-1861), was the first president of the Harrisburg, Portsmouth, Mount Joy & Lancaster Railroad, between Harrisburg and Lancaster, Pennsylvania, in the 1830s. This railroad is now a part of the main line of the Pennsylvania Railroad.

Abraham Lincoln, sixteenth President of the United States (1861-1865), was an attorney for the Illinois Central and Rock Island railroads in Illinois during the 1850s.

372. When did railway operations begin in California?

On February 22, 1856, the Sacramento Valley Railroad — the “Days of Gold Railroad” — was opened from Sacramento to Folsom, a distance of 23 miles. The locomotives “Nevada” and “Sacramento,” which had been shipped around Cape Horn by sailing vessel and barged up the Sacramento River from San Francisco, made their historic runs from Sacramento to Folsom on that date. The opening of the Sacramento Valley Railroad was marked by a great celebration which lasted several days. This railroad is now a part of the Southern Pacific System.

373. What is known of the early history of the caboose?

The caboose was variously known in the early days as “cabin car,” “conductor’s car,” “brakeman’s cab” and “train car.” The first mention of the term “caboose” found in railway journals related to a suit brought by a man named Edgerton against the New York & Harlem Railroad (now New York Central) for injuries sustained February 29, 1859. The cupola, which is an outstanding feature of the modern caboose, is said to have originated in the mind of T. B. Watson, a freight conductor on the Chicago & North Western Railroad, while on a run from Cedar Rapids to Clinton, Iowa, in the summer of 1863. Watson’s caboose had a hole in the roof about two feet square. He rigged up a seat so that he could sit with his head and shoulders above the roof. On reaching Clinton he sought the master mechanic, who was then building two cabooses, and suggested an elevated glassed-in enclosure. Watson’s suggestion was adopted, and the cupola soon became a standard feature.

374. How many miles of railroad were in operation in the United States at the time of the Civil War?

At the outbreak of the War Between the States in 1861, there were about 31,000 miles of railroad in the country. At the close of the war there were approximately 35,000 miles.

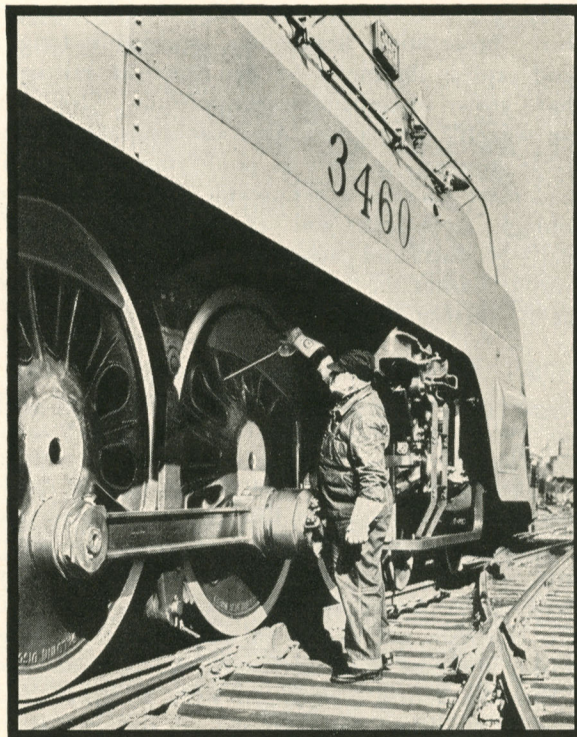
375. What was the most famous locomotive of the Civil War?

This distinction belongs to the Locomotive “General”, of the Western & Atlantic Railroad (now the Nashville, Chattanooga & St. Louis). The locomotive helped to write one of the most colorful and romantic chapters of Civil War history when captured April 12, 1862, by Captain James J. Andrews and his Yankee raiders and pursued and recaptured by the Confederates after a thrilling chase on the line between Atlanta and Chattanooga. Stories, ballads and a motion picture have given the “General” a place among the immortals. The historic locomotive is still in existence and has been exhibited at many fairs and expositions.

376. When and where were railway dining cars introduced?

The first railway dining cars were operated by the Philadelphia, Wilmington & Baltimore Railroad (now a part of the Pennsylvania) between Philadelphia and Baltimore in 1863. There were two of these cars, remodeled day-coaches, 50 feet in length, each fitted with an eating bar, steam box and “other fixtures usually found in a first-

The locomotive engineer adds a final touch of oil here and there before starting on his long run.



class restaurant." The food, however, was prepared at the terminal stations and placed on the cars immediately before the departure of the trains. These primitive "dining cars" remained in operation for about three years. In 1867, George M. Pullman introduced "hotel cars" (sleeping cars equipped with kitchen and dining facilities) the first three of which were the "President," the "Western World" and the "Kalamazoo." The first Pullman-built car devoted entirely to restaurant purposes was the "Delmonico," operated on the Chicago & Alton Railroad in 1868.

377. What was the origin of railway refrigerator service?

The first shipment of dressed beef under refrigeration was made from the Chicago Stock Yards to the East in 1857, in an ordinary box car fitted with bins of ice. The first rail shipments of fruit under refrigeration were made from southern Illinois to Chicago in 1866. Fresh strawberries packed in specially constructed iceboxes reached the Chicago market in excellent condition. The first patent for a refrigerator car was issued in 1867, and in 1872, southern Illinois was shipping strawberries and other fruits in the new type of car. In May, 1885, berries from the Norfolk (Virginia) area were shipped to New York under refrigeration. Florida oranges reached New York under refrigeration for the first time in October, 1888. In June, 1889, the first carload of deciduous fruit from California entered the New York market. From these beginnings, perishable freight and express shipments on the American railroads have grown to stupendous proportions. "Iceboxes on wheels" have given American fruit and vegetable growers, as well as poultrymen, dairymen, and meat packers, a nationwide market and have brought fresh fruits and vegetables, eggs, poultry, dairy products and packing-house products in great variety within the reach of every American home at all seasons of the year.

378. When was the first through railway train operated between Chicago and New York?

Prior to 1867, due to varying gauges of track between New York and Chicago, through service was not possible. Standardization of gauge in that year enabled through passage of cars by way of the Great Western Railroad of Canada. To celebrate the event, an excursion train, featuring the new Pullman "hotel" sleeping car, the "Western World", equipped with a kitchen and dining facilities, was operated all the way from

Chicago to New York. "The excursion party left Chicago on April 8, 1867, and, comfortably established in the "Western World", arrived in Detroit the following day. At Detroit the river was crossed on the 'great iron ferry boat', the first company of passengers that ever passed from Chicago to Canada without change of cars. . . . The cars were decorated with American and British flags, symbolizing the union which is destined to take place between the United States and Canada. . . . Large crowds visited the train at Rochester, Syracuse and Utica. . . . The party arrived in New York on April 14."

379. How did William F. Cody come to be known as "Buffalo Bill"?

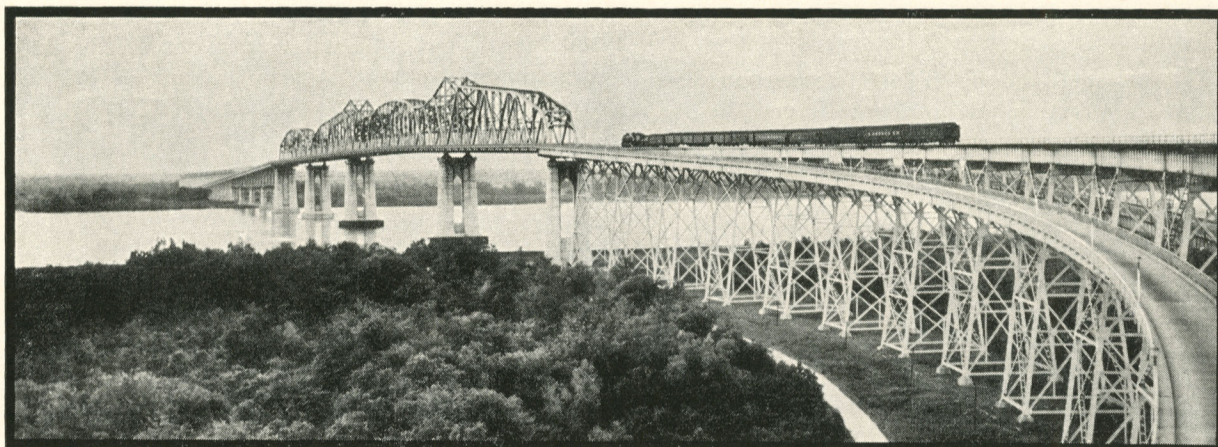
The famous Western scout and Indian fighter earned the picturesque nickname of "Buffalo Bill" as a result of his contract to supply buffalo meat to the construction forces engaged in building the Union Pacific Railroad.

380. What was known as "Hell-on-Wheels"?

In the construction of the Union Pacific Railroad across the Western plains and through the Rocky Mountains, temporary towns sprang up almost overnight as the grading, track-laying and bridge gangs advanced westward. The construction forces, consisting sometimes of thousands of men and accompanied by companies of armed soldiers to protect against hostile Indians and outlaws and to maintain order, brought locomotives, camp cars and other equipment, and this migratory town was known as "Hell-on-Wheels." Such cities as North Platte, Julesburg, Cheyenne and Laramie date their beginnings from the coming of the railway builders.

381. What was the ceremony known as "The Driving of the Golden Spike"?

This historic event occurred at Promontory Point, Utah, on May 10, 1869, when the last rails of the Union Pacific and the Central Pacific (now the Southern Pacific) were laid and the tracks were joined to form the first railway line to the Pacific. A spike of California gold and a spike of Nevada silver were driven by distinguished officials. "When the last spike was driven, the blows of the sledge, as well as the speeches marking the occasion, were carried to the East by telegraph. All over the country whistles were blown, bells were rung, guns were fired, processions were formed, and speeches became the order of the day. Congratulations were showered upon officials of the successful companies.



A majestic railway bridge spanning the "Father of Waters." If all railway bridges in the United States were strung together, they would reach from San Diego, California, to St. Johns, Newfoundland.

Editors joined in a paean of praise. In truth, the completion of the first transcontinental road marked an epoch!" The original Golden Spike now reposes in a bank vault in San Francisco.

382. When did the first through railway train cross the American continent?

The first railway train ever operated from the Atlantic to the Pacific was the Trans-Continental Excursion sponsored by the Boston Board of Trade in May, 1870, one year after the Union Pacific and Central Pacific railroads were opened. The trip from Boston to San Francisco consumed eight days, and was made in Pullman "hotel cars", then the newest thing in railroading. A daily newspaper, the "Trans-Continental", was published en route.

383. When were the several railroad routes completed to the Pacific Coast?

The Union Pacific and Central Pacific (now Southern Pacific) route between Omaha and Sacramento was completed May 10, 1869, and the extension to San Francisco Bay was opened in the same year.

The Atchison, Topeka & Santa Fe Railroad from Kansas City and the Southern Pacific line from California effected a junction at Deming, New Mexico, on March 18, 1881, forming the second rail route to the Pacific and the first direct rail route to southern California.

The Southern Pacific route from California to New Orleans was completed and formally opened for business on January 15, 1883.

The last spike in the construction of the North-

ern Pacific Railroad, pioneer railroad to the Pacific Northwest, was driven in Hell Gate Canyon, at Gold Creek, Montana, September 8, 1883.

The Oregon Short Line and the Oregon Railway & Navigation Company, forming the Union Pacific route to the Pacific Northwest, joined rails at Huntington, Oregon, November 25, 1885.

The last spike in the building of the Canadian Pacific Railway to Vancouver, first railroad to span the Canadian Rockies, was driven at Craigellachie, British Columbia, on November 7, 1885.

The Atchison, Topeka & Santa Fe Railroad completed its own through route from Chicago to California on May 1, 1888.

The last rail in the construction of the Great Northern Railroad between the Great Lakes and Everett, Washington, on Puget Sound, was laid on January 5, 1893. Through train service was established July 1 of that year.

The San Pedro, Los Angeles & Salt Lake Railroad, now the Union Pacific line from Salt Lake City to southern California, was completed May 1, 1905.

The last spike in the building of the Pacific Coast Extension of the Chicago, Milwaukee & St. Paul Railroad (now the Chicago, Milwaukee, St. Paul & Pacific) was driven at Garrison, Montana, May 19, 1909. Through freight service between Chicago and Seattle was established July 4, 1909, and through passenger service was established July 10, 1910.

The Spokane, Portland & Seattle Railway from Spokane to Portland was completed June 10, 1910.

The first passenger train to run over the entire line of the Western Pacific Railroad arrived in

San Francisco from Salt Lake City on August 22, 1910.

The Grand Trunk Pacific (now the Canadian National) was completed to Prince Rupert, British Columbia, in September, 1914.

The Canadian Northern (now the Canadian National) was completed to Vancouver in September, 1915.

384. What was the "Narrow Gauge Fever"?

During the 1870's numerous narrow-gauge railroads were built, causing considerable excitement in transportation circles. Extravagant claims were made for the "new system." Promoters emphasized its economy. By 1879 the narrow-gauge system embraced no fewer than 148 different companies in thirty-four states, with a total of 4,188 miles of railroad, nearly all of three-foot gauge.

385. What was the first circus to be transported by railroad?

In 1872, P. T. Barnum, the famous showman, who had previously moved his circus and menagerie from town to town by teams drawn by 600 horses, purchased 65 railway cars, painted in the most flamboyant manner, and began touring the United States by rail. This was the first circus to be transported by railroad. Wherever the "Greatest Show on Earth" went with its streaming Barnum banners, people flocked to see the circus trains. Where much time had previously been lost in traveling from town to town, all traveling could now be done by night, and for the first time long hops from one important city to another were possible. Barnum prospered beyond expectations, and in time additional equipment was necessary to transport his huge "Museum, Menagerie and Hippodrome."

386. Is it true that railway trains in the West were sometimes impeded by wild buffaloes?

Trains crossing the Western plains in pioneer days were frequently delayed by "thundering herds of buffaloes."

In the 1870's, P. T. Barnum's circus train, traveling to Denver over the Kansas Pacific Railroad, encountered huge herds of wild buffaloes, and it was sometimes necessary to stop the train to let them pass.

387. Did the Indians interfere with the railroad builders in the West?

The Indians attacked the builders on several occasions. One of the last incidents of this kind was the massacre by Apache Indians of thirteen surveyors of the Santa Fe Railroad on August 12, 1883.

388. When was the telephone first used in railway operations?

The world's first telephone message was transmitted by the inventor, Dr. Alexander Graham Bell, on March 10, 1876. At Altoona, Pennsylvania, May 21, 1877, Dr. Bell's assistants began tests which resulted in the permanent installation of telephones in the Pennsylvania Railroad shops at that point—the first trial and use of the telephone for railroad purposes. In the spring of 1878, the Central Pacific Railroad (now the Southern Pacific) installed a line of telephones through the Sierra Nevada Mountains, in California, to enable track-walkers to report to headquarters at Blue Canyon. Until 1879, one diaphragm served as transmitter and receiver, and there was no call bell. In that year the first set of telephones equipped with transmitters, receivers and call bells was used for train dispatching by the 9-mile narrow-gauge Boston, Revere Beach & Lynn Railroad. The first known use of the telephone for train dispatching in standard-gauge railway operations was on the Ravena-Schenectady branch of the New York, West Shore & Buffalo Railroad (now the New York Central) in January, 1882.

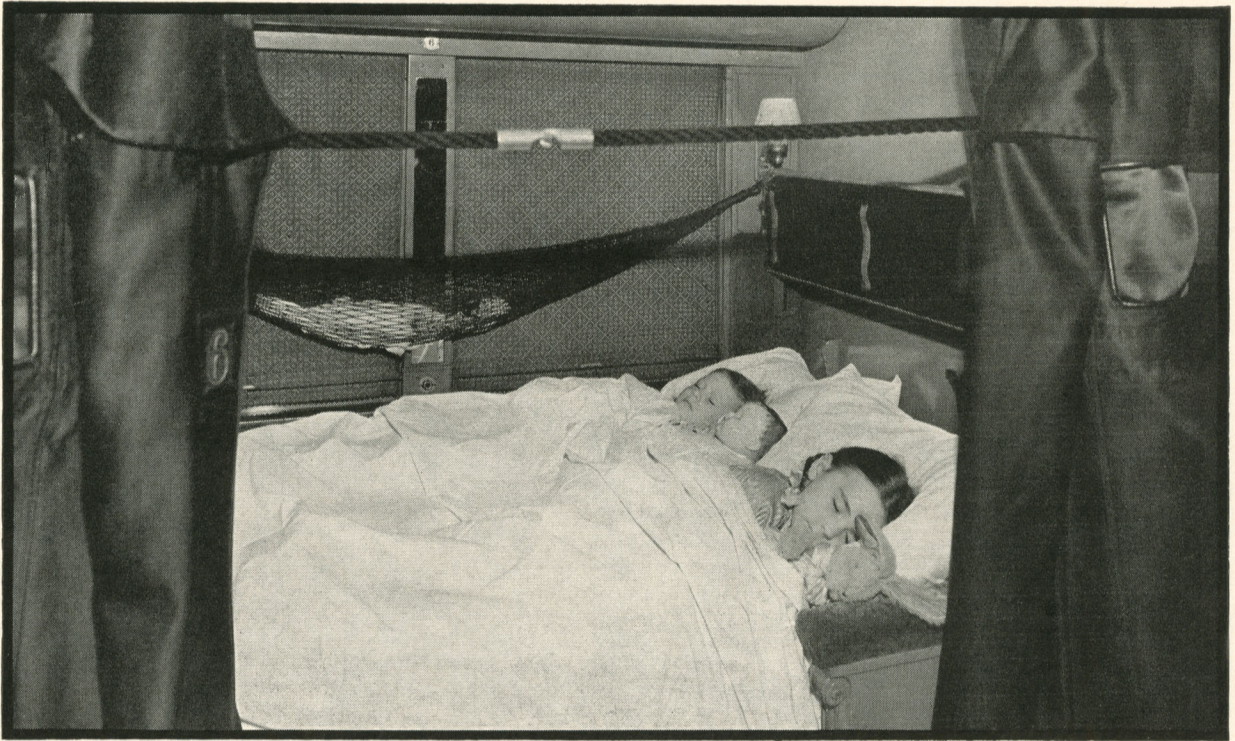
389. In what ten-year period was American railway expansion the greatest?

Railway expansion reached its peak in the 1880's. From 1880 to 1889, inclusive, 74,720 miles of new railway lines were opened. The largest number of miles completed in any year was 12,876 in 1887.

390. When was Standard Time adopted?

At the stroke of 12 o'clock noon, on November 18, 1883, more than fifty different "times" were abolished in the United States, and railway clocks and watches throughout the country were set to Standard Time, or four standards of time (Eastern, Central, Mountain, and Pacific, each one hour apart). Standard Time, which soon came into general use and was later adopted in other countries, was sponsored and put into effect by the General Time Convention of Railway Managers, which later became the American Railway Association and then the Association of American Railroads.

391. What was the origin of the "Stop,



Four little travelers fast asleep. A trip by train is always an adventure for children. When night-time comes, the soft, cozy Pullman beds carry the most restless youngsters quickly away to Slumberland.

Look and Listen" sign at railway grade crossings?

The first "Stop, Look and Listen" sign was drawn in 1884 by Thomas H. Gray, a shop employee of the Southern Pacific Railroad in San Francisco.

392. When did the vestibule come into use on American passenger cars?

The vestibule, consisting of elastic diaphragms on steel frames attached to the end of the car, was invented by George M. Pullman and patented in 1887. The earliest form of vestibule was the width of the doorway at the end of the car. In 1893 it was extended to the full width of the car. The first solid vestibule train was operated over the Illinois Central Railroad between Chicago and Otto, Illinois, with a distinguished passenger list, on April 11, 1887, and was placed in regular service on the Pennsylvania Railroad a few days later.

393. When were parlor cars introduced?

The first parlor car in the United States was the "Maritana", built by George M. Pullman and placed in operation in 1875. The chairs were

"richly upholstered", fitted with adjustable backs, and revolved on a swivel.

394. What railroad man was known as the "Empire Builder"?

This name was frequently applied to James J. Hill, under whose organizing and directing genius the Great Northern Railroad was built. The railroad opened up a vast and rich territory, and Hill devoted his great energies to developing the agricultural, mineral and forest resources of this far-flung "empire."

395. What locomotive won undying fame in the year of Chicago's World Columbian Exposition?

Running a mile in 32 seconds near Batavia, New York, on May 11, 1893, New York Central Locomotive No. "999" became the fastest creation of man up to that time. It held the world's speed record for more than twelve years.

396. What was the first railway electrification in the world?

The 3.6-mile electrification of the Baltimore Tunnel of the Baltimore & Ohio Railroad in 1895 was the world's first steam railroad electrification.

397. Who was Casey Jones?

The hero of the song "Casey Jones" was not a legendary character. He was a popular locomotive engineer employed in the 1890's on the Mississippi Division of the Illinois Central Railroad. His real name was John Luther Jones, but, to distinguish him from other men named Jones who worked on the railroad, his friends nicknamed him "Casey" because he hailed from Cayce, Kentucky. "Casey" Jones was a strapping young man, black-haired, gray-eyed, 6 feet 4 inches tall, one of four brothers and every one a crack locomotive engineer.

The famous ballad "Casey Jones" originated with Wallace Saunders, a negro engine wiper of Jackson, Tenn., who knew and loved the dashing engineer. Following the news of Casey's heroic death at the throttle of his engine at Vaughan, Miss., on April 30, 1900, Wallace, chanting as he worked, put line and line together until they were caught up and passed on by fellow workers to become one of the immortal folksongs of the rails.

398. What was the fastest train run ever recorded on the railways of the United States?

On June 12, 1905, the Pennsylvania Special, now the Broadway Limited, of the Pennsylvania Railroad, ran three miles near Ada, Ohio, in 85 seconds, or at the rate of 127.2 miles per hour.

399. What was "Death Valley Scotty's" famous train ride?

Walter Scott, better known as "Death Valley Scotty," a Californian of legendary riches, appeared at the office of the Santa Fe Railroad in Los Angeles, on July 8, 1905, and nonchalantly asked for a special train to take him to Chicago faster than any human being had ever made the trip before! Telegrams were hurriedly exchanged with headquarters. Scott was told that the 2,265-mile trip could be made in forty-six hours, but would cost a small fortune. "How much?" "Five thousand five hundred dollars," was the reply. Scott laid down the cash and closed the deal. At 1 p. m. on Sunday, July 9, Death Valley Scotty's "Coyote Special", consisting of a locomotive, a dining car and the Pullman car "Muskegon", pulled out of Los Angeles on its history-making run. Forty-four hours and fifty-four minutes later, the train came to a halt at Dearborn Street Station, Chicago, having beaten the previous record from Los Angeles to Chicago by 13 hours 2 minutes. The remarkable train ride of "Death Valley Scotty" caused a sensation and added a colorful chapter to railway history.

400. When did the Chicago, Milwaukee & St. Paul Railroad electrify its Western lines?

The Milwaukee Railroad completed the electrification of its line from Harlowton, Montana, to Avery, Idaho, 440 miles, on February 27, 1917, and its line from Othello to Tacoma, Washington, 207 miles, on March 5, 1920.

401. What road was known for years as the "Overseas Railway"?

From 1912 to 1935 the Florida East Coast Railway operated trains to and from Key West, over a succession of bridges and viaducts spanning the Florida Keys, and was known as the "Overseas Railway." In the latter year, following a disastrous hurricane which practically destroyed forty miles of the line on the Florida Keys, the railway company discontinued train service south of Florida City, thirty miles below Miami. The Florida East Coast Car Ferries which were formerly operated between Key West and Havana, have since been operated between Port Everglades and Havana.

402. How did passenger car lighting develop?

In the earliest days of railroading in America, passenger trains ran only in the daytime and did not require artificial lighting. As railroads developed and journeys became longer, night travel came into vogue, and, as was the custom in stage coaches, passengers brought their own candles. Later candles were provided by the railroads and protected from drafts by glass shields. In 1850 oil lamps were introduced and continued in use until superseded by gas, first employed about 1875. Oil lamps were generally used until the 1890's. Pintsch gas was introduced in 1890 and was extensively used until about 1909. Experiments in electric lighting began in the early 1880's. The first passenger train in America to be lighted entirely by electricity was operated in 1887. From these beginnings countless improvements have been made. Today's passenger train, generating its own electricity, is evenly and brilliantly lighted throughout.

403. What is the story of the air brake?

Various types of train brakes, all unsatisfactory, were employed during the early days of railroading. Prior to the straight air-brake invented in 1868 by George Westinghouse, more than 300 patents had been issued in the United States for railway brakes, only one of which was operated by air. The original Westinghouse brake patented



The spacious lounge-observation car of an ultra-modern streamliner dramatizes the strides which American railroads have made in recent years. Engineers, designers and interior decorators have all contributed to the modernization process. Air-conditioning and improved lighting are outstanding achievements.

April 13, 1869, was far from satisfactory. In 1870, the Master Car Builders' Association (now the Mechanical Division of the Association of American Railroads) began a series of air-brake tests which have continued to this day. In 1872, Westinghouse developed an automatic triple-valve air-brake which was a decided improvement over his previous patent. During the next several years numerous brakes were patented and tested, but none equaled in efficiency the Westinghouse automatic brake. By 1884 nearly all passenger cars in the United States were equipped with Westinghouse brakes, but the problem of developing an efficient brake for freight trains was more difficult. The superiority of the automatic air-brake over other types was demonstrated in the "Burlington Railroad Trials" in 1886. A year later Westinghouse's improved triple-valve automatic air-brake proved its superiority in freight service, and from that time forward its adoption was rapid. A railroad laboratory for air-brake tests was established at Altoona, Pa., in 1893; two years later it was transferred to Purdue University, where it is still in operation. Numerous improvements have resulted from these and other tests. Road tests during 1929 to 1931 led to the adoption of the modern "AB" air-brake, now widely used in freight service.

404. What was the development of automatic couplers?

In the early days, when cars were small and light and trains were short, a simple coupling known as the "link-and-pin" was used to hold locomotive and cars together in a train. Trainmen had to go between the cars to couple them; this resulted in many accidents; it was also slow. Many inventors tried to develop automatic couplers. As early as 1869 the Master Car Builders' Association, which later became the Mechanical Division of the Association of American Railroads, was active in this effort. Numerous tests were conducted, but in 1874 the M. C. B. A. had to report that all couplers which had been tested were failures. By 1885 more than 3,100 patents for couplers had been issued. An important series of tests beginning at Buffalo, N. Y., in September, 1885, led in 1887 to the approval by the M. C. B. A. of an automatic coupler invented by Janney. From then on the link-and-pin coupler was rapidly replaced by the Janney type automatic coupler. By 1890, 22,551 out of 26,820 passenger cars and 75,485 out of 918,491 freight cars had been equipped with automatic couplers. Ten years later, 33,927 out of 34,713 passenger cars and 1,376,051 out of

1,450,838 freight cars were equipped with automatic couplers. Laboratory and field tests were carried on continuously by the M. C. B. A., until it became a part of the Association of American Railroads in 1934. Tests have been continued since then by the Mechanical Division of the latter association. In 1918 the Type "D" automatic coupler, and in 1931 the Type "E" automatic coupler were adopted as standard. Although couplers have been greatly improved, the Janney principle is still used.

405. What was the fastest transcontinental run ever made?

In October, 1934, the Union Pacific Diesel-powered Streamliner "City of Portland" (M-10001) made an experimental run from Los Angeles to New York City, a distance of 3,248 miles, in 56 hours and 55 minutes, including stops en route. This is the fastest transcontinental passenger run ever made by a single train.

406. When were sleeping cars introduced in America?

The first sleeping car in the world was operated on the Cumberland Valley Railroad, (now a part of the Pennsylvania) between Harrisburg and Chambersburg, Pennsylvania, in the winter of 1836-37. It was a remodeled day-coach, and the berths or bunks were very crudely built. The car was divided into four compartments, each of which was equipped with three bunks, one above the other, all built along one side of the car. At one

end of the car was a wash basin. A wood or coal stove furnished the heat, and candles furnished the illumination.

407. When was the first Pullman sleeping car built and placed in service?

In 1858-59, George M. Pullman, a young Chicago contractor, converted two passenger coaches of the Chicago & Alton Railroad (No. 9 and 19) into sleeping cars at the railway company's shops in Bloomington, Illinois. The first of these cars — No. 9 — made its initial trip from Bloomington to Chicago on the night of September 1, 1859.

Mr. Pullman regarded the converted passenger coaches merely as experiments, and at Chicago in 1864 he began building the first real Pullman sleeping car. Up to that time the largest sum ever spent for a railway passenger coach was \$5,000. Fully equipped, Pullman's first sleeper, the "Pioneer," completed and placed in service in the spring of 1865, cost \$20,178.

408. To whom may one write for railway information?

Information about the railroads may be obtained by writing to the Association of American Railroads, Transportation Building, Washington, D. C.; to the Committee on Public Relations of the Eastern Railroads, 143 Liberty Street, New York City; to the Western Railways' Committee on Public Relations, 105 West Adams Street, Chicago, or to any railway company.

