Quiz

ON RAILROADS AND RAILROADING

450 Questions and Answers

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AMERICAN RAILROADS
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FOREWORD

This booklet provides in ready and convenient form the answers to many questions which are frequently asked about the American railroads, their history, their physical properties, their operations, their accomplishments, and the role which they play as transportation agencies, as fields of investment, as employers, as purchasers of the products of industry, and as taxpayers.

First issued in 1940, the popularity of the booklet has increased with the passing years, and several additional printings have been necessary to supply the demand. The booklet has proved especially useful as a source of ready reference for teachers, students, editors and writers, as well as railway employees. It enjoys a wide circulation among members of the armed forces and is used extensively as an authentic source book for "quiz" programs.

The present printing, identified as the sixth edition, contains the latest available information on a wide range of railway topics—all designed to help the reader become better acquainted with one of America's basic industries and the important place it occupies in the life of our nation.

Editors, speakers and others are at liberty to use any of the information contained herein without special permission.

Association of American Railroads.

Washington, D. C., April, 1947.

(Sixth Edition)

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RAILWAY MILEAGE

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

Prior to the war there were 788,672 miles of railroad in the world, distributed as follows:

	Miles	*Per Cent of Total*
North and South America	369,513	46.9
Europe	256,824	32.6
Asia	85,806	10.9
Africa	44,638	5.6
Australasia	31,891	4.0
Total	788,672	100.0

2. 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 29 per cent of the world's railway mileage.

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

There were 226,696 miles of railroad in the United States at the beginning of 1946.

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

The railway mileage of the United States is approximately 11 times that of Great Britain; 6 times that of France; 7 times that of Germany; 4½ times that of Russia; 5½ times that of India; 12 times that of Japan; 20 times that of Italy and 36 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.

RAILWAY PERFORMANCE

The way our railroads have transported munitions and men to all parts of the United States and to our sea coasts to be sent to our fighting fronts all over the world has earned the admiration and gratitude of the entire American people.—*The late President Franklin D. Roosevelt.*

5. 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.

6. How many miles of railway track are operated in the United States?

There were 403,812 miles of railway track operated in the United States at the beginning of 1946.

7. How many miles of railroad consist of two or more parallel tracks?

29,879 miles of railroad in the United States consisted of two or more parallel tracks at the beginning of 1946.

8. What is the railway mileage of each state?

At the beginning of 1946 the railway mileage by states was as follows:

Alabama	4,848	Nevada	1,827
Arizona	2,209	New Hampshire	951
Arkansas	4,354	New Jersey	2,044
California	7,383	New Mexico	2,526
Colorado	4,425	New York	7,629
Connecticut	875	North Carolina	4,534
District of Columbia	34	North Dakota	5,266
Delaware	295	Ohio	8,417
Florida	4,913	Oklahoma	5,991
Georgia	6,190	Oregon	3,310
Idaho	2,720	Pennsylvania	9,934
Illinois	11,760	Rhode Island	190
Indiana	6,711	South Carolina	3,329
Iowa	8,781	South Dakota	3,981
Kansas	8,445	Tennessee	3,494
Kentucky	3,578	Texas	15,685
Louisiana	4,151	Utah	1,880
Maine	1,827	Vermont	903
Maryland	1,324	Virginia	4,110
Massachusetts	1,723	Washington	5,227
Michigan	6,954	West Virginia	3,747
Minnesota	8,343	Wisconsin	6,395
Mississippi	3,805	Wyoming	1,924
Missouri	6,876		
Montana	5,057	Total	226,696
Nebraska	5,821		

9. What is the railway mileage of Alaska?

Alaska has 541 miles of railway line, as follows: The Alaska railroad, 506 miles in length, owned by the Federal Government; the Yakutat & Southern Railway, 15 miles in length; and the Pacific & Arctic Railway and Navigation Company, with 20 miles in Alaska. This road forms a part of the 111-mile White Pass & Yukon Route extending through British Columbia to Whitehorse, Yukon Territory.

10. What is the railway mileage of other United States possessions?

There are 399 miles of railroad on the island of Puerto Rico, 51 miles in the Canal Zone and the port cities of Panama and Colon, both just outside the Canal Zone, and 192 miles of railroad in the Hawaiian Islands. The Hawaiian railroads are used principally to serve the sugar and pineapple industries.

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

There are forty-four railway companies in this country which operate more than 1,000 miles of railroad each.

RAILWAY OPERATIONS

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

An estimate based on operations in 1943 put the number of passenger trains at 17,500 and the number of freight trains at 24,000 daily. On this basis, a passenger train starts on its run somewhere in the United States every 4.9 seconds, and a freight train starts on its run somewhere in the United States every 3.6 seconds, day and night, on the average.

13. What part of the total transportation service of the nation is performed by the railroads?

In 1945, the railroads of the United States handled about 69 per cent of all intercity commercial freight, 73 per cent of all intercity passenger traffic, 99 per cent of all intercity United States mail, and nearly all of the nation's commercial express traffic.

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

Revenues vary from year to year. In 1946 Class I railway operating revenues averaged $20,896,749 a day. In 1940, before this country entered the war, revenues averaged $11,739,347 a day.

15. Where does the average railroad dollar come from?

The average dollar earned by the Class I railroads in 1946 was derived from the following sources:

	Cents
Freight operations	75.9
Passenger operations	16.5
Express	1.2
United States Mails	1.7
All other sources	4.7
Total	100.0

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

The average dollar earned from operations of Class I railroads in 1946 was distributed as follows:

	Cents
Wages and salaries	52.3
Fuel, materials, supplies, etc.	26.5
Taxes	6.5
Depreciation	4.6
Equipment and joint rents	2.0
Net railway operating income (for interest, rents, dividends, etc.)	8.1
Total	100.0

17. 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 1946 was 83.4 per cent.

18. 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 1,000 miles or more.

The station platform presents a busy scene between the arrival and departure of the passenger train.

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

At the beginning of 1946, train orders were being transmitted by telephone on 147,197 miles of railroad, and by telegraph on 71,572 miles of railroad in this country.

20. What do the different locomotive whistles mean?

The standard code of operating rules, observed 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.

Release brakes, proceed — Two long.

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.

To another train: A second section is following — One long, two short.

Engineer's answer to most signals from other trains — Two short.

21. What do the various bell-cord signals mean?

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.

22. What are the standard hand, flag and lantern signals in 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.*

23. 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 other point located some distance away from the actual scene of train operations. Many remote control systems embrace operations within yards and terminals; many others apply to main-line operations extending over distances ranging from a few miles to 200 miles or more.

24. What is the present place of radio in train operations?

Since the early days of radio, railroads have carried on numerous experiments in the use of this medium of communication in connection with train operations. Studies and tests have been encouraged and sponsored by the Association of American Railroads and its predecessor organizations for more than a quarter of a century. These tests have included communication between fixed points, between moving trains and fixed points, between different parts of a train, and between two trains, including yard, terminal and main-line operations.

Many railroads have actively experimented with radio, testing its possible use in train operations. On the recommendation of a special committee of the Radio Technical Planning Board, of which the Association of American Railroads is a contributing sponsor, the Federal Communications Commission has allocated certain frequencies to the railroads, and it is anticipated that these will be used in connection with permanent radio installations.

25. 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 comparison weekly, semi-monthly or monthly and for inspection monthly, quarterly or semi-annually. The rule applies to certain classes of officers and employees in the operating, maintenance of way and mechanical departments, including train masters, assistant train masters, traveling engineers, train dispatchers, yardmasters, engine foremen, yardmen, switch tenders, enginemen, firemen, hostlers, conductors, flagmen, brakemen, train baggagemen, section foremen, bridge foremen, signal maintainers, telegraph linemen, and employees operating track cars. Train service employees and certain others must also compare their watches with designated standard clocks before commencing each day's work or each trip. When an employee does not have access to a standard clock he must obtain the correct time from the train dispatcher, or from either a conductor or an engineer who has done so.

PASSENGER SERVICE

26. 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.

27. How many passenger trains are designated by names?

There are about 725 passenger trains operated by the railroads of the United States which bear names, many of them world-famous.

28. 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 6, D. C.

29. Are there any passenger trains named for women?

There are two: the "Ann Rutledge," running between Chicago and St. Louis on the Alton Rail-

road, and "The Pocahontas," running between Norfolk and Cincinnati and Columbus on the Norfolk & Western Railway. 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.

30. How many mile-a-minute passenger train runs are there in the United States?

A survey of fast passenger train runs, published in *Railroad Magazine,* shows that in 1946 there were 1,963 passenger runs of a mile-a-minute or faster. These runs covered 108,629 route-miles, of which 98,827 were on a daily scheduled basis.

Of these runs, 602 were powered by steam locomotives, 559 were powered by electric locomotives, 800 were powered by Diesel-electric locomotives, and two were powered by gas-electric locomotives.

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

The longest non-stop run is made by the Union Pacific Diesel-powered streamliner "City of Los Angeles," between Salt Lake City, Utah, and Caliente, Nevada, a distance of 324.5 miles.

32. What are the fastest scheduled passenger train runs in the United States?

The fastest scheduled passenger train runs in the United States in 1946 were made by the following Diesel-powered streamline trains: "City of Milwaukee," of the Chicago & North Western Railway, from Kenosha, Wis., to Waukegan, Ill., 15.66 miles, at an average speed of 85.4 miles an hour; "Morning Zephyr," of the Burlington Lines, from East Dubuque, Ill., to Prairie du Chien, Wis., 54.6 miles, at an average speed of 84 miles an hour; "City of Denver," of the Union Pacific, from North Platte to Kearney, Neb., 95 miles, at an average speed of 82.6 miles an hour.

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

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

34. 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 in 1946 ranged from 1.7 to 2.2 cents a mile; generally speaking, one-way fares for travel in standard sleeping and parlor cars were 3.3 cents a mile, plus the cost of reserved space. To the foregoing fares should be added the applicable federal transportation tax. Fares for travel in 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 service in 1946 was 1.95 cents per passenger mile.

Four-unit 5,400-horsepower Diesel-electric freight locomotives of this type are capable of pulling trains of 100 or more cars at passenger-train speeds.

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

In 1946, the railroads carried passengers one mile for an average, as stated above, of 1.95 cents, compared with 1.84 cents in 1936, 2.94 cents in 1926, 2.04 cents in 1916, and 2.00 cents in 1906. Since 1936 the average revenue per passenger mile has been lower than in any previous period in railway history.

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

In 1926, the railroads carried the average passenger 34 miles for his dollar; in 1936, they carried him 54.3 miles; in 1946, they carried him 51.3 miles.

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

Due to dissimilarities in weight and passenger-carrying capacity of coaches and sleeping cars, there is a wide difference in the cost of providing and handling the two types of equipment. The average gross weight of a coach is 62 tons, while that of a sleeping car is 75 tons. The greater weight of a sleeping car, as compared with that of a coach, is due to the special equipment and facilities required for sleeping car accomodations. The average coach is designed to accommodate from two to three times as many passengers as a sleeping car.

38. 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 about $2.95 for a lower berth; $2.20 for an upper berth; $4.10 for a roomette for one; $4.65 for a duplex room for one; $5.25 for a bedroom for one or $5.80 for a bedroom for two; $7.30 for a drawing room for one, or $10.40 for a drawing room for two or more. To these costs should be added the applicable federal transportation tax.

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

The rates for berths in tourist sleeping cars are approximately two-thirds the rates for berths in a standard car. For instance, where the cost of a standard lower berth is $5.25, the cost of a tourist lower berth is $3.55, to which should be added the applicable federal transportation tax.

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

In 1945, the average journey of a Pullman passenger was 866 miles—about as far as from Washington, D. C., to St. Louis, Mo.

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

In 1945, cars operated by The Pullman Company traveled an average distance of 184,691 miles each—equal to more than fifty-eight trips between New York and San Francisco.

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

It is estimated that railway dining cars prepared and served about 70,000,000 meals in 1946, compared with 96,000,000 meals in 1945.

43. How can a passenger tell the speed of his train?

The following table gives the speed in miles per hour at various time intervals between mile posts:

Seconds per Mile	Miles per Hour	Seconds per Mile	Miles per Hour	Seconds per Mile	Miles per Hour	Seconds per Mile	Miles per Hour
90	40.0	76	47.4	62	58.1	48	75.0
89	40.4	75	48.0	61	59.0	47	76.6
88	40.9	74	48.6	60	60.0	46	78.3
87	41.4	73	49.3	59	61.0	45	80.0
86	41.9	72	50.0	58	62.1	44	81.8
85	42.4	71	50.7	57	63.2	43	83.7
84	42.9	70	51.4	56	64.3	42	85.7
83	43.4	69	52.2	55	65.5	41	87.8
82	43.9	68	52.9	54	66.7	40	90.0
81	44.4	67	53.7	53	67.9	39	92.3
80	45.0	66	54.5	52	69.2	38	94.7
79	45.6	65	55.4	51	70.6	37	97.3
78	46.2	64	56.3	50	72.0	36	100.0
77	46.8	63	57.1	49	73.5	35	102.9

To the docks and wharves of our seaport cities, railroads bring the surplus products of farms, mines, forests and factories for overseas destinations.

44. 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 name; (2) operating at an overall speed of 40 miles per hour or more for distances of over 200 miles; (3) operating for distances over 300 miles with scheduled stops at intervals averaging not less than 50 miles each.

45. 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 heavy.

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

In 1946, commuter passenger traffic represented 43.0 per cent of all passengers carried, 9.1 per cent of total passenger-miles of service, and 5.0 per cent of total passenger revenues of Class I railroads.

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

The average journey per passenger on the Class I railroads of this country in 1946 was 81.6 miles. For suburban and commuter travel in metropolitan districts the average trip was 17.2 miles. For other travel it was 130.2 miles.

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

In normal times, the railroads of the United States issue and distribute approximately 80,000,000 timetables annually to keep the traveling public informed concerning passenger train schedules. During the war years, with greatly increased travel, the number was much larger.

49. What is the Rail Travel Credit Plan?

Effective April 1, 1947, many railroads in the United States inaugurated a nation-wide "travel-and-charge-it" plan whereby business firms, as well as individuals, can purchase railway tickets, Pullman tickets and parlor car tickets on charge accounts. The plan calls for no deposit, no service charge, no red tape. All a firm or individual has to do is obtain a credit card, on satisfactory references, from any participating railroad and present the card at any ticket office of a participating railroad, sign a receipt, and get the ticket. The subscriber will be billed monthly for transportation purchased.

50. How many miles did Franklin D. Roosevelt travel by rail while he was President of the United States?

President Roosevelt's railway journeys totaled 243,827 miles during the twelve years and one month he was in office.

51. When was Coast-to-Coast sleeping car service established?

On March 31, 1946, several railway companies inaugurated through standard Pullman sleeping car service between New York, Philadelphia, Baltimore, Washington and other Eastern cities and San Francisco, Los Angeles and other cities in the Pacific Coast area, through the Chicago gateway. Many intermediate cities, including Galesburg, Omaha, Lincoln, Kansas City, Dodge City, Cheyenne, Denver, Colorado Springs, Albuquerque and Salt Lake City, are thus provided with through sleeper service to and from either Coast. Seventy-two sleeping cars, providing a variety of accommodations, including bedrooms, compartments, drawing rooms, sections and upper and lower berths, were used initially in this service, other cars being added as needed.

FIRST AND PRIMARY LINK

The Transportation Corps . . . knows . . . the burden which was imposed upon the nation's railroads, and the truly gigantic proportions of the effort which had to be exerted by them in the face of serious manpower shortages and inability to make any substantial additions to their plant or rolling stock. Despite every impediment and obstacle, the railroads stood up magnificently.

The railroads were the first and primary link in the chain of movement which carried our military strength against the enemy in all corners of the earth.—*Major General Edmond H. Leavey, Chief of Transportation, U. S. Army, 1946.*

HEAD-END TRAFFIC

52. 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.

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

A total of 7,467,000,000 pounds of mail was handled by the Post Office Department in the year ended June 30, 1945, of which 6,834,000,000 pounds, or 91.5 per cent, were handled by the railroads.

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

The Postmaster General reported that 22,036,-957,104 pieces of mail of all classes, including redistributions, were handled by the Railway Mail Service during the year ended June 30, 1945.

55. On what basis are the railroads paid for the transportation of United States mail?

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.

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

For transporting United States mails during the year ended June 30, 1945, the railroads re-

ceived 10.6 per cent 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 received an average of 1/7 of 1 cent per letter, or approximately 1/21 of the postal revenues collected by the government on this class of mail.

57. How many Federal Government employees are assigned to Railway Mail Service?

Personnel in the Railway Mail Service June 30, 1945, consisted of 20,796 officers and employees, of whom 19,705 were postal clerks.

58. Can letters and other first-class 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 en route, is equipped with two mail drops, one on either side, and letters and other first-class mail deposited in these drops receive prompt attention.

59. 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.

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

The Railway Express Agency, which provides the American people with express service, conducts business through 23,000 offices and uses in its operations more than 197,000 miles of railway lines, 13,000 miles of boat lines, 67,000 miles of air lines, and 17,000 miles of motor-carrier lines. The Express Agency owns and operates a fleet of around 18,000 motor trucks for the pick-up, transfer and delivery of express shipments. About eighty thousand persons are employed in the performance of its far-flung transportation service. The Agency handles about 600,000 separate shipments each day. Although its principal operations are in the United States, Railway Express Agency, through its connections, provides patrons with international service.

61. 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; pre-

cious 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. As a consequence, express service provides the public with a constantly available transportation medium equipped to meet almost every shipping need in office, factory, or private home.

62. 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.

63. 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 1841 when a shipper asked the express company to collect payment for the goods from the consignee at the time of delivery. Today, some 7,000,000 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.

MAGNIFICENT JOB

They (the railroads), aided by other forms of transportation, have completed . . . the most stupendous and magnificent job any transportation system has ever been or likely will ever be called upon to perform.—*Hon. J. M. Johnson, Director, Office of Defense Transportation.*

64. 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

65. 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.

66. What have been minimum and maximum weekly carloadings since World War I?

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 during the week ended October 29, 1926.

However, because of larger cars, heavier loadings, and longer hauls, the railroads performed approximately 31 per cent more freight service, measured by ton-miles, in October, 1946, than they performed in October, 1926, although in no week of October, 1946, did carloadings exceed 942,257.

67. 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. shipment, 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.

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

Class I railroad freight tonnage in 1945 was distributed as follows: Products of agriculture, 11.1 per cent of total carried; animals and products, 1.8 per cent; products of mines, 46.6 per cent; products of forests, 5.5 per cent; manufactures and miscellaneous, 33.5 per cent; L. C. L. freight, 1.5 per cent.

Solid comfort is built into the modern passenger coach. Soft, adjustable, reclining seats, air conditioning, fluorescent lighting and extra-wide windows all add to the pleasure of railway travel.

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

Bituminous coal ranks first in carloadings and tonnage. In 1945, the Class I railroads originated 7,002,135 carloads, consisting of 397,755,624 tons, of bituminous coal. Approximately one-eighth of the freight revenues of the American railroads is derived from bituminous coal traffic.

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

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

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

Ton-miles vary from year to year. In 1946, the Class I railroads of the United States performed approximately 592 billion ton-miles of service. This compares with 737 billion ton-miles in 1944—the all-time record—and 373 billion ton-miles in 1940. The greatest volume of traffic ever handled in a *peace-time* year prior to 1946 was 447 billion ton-miles in 1929.

72. How much railway freight service has been performed per capita in various years?

For every person in the United States the railroads in the years indicated performed the equivalent of transporting *a ton of freight* the following distances:

Year	*Miles*	*Year*	*Miles*
1867	285	1940	2,851
1880	645	1941	3,585
1890	1,211	1942	4,760
1900	1,863	1943	5,349
1910	2,773	1944	5,363
1920	3,914	1945	4,879
1930	3,142	1946	4,192

73. Has the average length of freight trains been increased in recent years?

The average freight train in 1946 consisted of 52 cars, compared with 44 cars in 1926.

74. What is the average load of a freight train?

The average freight train load in 1946 was 1,086 tons, compared with 774 tons in 1936.

75. How much do the railroads receive 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. In every year since 1932 the amount received by Class I railroads for freight transportation has averaged less than one cent per ton-mile. In 1946, the average revenue was approximately 9.78 mills per ton-mile, compared with 9.74 mills in 1936, 10.81 mills in 1926, and 12.75 mills in 1921, the high point following World War I. Thus, in 1946, the average level of freight revenue was approximately the same as in 1936, and 23 per cent lower than in 1921.

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

The carload varies, depending upon the commodity. Average tons per car for important commodities in 1945 were as follows:

All commodities	39.89
Bituminous coal	56.80
Petroleum	33.55
Wheat	51.13
Corn	48.70
Cotton in bales	17.57
Potatoes	20.70
Tobacco, leaf	12.84
Apples, fresh	19.61
Oranges and grapefruit	23.27
Bananas	12.25
Cattle and calves, single deck	11.76
Hogs, single deck	8.71
Hogs, double deck	12.39
Eggs	16.33
Butter	18.94
Lumber	33.55
Sugar	41.88

77. How much service does the average freight train perform in an hour?

In 1946, the average freight train performed 17,181 net ton-miles of service per hour. This compares with 14,028 net ton-miles in 1940, 10,836 net ton-miles in 1930, and 7,303 net ton-miles in 1920.

ALL ESSENTIAL

The American railroads, united as they are and working together, have done and are doing a magnificent job. We, as a nation, must continue to depend upon them for transportation that is all essential to . . . that full life which we as American citizens have a right to desire and to achieve.—President *Harry S. Truman, 1945.*

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

For each loaded freight car moved 100 miles in 1946, the railroads hauled an empty freight car 49 miles.

79. 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 1946, the average haul of all revenue freight on all railroads as a system was approximately 420 miles. This compares with 337 miles in 1936, 311 miles in 1926, 278 miles in 1916, and 241 miles in 1906.

80. What is a car-mile?

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

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

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 other railroads. When a car moves from one railroad to another, the agent at the point of interchange reports the fact to the Car Record Office 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.

82. How much have freight train speeds been increased?

The average speed of freight trains in the United States was 55 per cent faster in 1946 than in 1920. In 1946, the average distance traveled by trains for each 24-hour period was 384 miles, including all stops and delays en route, compared with 247 miles in 1920.

83. 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.

84. What progress has been made in the reduction of loss and damage to freight?

In 1920, when a joint loss and damage prevention bureau was set up by the railroads, the loss and damage to railway freight in the United States amounted to $120,000,000. In 1945, although the railroads handled 66 per cent more freight traffic than in 1920, loss and damage was 37 per cent less, or $75,972,000.

85. Have losses of freight through theft and robbery been reduced on the railroads?

Largely as a result of improvements in prevention work of railway police officers, organized for cooperation through the Protective Section of the Association of American Railroads, losses of freight resulting from thefts and robberies on the railroads of the United States were reduced from $12,000,000 in 1920 to $1,803,000 in 1945.

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

In 1945, the railroads of the United States transported 1,165,513 carloads of fresh 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.

87. 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.

Running straight as an arrow, this well-groomed double-track is one of the nation's busiest thoroughfares of commerce. Nearly 30,000 miles of railroad in the United States consist of two or more parallel tracks.

88. 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.

89. 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.

90. How many carloads of perishable foodstuffs are delivered by rail daily to New York City?

Approximately 1,660 carloads of perishable

foodstuffs—fruits, vegetables, meats, poultry, milk, butter, eggs, etc.—representing about 90 per cent of the city's requirements, are delivered to New York City daily.

91. 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.

92. 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.

93. 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 day the car is held. To encourage the prompt unloading and release of cars, especially when traffic is heavy and cars are scarce, the Interstate Commerce Commission may order an increase in demurrage charges. Such orders usually apply only to certain types of equipment. If a car is held for a specified period beyond the free period, the demurrage charge per day is sharply increased. In normal times, the penalty period usually starts five days after the free period.

94. 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. In 1946, the per diem rate was $1.15, 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 rate varying with the type of car.

THE MOST IMPORTANT BUSINESS

Hauling freight and passengers has been the most important business since governments began. . . . Fast transportation and instant communication across the whole continent made the United States of America a great nation.

* * *

The economic importance of the railroads cannot be overestimated. They constitute the nation's most important form of transportation.—*Harry S. Truman, 1939.*

95. 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 passengers and various classes and types of commodities between specific points, for switching cars and for performing various other services.

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

Before the war, the average revenues per ton-mile on the railroads of the United States and Canada were the lowest in the world with the single exception of Japan, where labor costs were far below those of this country. Latest available data on average revenues in several important countries are as follows:

Country	*Year Ended*	*Av. Revenue per ton-mile (cents)*
Great Britain[1]	Dec. 31, 1937	2.406
Denmark[3]	Mar. 31, 1939	2.231
Italy[3]	June 30, 1938	1.689
Australia[3]	June 30, 1938	2.128
Germany[3]	Dec. 31, 1938	2.309
France[2]	Dec. 31, 1937	1.953
Union of So. Africa[3]	Mar. 31, 1940	1.378
Norway[3]	June 30, 1939	2.678
Sweden[2]	Dec. 31, 1939	1.425
British India[2]	Mar. 31, 1938	1.003
Canada[2]	Dec. 31, 1943	0.954
United States[1]	Dec. 31, 1946	0.978
Japan[3]	Mar. 31, 1937	0.679

[1] All railroads, privately owned and operated.
[2] All railroads, both state and private lines.
[3] State operated railroads only.

97. 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 each of the thousands of different articles or commodities between the thousands of shipping points in the United States. Tariffs are greatly simplified by grouping many 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.

98. What are the three freight classification territories?

In the making of freight classifications, the United States is divided into three territories: the *Official Territory,* embracing the region east of Lake Michigan and the Illinois and Mississippi rivers and north of the Potomac and Ohio rivers; the *Western Territory,* embracing the region west of Lake Michigan and the Illinois and Mississippi rivers; the *Southern Territory,* embracing all of the region south of the Ohio and Potomac rivers and east of the Mississippi River.

99. 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.

100. 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.

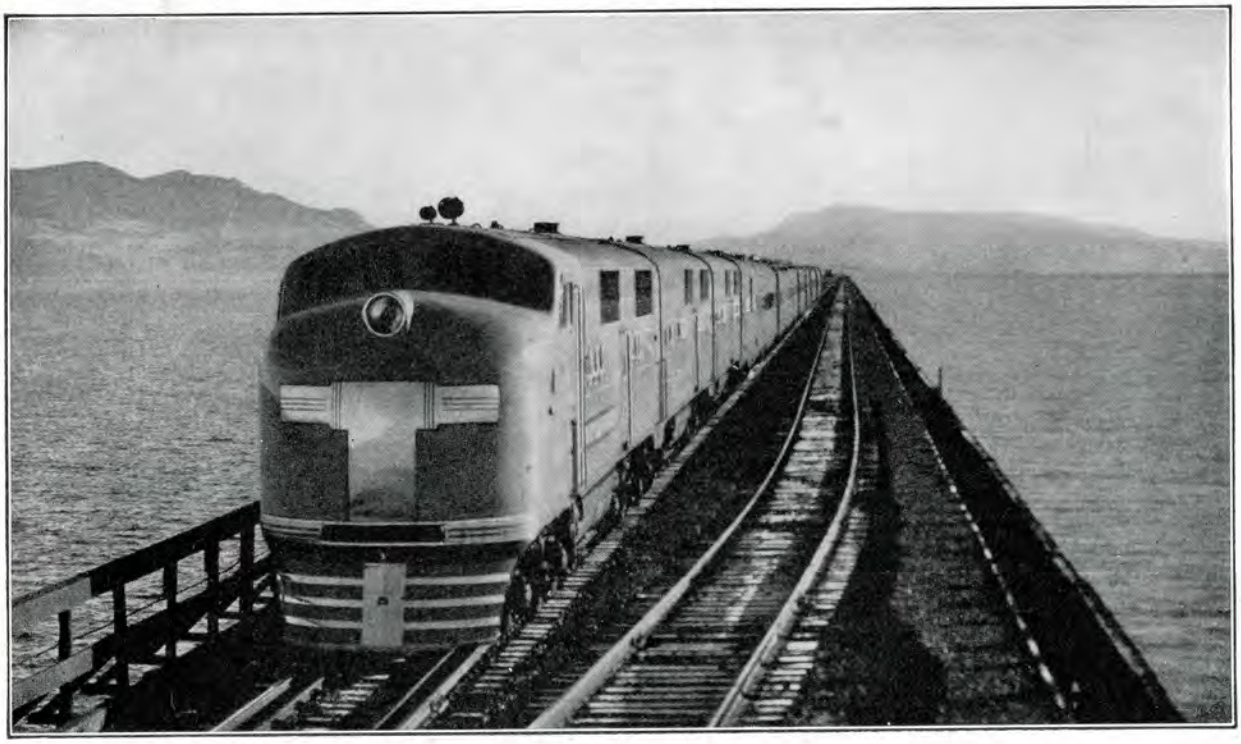
101. What were the heaviest freight shipments on record?

The heaviest freight shipment on record was a 488,200-pound steel oil refinery fractionating column, or "bubble" tower, shipped on two flat cars over the Frisco and Kansas City Southern railroads from St. Louis, Mo., to Smith's Bluff, Texas, in June 1938. In March, 1940, the Southern Pacific Lines transported a 430,000-pound "bubble" tower on three flat cars from Alhambra, Calif., to Baytown, Texas. In March, 1935, the Delaware and Hudson, Western Maryland and Pennsylvania railroads transported, on a single freight car, an electrical converter weighing 367,000 pounds from Schenectady, N. Y., to Washington, D. C.

102. 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.

The long run from the Great Lakes to the Pacific is made by this Diesel-powered, streamlined train in a day and two nights without changing engines or cars en route.



(less-than-carload) 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.

103. 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.

SAFETY

104. How safe is railway travel?

The railway passenger train provides the safest form of travel known to man. In the ten-year period 1937-1946, the railroads performed 516-, 000,000,000 passenger-miles of service and had 706 passenger fatalities in train accidents. For each passenger fatality during this period the railroads performed 732,000,000 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 100 miles each day, his expectancy of life—if it rested solely upon passenger train accidents—would be more than 20,000 years, or 21 times the age attained by Methuselah.

AN ESSENTIAL ELEMENT

The effective mobilization of our national economic resources depends on efficient transportation systems. Scientific research and production technology, national organization and political unity are all elements of our national strength. But without a well run transportation system our population and the products of our mines, fields, and factories cannot be brought together to transform our economic potential into actual power. Consequently, railroads have been and will continue to be an essential element of our position in the international arena. — *Brigadier General Donald Armstrong, Commandant, Army Industrial College.*

105. Have railroads been active in organized safety research and education?

The railroads were pioneers in this field. Organized safety education became a definite part of the railway program as far back as 1913. In 1921, the American Railway Association, predecessor of the Association of American Railroads, organized a Safety Section which has since carried forward three major activities—safety engineering directed toward safer plant equipment, efforts to secure nation-wide compliance with safety rules and practices, and education to cultivate a safety state of mind among those who work for and use the railroads. **The safety record of the railroads during the past thirty-three years has been greatly improved as a result of diligent and continuous efforts to promote safe conditions, safe methods, and safe thinking and action.**

106. Has railway safety been increased during this period?

From 1913 to 1946 the passenger casualty rate (fatalities and injuries of all kinds) on the American railroads was reduced from 45 to 9 per 100,000,000 passenger-miles. In the same period the casualty rate for railway employees on duty was reduced from 31 to 11 per 1,000,000 man-hours. When the casualty rate for employees is considered in relation to the volume of freight and passenger traffic moved on the railroads, the reduction is still more striking—the 1946 rate being about one-ninth what is was thirty-three years before, when organized safety work began on the railroads.

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

The number of persons who met death in railway-highway grade crossing accidents in the United States was reduced from 2,568 in 1928 to 1,853 in 1946. The number of fatalities per 10,000 motor vehicles registered was reduced in the same period from 0.88 to 0.57 in accidents where motor vehicles were involved.

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

Thirty-one out of every 100 automobile accidents at highway-railway crossings in 1946 were due to automobiles running into the sides of trains.

A Railway Express terminal is a beehive of activity. The Railway Express Agency maintains some 23,000 stations, large and small, in nearly as many cities and towns in the United States.

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

The average cost of eliminating highway grade crossings by the construction of underpasses or overhead bridges is in the neighborhood of $150,000 each. Since there are 226,153 grade crossings in the country, the total cost of separating all grade crossings would be in the neighborhood of $33,923,000,000. This is nearly $6,000,000,000 more than the total railway investment.

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

The number of trespassers fatally injured in 1946 totaled 1,635, compared with an all-time high of 5,612 in 1907.

RAILROADS IN THE LATE WAR

111. What part did railroads play in the war?

Railroads furnish the nation's basic transportation service. During the war, they were an important part of the assembly line of every war industry. Upon them fell the responsibility of moving millions of troops and vast quantities of war supplies and equipment. They transported materials for the construction of Army camps, air bases, supply depots, airdromes, shipyards and ships. They transported most of the raw and semi-processed materials used in munitions plants, airplane factories and other industries engaged in the war effort. They moved to all parts of the country and to the seaports immense quantities of implements and materials, as well as fuels and foodstuffs, to keep the nation's war machine operating at maximum efficiency.

112. What proportion of United States troops and military supplies moved by rail?

More than 97 per cent of all troops, more than 90 per cent of all Army equipment and supplies and about 90 per cent of all Navy equipment and supplies were transported by rail during the war.

113. How many special troop trains were operated by the railroads during the war?

From December, 1941, to August, 1945, inclusive, a total of 113,891 special troop trains were operated for distances ranging all the way up to 3,000 miles or more. In addition, the railroads handled an even greater number of special troop

cars in regular trains. The special train movements involved 303,003 coach trips, 511,385 sleeping car trips, 142,706 baggage and kitchen car trips, and 193,784 refrigerator, box, flat, and gondola car trips, not to mention an almost equal movement of empty cars to and from loading and unloading points.

114. How many troops did the railroads carry during the war?

From December 1, 1941, to the end of August, 1945, the railroads transported approximately 43,700,000 members of the United States Army, Navy, Marines, and Coast Guard in special troop or hospital trains, or in special cars attached to regular trains. The average monthly movement during this forty-five-month period was 971,110 troops. The foregoing figures do not include many millions of railway trips made by uniformed men and women traveling singly or in small groups in line of duty or on furlough, nor do they include servicemen and women returning to their homes after being discharged from the service.

115. How did the volume of troop movements by rail in the recent war compare with that of World War I?

In World War I, from May, 1917, to November 10, 1918, inclusive, a period of 18-1/3 months, the railroads transported 8,715,000 troops in special trains or in special cars attached to regular trains. The average monthly movement was 475,450 troops, or slightly less than one-half the average for World War II.

116. What percentage of total railway passenger traffic consisted of members of the Armed Forces?

It is estimated that approximately 40 per cent of the total passenger travel on the railroads in 1944 consisted of Army and Navy personnel traveling under orders or on furlough. A substantial part of the civilian travel consisted of members of the families of servicemen and women.

117. What percentages of all Pullman sleeping cars and railway coaches were engaged in the movement of troops?

From 50 to 67 per cent of all Pullman cars and from 33 to 50 per cent of all coaches were used exclusively for troop movements during most of the time this country was at war.

118. What percentage of all troop movements was in sleeping cars?

About 57 per cent of all organized troop movements in the United States was handled in sleeping cars in 1944.

119. What was the volume of Pullman travel during 1944, the peak year of World War II?

Pullman cars performed 28,267,000,000 revenue passenger-miles of service, military and civilian, in 1944—the greatest volume in eighty years of Pullman history. This was about double the peacetime record traffic of 14,407,000,000 passenger-miles in 1926. The 1944 Pullman traffic included trips up to 3,000 miles or more of 8,360,000 members of the military services in special trains or in special cars attached to regular trains.

120. How many railway trips did the average serviceman make while in this country?

The average serviceman made about five railway trips in line of duty before going overseas. From two to five trips were made between his arrival from overseas and his discharge from military service.

121. What was the average railway trip of a member of the Armed Forces?

The average railway trip of a serviceman in special troop trains was 1,114 miles in World War II, compared with 852 miles in World War I.

122. How much railway equipment is required to move an Army division?

The movement of an infantry division of 15,000 men requires 283 passenger-train cars, including sleeping cars, dining and kitchen cars, baggage cars, and a minimum of twenty locomotives. If the movement is for long distances, several times the above number of locomotives are required.

123. How much materiel was delivered to the seaports and shipped overseas for every soldier?

For every soldier sent overseas in World War II, the Army initially sent 6 tons of equipment and supplies. An additional ton of supplies was sent overseas each month for his maintenance.

124. Was railway passenger travel safer in World War II than in World War I?

Passenger travel was more than four times safer in World War II. In 1917-1918 there was one passenger fatality for every 107,917,000 passenger-miles of service performed. From January 1, 1942, to December 31, 1945, there was only one passenger fatality for every 460,000,000 passenger-miles of service performed.

125. How was Army freight moved within the United States during the War?

In the 3-year period from August, 1942, to August, 1945, approximately 294,000,000 tons of Army supplies were moved by railroad, 26,000,000 tons were moved by motor carriers, and 4,000,000 tons were moved by inland waterways.

126. What special recognition was given the railroads for outstanding safety performance in the war period?

On June 28, 1944, the American Museum of Safety presented the railroads of the United States, through the Association of American Railroads, a special Harriman Safety Award for their 1943 performance, pointing out that the railroads "have met all their obligations to the public and have established a notable record for safety in the face of conditions of unprecedented difficulty."

127. How many railway employees entered military service during World War II?

A total of 351,451 employees of the railroads, The Pullman Company and the Railway Express Agency entered military service up to July 15, 1945—enough to form twenty-three Army divisions of 15,000 men each.

128. In what foreign countries were American railroad units operated?

Military railway battalions of the Army Transportation Corps, composed 85 per cent of American railroad men, operated railroads during the war in England, French Morocco, Algeria, Tunisia, Sicily, Italy, France, Belgium, Luxembourg, Germany, Iran, India, Burma, New Caledonia, the Philippines and the Yukon District of Canada. They also operated railroads in Alaska. Following the war they operated railroads in Japan and Korea.

129. How were the services of the Railway Express Agency used in the war?

Throughout the war, the facilities of the Railway Express Agency were available to the Government, on call, twenty-four hours a day. A special office in Washington handled Government express exclusively, and some seven hundred experienced Railway Express representatives were assigned to military camps, naval bases and war plants, to cooperate with the Army and Navy and to facilitate the movement of express shipments. The traffic included airplane, tank and motor truck parts, guns, ammunition, and thousands of other items. Large numbers and many kinds of delicate instruments were forwarded by express to meet sailing dates or production schedules. Among the many wartime services of the Railway Express Agency was that of carrying blood from Red Cross donor centers to processing laboratories. From the laboratories the dry plasma and whole blood were dispatched to Army and Navy hospitals far and near.

Out of 200,289,443 separate shipments handled by the Railway Express Agency in 1944, approximately 140,000,000, or 70 per cent of the total, were classed as war traffic.

One of hundreds of huge freight classification yards where cars are assembled into trains.

130. What percentage of the increased traffic resulting from the war moved by rail?

From 1941 to 1944, total freight traffic of all agencies of commercial transportation increased from 748 to 1,062 billion ton-miles and total intercity passenger traffic of all agencies of commercial transportation increased from 47 to 135 billion passenger-miles. Of the total increase in commercial freight traffic during this period, 83 per cent was handled by the railroads, and of the total increase in intercity passenger traffic, 77 per cent was handled by the railroads.

131. How did railway operations in World War II compare with those of World War I?

The following figures for Class I railroads in 1918, the peak year of the First World War, and 1944, the peak year of the Second World War, help tell the story:

	1918	*1944*	*% Incr. or Decr.*	
Miles of track	372,437	383,889	I.	3
Locomotives	63,889	43,612	D.	32
Freight-train cars	2,325,673	1,794,135	D.	23
Passenger-train cars	53,941	37,837	D.	30
Employees	1,841,575	1,414,776	D.	23
Ton-miles (billions)	405.4	737.2	I.	82
Ton-miles per capita	3,946	5,363	I.	36
Passenger-miles (billions)	42.7	95.5	I.	124
Passenger-miles per capita	412	692	I.	68
Net ton-miles—				
Per freight car day	518	1,113	I.	115
Per freight train hour	7,303*	17,623	I.	141
Avg. frt. train load (tons)	681	1,139	I.	67
Avg. haul per ton (miles)	297	473	I.	59
Avg. miles per car day	26.1	51.9	I.	99
Average revenue—				
Per ton-mile (cent)	0.849	0.949	I.	12
Per pass.-mile (cents)	2.414	1.874	D.	22
Taxes per day	$ 611,439	$5,043,834	I.	725

* 1920. I.—Increase. D.—Decrease.

132. Railway performance in World War II has frequently been called remarkable. Why?

With one-fourth fewer employees, one-third fewer locomotives, one-fourth fewer freight cars and one-third fewer passenger cars than they had in World War I, the railroads of the United States, each month, on the average, moved about twice as many troops, performed more than twice as many passenger-miles of service, moved more than five times as much Army freight and express, twenty times as much Navy freight for overseas destinations, and nearly double as many ton-miles of freight of all kinds as they moved in the last war—and they performed this unprecedented task without the prolonged delays and the congestion of the First World War.

133. What is another remarkable thing about railway operations in the recent war?

Despite the fact that wages and prices advanced and taxes soared to unprecedented heights, freight rates generally remained at pre-war levels and passenger fares advanced but slightly. In fact, the average revenue per ton-mile at the end of the war was about 1.5 per cent lower than in 1939, and the average revenue per passenger-mile was less than 2 per cent higher.

134. How were freight rates and passenger fares affected by the First World War?

Freight rates and passenger fares increased sharply during the period of World War I. From 1916, the last full year prior to government control, until 1921, the year following the return of the railroads to their owners, the average revenue per passenger-mile increased 51 per cent and the average revenue per ton-mile increased 80 per cent.

135. How did private operation of railroads in the Second World War compare with government operation in the First World War?

The Government, the taxpayers and the general public fared much better under private operation in World War II than they fared under Government operation in World War I.

Federal operation during and following the First World War (from January 1, 1918, to March 1, 1920) cost the American taxpayers $1,616,000,000, or an average of about $2,000,000 a day, notwithstanding repeated increases in freight rates and passenger fares. In World War II, the railroads were privately operated at no loss whatever to the taxpayers or the Federal Government.

In the three-year period 1918-1920, the railroads paid the Federal Government an average of $133,000 a day in taxes. In the four-year period 1942-1945, they paid an average of $2,533,000 a day in Federal income taxes.

When the losses under Federal control in the First World War and taxes paid in both wars are taken into account, it is found that the Federal

Many types of cars are seen in the railway freight yard, where trains are assembled and started on their runs.

Government was about $4,400,000 a day better off under private operation in World War II than under Government operation in World War I. Moreover, freight rates remained at approximately pre-war levels throughout World War II, and passenger fares advanced but slightly.

136. What are a few accomplishments of the railroads since World War I?

Since World War I, the railroads have—

1. About doubled the transportation performance of the average freight car per day.

2. Increased the net load of freight in the average train from less than 700 tons to 1,139 tons.

3. Increased the average speed of freight trains by 52 per cent.

4. Increased the transportation output of the average train from approximately 7,000 to 17,623 net ton-miles per hour.

5. Abolished the old "bug-a-boo" of commerce—prolonged and general "car shortage," barring the temporary effect of wartime restrictions on equipment supply and industrial reconversion.

6. Made railway travel more than four times safer.

7. Cut the ratio of loss and damage to freight revenues to one-fourth of what it was in 1920.

8. Reduced the price of railway service while improving the quality and safety of the service.

137. How was it possible for the railroads to achieve these results?

Expenditures of more than $12,000,000,000 for improvements during the 1920's and 1930's greatly increased plant capacity and operating efficiency. For instance, the tractive force of the average locomotive was 52 per cent greater in World War II than in World War I; the capacity of the average freight car was 22 per cent greater. Cars in the late war were loaded much heavier; trains moved faster. Consequently, the hourly service performance of the average freight train was about 150 per cent greater than it was in World War I. Even more significant is the fact that in recent years there has been much greater cooperation among shippers, railroads, and government agencies than existed twenty-odd years ago.

138. How much have the railroads spent per day since World War I for additions and improvements?

In the 25-year period 1921-1945 the Class I railroads invested an average of $1,440,469 a day in additions and improvements. Of this sum, $715,421 was for additions and improvements to locomotives, cars, and other rolling stock, and $725,048 was for additions and improvements to roadway, signals, bridges, stations, shops, and other fixed property.

139. How did the Association of American Railroads facilitate the movement of war traffic?

The Car Service Division of the Association of American Railroads, with nation-wide supervision over the distribution and utilization of freight and passenger equipment, was made up of eight sections, under the direction of a chairman. During the war each of these sections was charged with a specific activity in connection with war traffic, as follows:

1. *Railroad Relations Section:* Coordinated the various activities of the Car Service Division and maintained close working contacts among government agencies, shippers and railroads.

2. *Military Transportation Section:* Supervised and coordinated the movement of military supplies, troops, war prisoners and casualties in accordance with the directions of the armed services. This section had offices in the Pentagon Building, Washington, D. C. Its personnel throughout the war was on a three-shift, 24-hour schedule.

3. *Port Traffic Section:* With representatives in all principal Atlantic, Pacific and Gulf ports, this section gave exclusive attention to the problems of keeping rail traffic moving to seaports in such volume as would meet the schedules of water shipping, thus avoiding congestion, and keeping freight cars moving promptly in and out of the ports.

4. *Closed Car Section:* Supervised and directed the distribution of box cars and stock cars to avoid car shortages, reduce delays and obtain the highest degree of efficiency in the use of such cars.

5. *Open Car Section:* Performed similar functions in connection with the use of flat cars, gondolas and hopper cars.

6. *Refrigerator Car Section:* Performed similar functions in the distribution and use of refrigerator cars.

7. *Tank Car Section:* Performed similar functions in connection with the movement of petroleum and other commodities loaded in tank cars and supervised organized trainload movements of such products into shortage areas.

8. *Passenger Car Section:* Supervised the nation-wide distribution of and cooperated to obtain the maximum use of passenger-train cars; aided in supplying such equipment for military movements.

140. What is the Office of Defense Transportation, and what are its functions?

The Office of Defense Transportation is a war agency created by the President of the United States on December 18, 1941—eleven days after Pearl Harbor. Its Director was empowered to coordinate and direct traffic movements by railway, highway, inland waterway, airway, pipe lines and other domestic transportation, and to take necessary steps to conserve and obtain maximum utilization of the nation's transport facilities and services in furtherance of the war effort. To this end, General Orders and Special Orders regulating the loading and use of freight cars and the movement and routing of tonnage by rail, highway and other agencies were issued or modified by the Office of Defense Transportation during and following the war to meet conditions that developed from time to time.

During the war, the O.D.T. functioned through the following offices, divisions and departments: Office of General Counsel, Division of Transport Personnel, Division of Information, Division of Storage, Division of Rates, Division of Materials and Equipment, Insular Transport Division, Railway Transport Department, Highway Transport Department, Waterway Transport Department, and Liquid Transport Department.

141. To what extent did railroad traffic increase (1) from the low point of the depression, and (2) from the entry of the United States into the war?

The question is answered by the following comparisons of traffic in 1932, the depth of the depression, 1940, the last full pre-war year, and 1944, the peak year of World War II:

Year	*Revenue Ton-Miles*	*Revenue Passenger-Miles*
1932 (millions)	233,977	16,971
1940 (millions)	373,253	23,762
1944 (millions)	737,246	95,549
Increase 1944 over 1940 (%)	97.5	302.1
Increase 1944 over 1932 (%)	215.1	463.0

142. How did deliveries of freight at the seaports compare with those of the pre-war period?

Railway unloadings of export and coastal freight

at the seaports of the United States from 1939 to 1946, inclusive, were as follows:

Year	Average Daily Unloadings (Carloads)	Per Cent increase Over 1939
1939	1,671	——
1940	2,235	33.8
1941	2,413	44.4
1942	2,615	56.5
1943	4,005	139.7
1944	5,226	212.7
1945	5,172	209.5
1946	2,735	63.7

143. How many locomotives and freight cars were sent overseas during World War II?

Approximately 5,800 locomotives and 84,000 freight cars, built in the United States, were sent overseas for military uses during the war.

144. How did the performance per freight car compare in the two wars?

In 1944, each serviceable freight car moved 51.9 miles a day, on the average, compared with 26.1 miles in 1918. In 1944, the average freight car carried 32.7 tons of freight for each mile traveled, compared with 29.2 tons in 1918. In 1944, the average serviceable freight car performed 1,113 net ton-miles of service per day, whereas in 1918 the average freight car performed 518 net ton-miles per day.

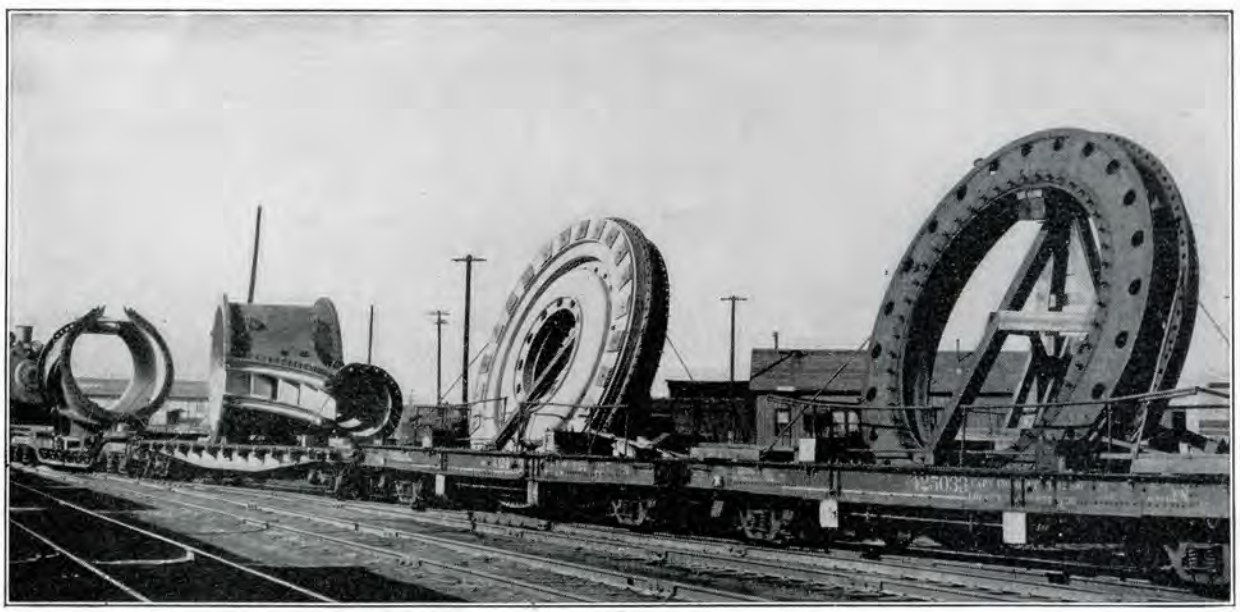
145. How many freight cars would have been required to handle the 1944 traffic if performance per car had been no greater than in World War I?

If each freight car in 1944 had performed the same number of ton-miles of service as each car performed in 1918, the peak year of the First World War, 4,143,000 freight cars would have been required to handle the 1944 traffic. Because of technological improvements, increased efficiency, greater cooperation between shippers and railroads, and other factors, the 1944 traffic was handled with only 1,975,000 serviceable cars. This includes privately owned as well as railway owned cars.

146. What was the railroad safety record in the transportation of explosives during the war?

During World War II the railroads handled 50,000,000 tons of high explosives for military purposes, as well as great quantities of poison gas, without a single fatality. In addition, the railroads handled large quantities of commercial explosives

Nothing is too small or too big for the railroads to handle. The transportation of Army tanks and guns, steel bridge girders, steam engines, generators, boilers, refinery towers, printing presses, paper making machines, foundry and machine shop equipment, power plant parts, huge timbers, and other heavy objects, are all a part of the day's work.



throughout the war period without the loss of a life.

147. How was oil traffic affected by the war?

Prior to 1940, nearly all oil moved from the producing regions to the Atlantic seaboard area by pipe lines and tanker vessels. The railroads handled practically no oil or gasoline for long distances. War conditions, including German submarine warfare, caused the discontinuance of tanker vessel operations between the Gulf Coast ports and Atlantic seaports. Railroads were called upon to take over the job. Every available locomotive and tank car was turned to the task. From a mere trickle of oil in the summer of 1941, amounting to 11,250 barrels daily, rail deliveries to the Eastern area mounted until they exceeded 1,000,000 barrels a day. In 1944, a substantial part of the tank car movement was diverted to the Pacific Coast ports. Total deliveries during 1944 to all points East and West averaged 800,000 barrels a day. From July, 1941, to August, 1945—a period of fifty months—the railroads delivered approximately 874,356,000 barrels of petroleum and petroleum products to the Atlantic Seaboard territory.

148. How much oil can be hauled in a tank car train?

The quantity depends, of course, upon the length of the train and the capacity of the cars making up the train. Oil trains average about 60 tank cars each, and the capacity of the average tank car is about 210 barrels. Thus, an average oil train carries about 12,600 barrels, or 529,200 gallons, of oil.

149. How many trains were required to handle the wartime movement of oil for the Atlantic and Pacific Coast regions?

Each day during 1943 and 1944 and the first half of 1945, around 75 oil trains of about 60 tank cars each were loaded and dispatched from the producing or loading points, and from 400 to 500 trains laden with oil were speeding toward their destinations. In the same 24-hour period about 75 trains were unloaded at destinations, and 400 or 500 trains of empty tank cars were hurrying back to loading points. Altogether, some 70,000 tank cars and 1,400 locomotives were engaged in these long-distance oil movements—not to mention thousands of other tank cars engaged in short-haul oil movements in various parts of the country.

150. What important shifts of tonnage from water routes to railroads occurred during the war, other than petroleum?

Early in the war, owing to the submarine menace and the transfer of steamships to other services, much tonnage which formerly moved to North Atlantic, Pacific and Canadian points by coastwise and intercoastal steamships began moving all the way or part way by rail. Among the important tonnage movements taken over in whole or in part by the railroads were sugar from Cuba, bauxite and other ores from South America, phosphate rock from Florida, sulphur from Texas, and lumber from the South and West. Large quantities of coal which formerly moved by rail and water moved all-rail. The need for every available vessel on the Great Lakes for the movement of iron ore caused much bulk traffic, including coal and grain, to be diverted to the railroads.

151. How did the wartime closing of the Panama Canal affect transcontinental railway traffic?

Prior to the war approximately 27,000,000 tons of commerce moved annually through the Panama Canal, much of which was between points on the Atlantic and Pacific Coasts. After Pearl Harbor, commercial shipments stopped altogether, and nearly all traffic between the two coastal areas was shifted to the railroads.

152. Did the railroads add many new locomotives and cars during the war?

Owing to the scarcity of strategic war materials and the shortage of manpower, neither the railroads nor the manufacturers were permitted to build passenger cars for public use during the war, notwithstanding the fact that passenger travel increased more than four-fold. In 1943-1944, 1,200 special troop sleeping cars and 400 special troop kitchen cars were built and placed in service. After V-J Day, 1,200 additional troop sleeping cars and 400 additional troop kitchen cars, ordered during the war, were completed and placed in service. From December 1, 1941, to the end of August, 1945, the Class I railroads installed 2,907 new locomotives and 167,911 new freight cars. However, owing to retirements of old and worn-out units, the net increase in the railroad fleet during that period was only 1,310 locomotives and 77,453 freight cars.

A trainload of oil, pulled by a 4-unit Diesel-electric freight locomotive, speeds through the canyon.

153. How much iron and steel scrap did the railroads contribute to the war effort?

Railroads are the country's leading sources of iron and steel scrap. During 1939-44, they supplied iron and steel mills with 20,537,000 tons of scrap materials, mostly steel. This represented one-sixth of all commercial scrap material consumed during that period.

154. Did railway shops engage in the production of war materials?

Many railroads employed their skilled shop forces and their shop machinery and facilities in the manufacture or processing of parts and materials for ship building companies, construction companies, ordnance works, chemical or ammunition plants and other industries engaged in the manufacture of war materials. Railway shops made parts for mine-sweepers, patrol boats, sub-chasers, and merchant vessels. They produced parts for naval gun mounts, ship winches, and airplane engine mountings, and they aided in the construction and conditioning of railway equipment for military operations.

PERSONNEL

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

The number of persons required to operate the railroads depends largely upon the volume of traffic handled. Before the war the Class I railroads of the United States employed an average of about 1,000,000 persons. In 1944, the peak year of the war, they employed an average of 1,415,000. In 1946, handling the largest volume of traffic for any peacetime year in their history, the railroads employed an average of 1,359,000 persons.

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

The aggregate payroll of the Class I railroads of the United States amounted to $4,200,000,000 in 1946. This compares with a payroll of $3,858,000,000 in 1944 and $1,964,000,000 in 1940.

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

About 55.1 cents out of every dollar of operating revenue taken in by the Class I railroads in 1946 were paid out in wages.

158. What has been the trend of railway wages during the last thirty years?

The following table shows railway wages since 1916, just prior to World War I:

Year	*Average Compensation Class I Railroads Including Overtime* Per Hour (Cents)	Per Week	Per Year
1916	28.3	$17.05	$ 891.61
1920	67.6	34.81	1,820.12
1925	63.1	31.45	1,639.96
1930	67.8	32.88	1,714.43
1935	68.6	31.70	1,653.18
1940	75.1	36.58	1,912.77
1941	78.0	39.23	2,045.47
1942	85.2	44.25	2,307.47
1943	92.3	49.83	2,598.25
1944	96.5	52.15	2,726.90
1945	97.0	52.18	2,720.67
1946*	115.7	59.36	3,090.00

*Estimated. Includes award of 16 cents per hour effective January 1, 1946, and 2.5 cents awarded May 22, 1946.

159. What has been the effect of recent changes in wage rates upon railroad payrolls?

The 1946 railroad payroll, estimated at $4,200,000,000, is $1,451,000,000 more than it would have been with wages at 1940 levels. The annual cost to the railroads of the three wage changes since 1940 has been approximately as follows:

Wage increases in 1941.....$382,000,000
Wage increases in 1943..... 354,000,000
Wage increases in 1946..... 715,000,000

160. How many women are employed by the railroads?

In October, 1946, 75,860 women were employed in various capacities, classified as follows: Executives, officials, staff assistants, professional and supervisory clerks, 720; clerks, stenographers, and other office and general employees, 58,176; track and extra gang laborers and other maintenance of way employees, 225; shop, repair yard and storehouse employees, 8,277; station agents, telegraphers, telephoners and towermen, baggage attendants and restaurant and dining car employees, 6,711; train service employees, 80; other transportation employees, 1,671.

Women comprised about 6 per cent of all railway employees in October, 1946.

161. How are railway train service employees paid?

They are paid for miles run. If it takes longer than a certain time to run the miles so paid for, they are paid for each hour over that time in addition to the mileage pay.

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 is over 100 miles, the employee receives additional compensation of 1/100th of his basic day's pay for each mile run over 100. If time of an employee in making any given trip exceeds the time that would be required to make such trip at the basic speed of 12½ miles per hour, such excess time is paid for at 1½ times the regular rate.

In yard service, employees are paid a daily rate for work of 8 hours or less.

In through passenger train service, a basic day's work for pay purposes for enginemen 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.

162. What percentage of all railway employees are in train service?

Enginemen, motormen, firemen, conductors, trainmen and other persons employed directly in the operation of trains comprise about 21 per cent of all railway employees. For every person actually engaged in train service, about four persons are required to keep railway track, bridges, equipment and other facilities in repair and to perform other duties in connection with railway operations.

163. 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 engineer in 1930; Green in 1932. Both have worked for the railroad continuously since then. Hence, Brown has two years' seniority over Green. Therefore, if reduction of force were necessary, Green

would be the first to be laid off. If both should be laid off for lack of work, Brown would be entitled to recall before Green. With greater seniority, Brown also would have the right, if he desired, to preference over Green in the assignment of locomotive runs.

164. 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.

165. 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.

166. 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 of Class I railroads numbered 265,685 in 1946. Shop employees and others engaged in keeping locomotives, cars and other movable equipment in repair and in handling railway supplies numbered 371,150 in 1946.

167. 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 en route. 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 fifty to seventy persons are employed on such a run.

168. What is the average age of railway employees?

The average age of railway employees in 1942, according to the Railroad Retirement Board, was 38.5 years.

169. 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.

170. 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.

171. What percentage of all railway employees is represented by labor unions?

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

172. How many unions represent railway employees?

There are twenty-one so-called "standard" railway labor unions or brotherhoods in this country.

The information clerk answers all sorts of questions about train arrivals, departures and connections, as well as passenger fares. About 75,000 women are employed by the railroads.

Nineteen of them belong to the Railway Labor Executives' Association.

173. What machinery exists for the settlement of disputes between railroads and their employees?

Under the Railway Labor Act, disputes involving the interpretation and application of existing agreements covering wages and working conditions may be referred by either party to the proper division of the National Railroad Adjustment Board, created by that Act.

Disputes involving requested changes in agreements covering wages and working conditions must first be handled in conferences between the parties. If no settlement is reached, they may be referred by either party to the National Mediation Board, created by the Railway Labor Act. If the services of the Mediation Board do not bring about a settlement, that Board must proffer arbitration. If the parties accept arbitration, an arbitration board is created to hear and decide the dispute. If either party does not accept arbitration, and if interruption of service is threatened, the Mediation Board so notifies the President of the United States, and he may appoint an emergency board to investigate and report. The findings and recommendations of such an emergency board do not constitute a binding award, but are subject to acceptance by the parties. The emergency board is allowed 30 days to report, although the time may be extended by agreement. Until 30 days after the emergency board makes its report, neither party may make any change in conditions out of which the dispute arose, except by agreement.

Under Executive Order 9172, issued May 21, 1942, if the employee representatives involved in a dispute with a railroad inform the chairman of the National Railway Labor Panel (created by that Order) that they do not desire to circulate a strike ballot, the chairman of the Panel may appoint an emergency board to investigate and report, in which case the provisions of the Railway Labor Act apply the same as they do to an emergency board created by the President of the United States.

174. 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 provisions of the Railroad Retirement Act, approved June 24, 1937, and subsequently amended, 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, and subsequently amended.

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

The Board maintains headquarters at 844 North Rush Street, Chicago, Ill., and regional offices in New York, Cleveland, Chicago, Atlanta, Minneapolis, Kansas City, Dallas, Denver and San Francisco. In addition, district managers' offices are located in 112 cities.

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

On October 31, 1946, there were 188,774 persons receiving pensions under the Railroad Retirement Act, aggregate monthly disbursements to such persons amounting to $13,592,344.

177. How many railroads maintained pension systems for their employees prior to the passage 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.

178. Why do passenger 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.

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

A study of the careers of ninety railway presidents and chief executive officers—men who have "reached the top" in the railway field—shows that seventy-five of them entered railway service in minor capacities and advanced step by step up the ladder. Four started as office boys, five as messenger boys, twenty-three as clerks, two as agent-telegraphers, eight as telegraphers, two as laborers,

nine as rodmen, two as chainmen, two as transitmen, four as junior lawyers, and one each as clerk-bookkeeper, clerk-telegrapher, station agent, call boy, water boy, secretary, track apprentice, claim adjuster, assistant treasurer, instrumentman, assistant supervisor, assistant signal engineer, assistant resident engineer and timekeeper. On the average, railway presidents reached their positions after about thirty years of railway experience.

DEPARTMENTAL ORGANIZATION

180. 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.

181. 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.

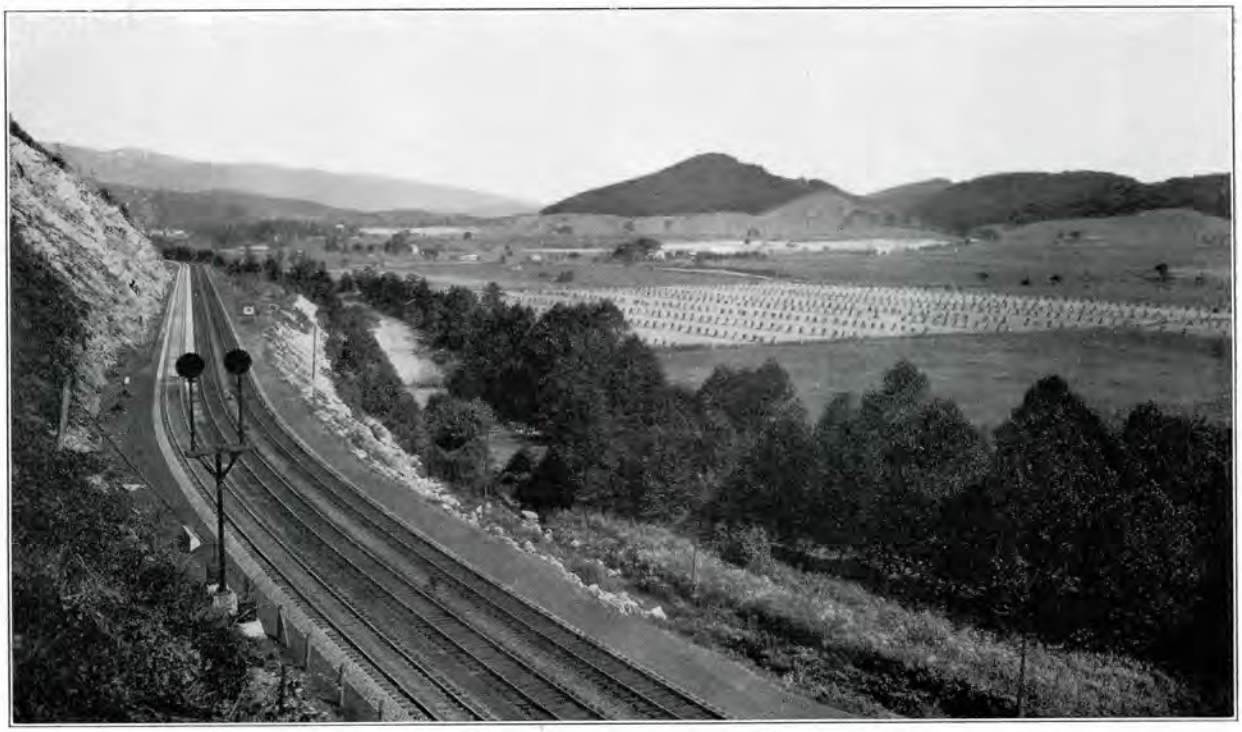
182. What are the responsibilities of the chief executive officer of the railroad?

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. 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.

183. What are the functions of the Operating Department?

The Operating Department, usually headed by a Vice President or a General Manager, is, with

The side of a mountain has been removed to provide a roadway for this triple-track railroad.



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 general 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.

184. 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, Signal Engineer, 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 Track Supervisors, and reporting to them are the Section Foremen, each assigned to the maintenance of a certain section of road.

OUTSTANDING ACCOMPLISHMENT

One of the outstanding accomplishments in the war has been the contribution of American railroads. They went into high gear at the beginning; they have stayed in high gear every day and every night. They have moved more troops and more tonnage than anyone considered possible. They have an important share in the credit for our victories around the world.—*Lieutenant General Brehon Somervell, Commanding General, Army Service Forces.*

185. What are the functions of the Mechanical Department?

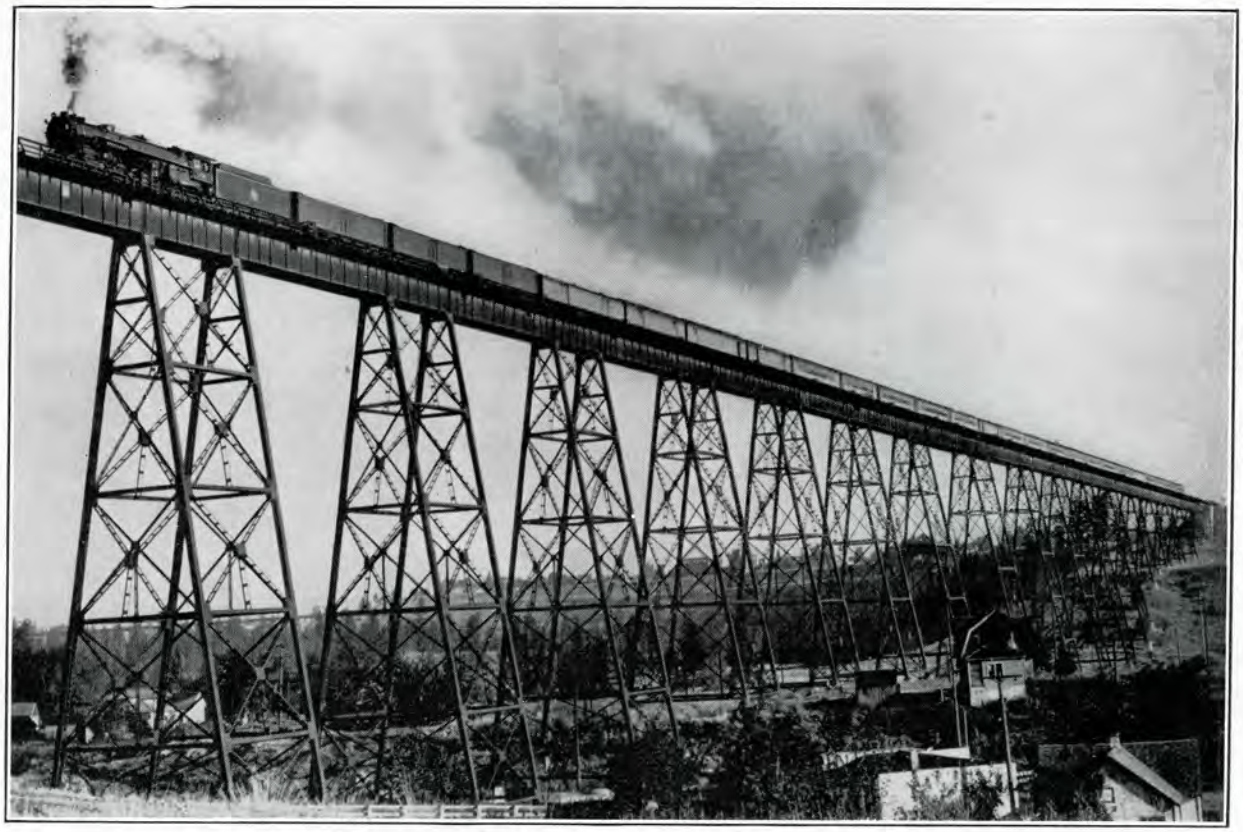
The Mechanical Department, usually headed by a Chief Mechanical Officer or a Superintendent of Motive Power, is responsible for the maintenance of the railroad's rolling stock—locomotives, passenger and freight cars and work equipment—and for the operation of locomotive and car shops. A few railroads 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 Car Department Superintendent 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.

186. 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.

187. What are the duties of the Law Department?

The Law Department, usually headed by a Vice President or a General Counsel, is responsible for



Tens of thousands of bridges form vital links in America's vast railway network.

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.

188. What are the duties of the Treasury Department?

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.

189. 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.

190. 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 the railroad.

ROADWAY AND STRUCTURES

191. What is the right-of-way?

The right-of-way is the strip of land, of various 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.

192. What is a railroad cut?

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

193. 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.

194. 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.

195. What is meant by the bonding of rails?

In signal operations, electrical current passes through the rails. The narrow gaps between the rail ends are bridged by welding copper wires to the rails. This is called the bonding of rails.

196. 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, and reduced maintenance cost.

197. What are the longest continuous rails now in actual service?

The longest stretches of continuous rails in the United States in 1946 were 12,782 feet and 11,440 feet in length, both on the Elgin, Joliet & Eastern Railway (Chicago Outer Belt). There are in this country at least ten stretches of continuous rails each more than a mile in length.

198. What is the cost of steel rails?

New steel rails laid in replacements by the railroads in 1946 cost an average of $48.91 a gross ton at the rolling mills. Transportation expense, storage costs, loading and unloading costs and the cost of installation in track are additional.

199. How much rail is installed annually by the railroads of the United States?

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

200. 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.

201. 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 Bessemer 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 were 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.

202. 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.

203. 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.

204. 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 Class I railway track throughout the United States was increased from an average of 82.89 pounds per yard in 1921 to 98.85 pounds per yard in 1945.

205. How much does rail weigh?

Rails ranging in weight from 50 to 152 pounds per yard are in use on the Class I railroads of the United States. On trunk line railroads, rail weights range from 85 pounds upward. At the beginning of 1946, there were 123,799 miles of mainline railroad equipped with rail weighing 100 pounds or more per yard.

206. 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.

207. How are rails secured to the ground?

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

208. 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.

209. How many crossties are there in railway tracks throughout the United States?

There are approximately 991,587,000 crossties in Class I railway track throughout the United States. In addition, about 23,898 miles of track are laid with switch and bridge ties.

210. How many crossties are required for a mile of railway track?

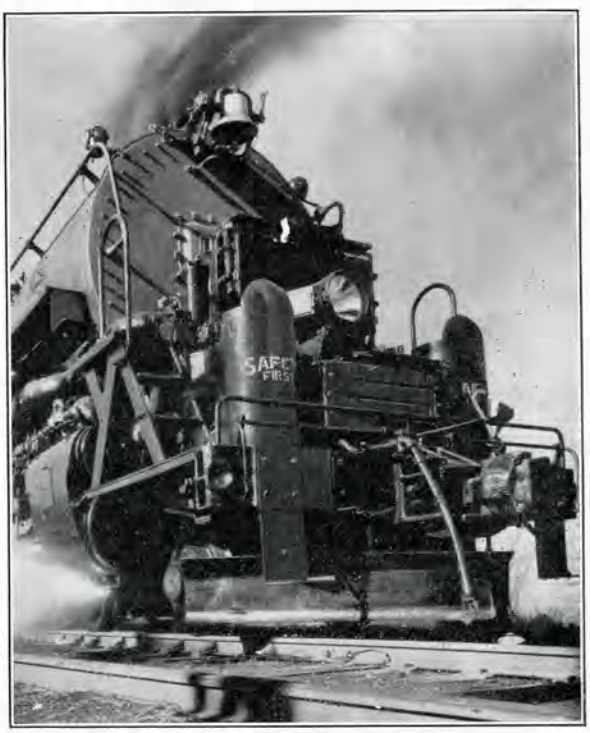
The number of crossties in the average mile of railway track at the beginning of 1946 was 2,997. The average spacing was, therefore, 21.1 inches, center to center.

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

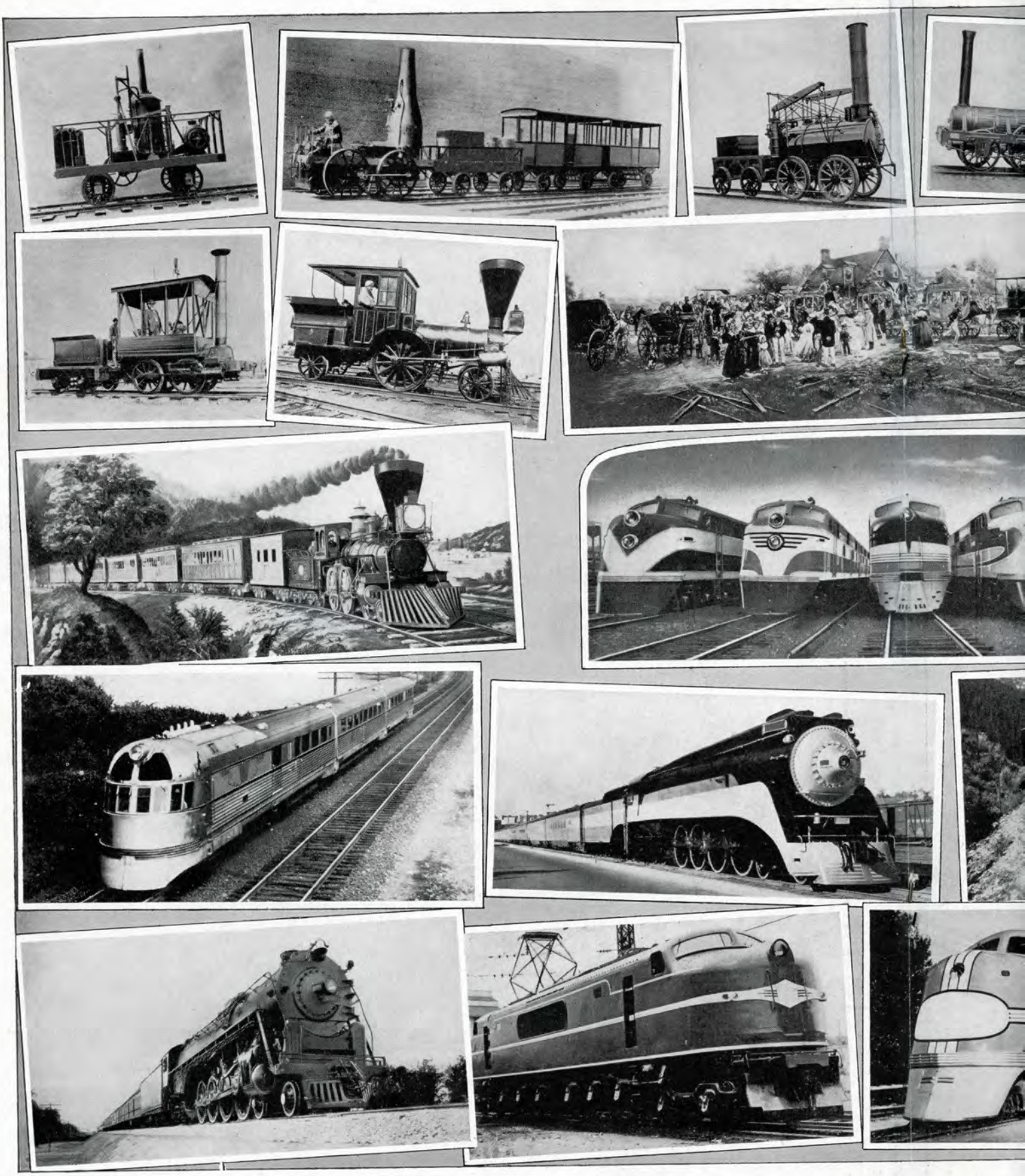
Crossties, switch ties and bridge ties which have been saturated with creosote, zinc chloride or other preservatives to prevent decay or destruction by insects are called "treated." The treatment more than doubles the service life of the ties. Bridge timbers, piling, poles and other woods are also treated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

212. What is the cost of a crosstie?

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 crosstie cost the railroads $2.07 in 1945; the average untreated crosstie cost $1.34.



The modern steam locomotive is a marvelous piece of mechanism — powerful, dependable, efficient.



213. How many crossties do the railroads install in a year?

The Class I railroads of the United States install about 46,000,000 crossties a year, on the average. Approximately 87 per cent of the crossties installed in replacements in recent years have been treated.

214. 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.

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

In 1871, no fewer than twenty-three 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.

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

Of the 226,696 miles of railroad in this country at the beginning of 1946, 225,980 miles, or 99.6 per cent, were standard gauge lines, 716 miles were 3-ft., or narrow gauge lines, and 70 miles of railroad tracks were equipped with three rails to accommodate both standard and narrow gauge equipment.

217. 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.

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

The first successful locomotives built by George Stephenson, in England, were designed to run on rails 4 feet $8\frac{1}{2}$ inches apart. Early English tramways, operated by horse power, were built to accommodate vehicles of approximately this width. Some of the early 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 a gauge of 4 feet $8\frac{1}{2}$ inches. 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.

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

A straight track, 78.86 miles in length, on the Seaboard Air Line Railroad between Wilmington and Hamlet, North Carolina, is the longest stretch of track without a curve in this country.

220. 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 Railroad, between

Waycross and Kinderlou, Georgia, 60.10 miles; on the Seaboard Air Line Railroad, 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 Norfolk & Western Railway, between Suffolk and Petersburg, Virginia, 52.12 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.

221. 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 is more than 7,000 feet above sea level.

222. 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 vertical climb of 2 feet in 100 feet of track length 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 or with a highway at the same level.

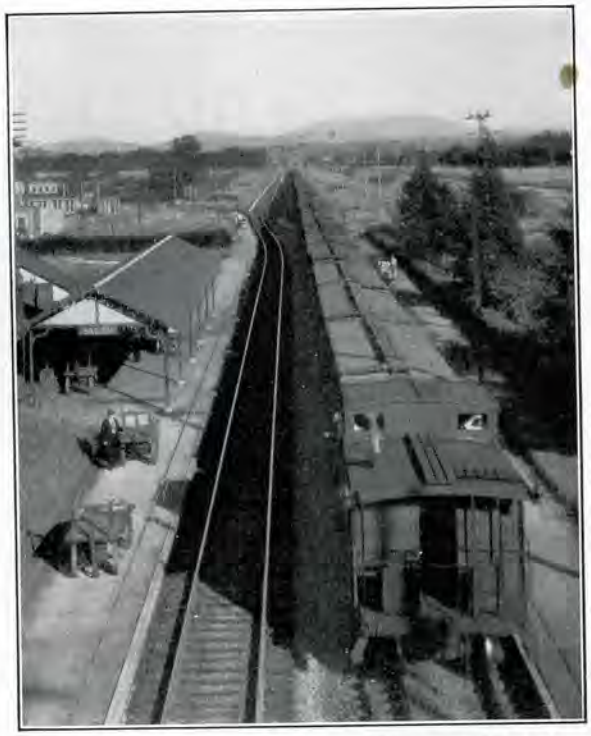
223. What is the maximum grade on main line track?

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.

224. 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.



There's a geography lesson in every freight train. Cars and "cargo" are drawn from widely scattered points and are bound for many places, far and near.

225. How is curvature of track expressed and measured?

A curve is a part of a circle. The sharper the curve, the smaller the circle, and the shorter the radius. Curvature—expressed in degrees, minutes and seconds—equals the angle between two lines drawn from the center of the circle to the ends of a 100-foot segment of the circle. Curvature may be roughly determined by tieing a knot midway between the ends of a string 62 feet long and stretching the string between two points on the inside face of the outer rail head. The distance between the knot and the face of the head of the rail indicates the approximate curvature, 1 inch equaling 1 degree, 2 inches equaling 2 degrees, and so on.

226. 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 mountain-

ous 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 in 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.

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

The Pontchartrain Curve on the Illinois Central Railroad between Ruddock and Tunity, Louisiana, is 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.

228. 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.

229. 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) Railway.

230. 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 Climax, Colorado, on the Colorado & Southern Railway, where the elevation is 11,319 feet above sea level. This is a standard gauge line.

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

The Denver & Rio Grande Western Railroad reaches elevations of 10,856 feet above sea level at Marshall Pass, Colorado (narrow gauge); 10,331 feet at Resurrection Mill, Colorado (standard gauge); 10,239 feet at Tennessee Pass, Colorado (standard gauge); 10,200 feet at Leadville, Colorado (standard gauge), and 10,028 feet at Monarch, Colorado (narrow gauge). The Rio Grande Southern Railroad (narrow gauge) reaches 10,250 feet at Lizard Head Pass, Colorado. The Colorado & Southern Railway reaches 10,207 feet at Leadville, Colorado (standard gauge). The Midland Terminal Railway (standard gauge) reaches an elevation of 10,199 feet at Bull Hill, Colorado.

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

There are approximately 1,500 railway tunnels in this country. Their aggregate length is about 320 miles.

233. Where 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.)

234. 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; officially opened July 1, 1876; electrified May, 1911. The use of Diesel-electric locomotives through this tunnel commenced on August 24, 1946.

235. 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, 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.

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

The Moffat Tunnel, of the Denver & Salt Lake Railway, 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.

237. What is the shortest railway tunnel in the United States?

The Bee Rock Tunnel, 30 feet in length, on the Louisville and Nashville Railroad near Appalachia, Virginia, is the shortest railway tunnel in this country. Ripley says it is the smallest in the world.

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

There are approximately 191,800 bridges, with an aggregate length of 3,860 miles, in the railway structure of the United States.

239. What is the longest railroad bridge in the United States?

The 12-mile pile-trestle bridge, forming a part of the Lucin Cut-off, which carries the tracks of the Southern Pacific Railroad across Great Salt Lake, in Utah, is the longest railway bridge structure in the United States. It was completed in 1903.

The Huey Long Bridge, 4.4 miles in length, including approaches, across the Mississippi River above New Orleans, is the longest railway-highway bridge of steel and concrete construction in the United States. It was opened in December, 1935, and is used by the Southern Pacific, Missouri Pacific and Texas & Pacific railroads.

240. 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.

241. 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

There is a railroad bridge—large or small—for every two miles of railway track in the United States.

"the mechanical wonder of the West." The first locomotive, the "Des Moines," crossed the bridge on April 21, 1856.

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

The Class I railroads of the United States use 1,353,000 miles of telephone and telegraph wires in their operations. This would be sufficient to reach fifty-four times around the globe at the equator.

243. What do the various signposts 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.

Mile Posts: For identification and reference to terminal or division locations.

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

Grade Markers: Used to establish track elevations or super-elevations.

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

Maintenance Limits Markers: Define division of track ownership and maintenance between a railroad and an industry and of 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.

Snowplow 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 by rules or law to be sounded.

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

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.

244. What is a derail?

A derail or derailer 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.

245. 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.

246. 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.

247. 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

Along the smooth and shining rails, across the length and breadth of America, speed the trains that keep passengers, as well as mail and express, on the move, night and day. The passenger train is a symbol of American enterprise and achievement.

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.

248. 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 along each side of and parallel to each rail. When applied by the towerman, these "shoes" act as brakes against the rims 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.

249. 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, shops, station grounds and other transportation purposes. This is equal to about one-sixth of the area of Indiana.

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

A survey made in January, 1945, indicated a total of 655 major railway shop plants in the United States, of which 315 are for heavy repairs to locomotives and 340 are for heavy repairs to freight and passenger cars. Many of these railway shops are equipped to build as well as repair locomotives and cars. In addition to these large shops, often consisting of groups of buildings covering many acres, the railroads operate hundreds of smaller plants, such as roundhouses and terminal shops engaged in making light and running repairs to railway equipment.

251. How many passenger and freight stations are there in the United States?

There are approximately 59,000 railway passenger stations and 61,929 railway freight stations in the United States. These stations serve the entire population of the country.

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

The railroads of the United States own and operate approximately 120,000 passenger and freight station buildings and buildings used for

baggage, express, restaurants and other station services.

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

At the beginning of 1946, twenty Class I line-haul railroads were operating electrically 2,686 miles of road and 6,495 miles of track, as follows:

Railroad	*Miles of Road*	*Miles of Track*
Baltimore & Ohio	3	9
Beaumont, Sour Lake & Western	27	36
Boston & Maine	8	21
Chicago, Milwaukee, St. P. & P.	661	922
Delaware, Lackawanna & Western	68	160
Great Northern	73	94
Illinois Central	40	129
Illinois Terminal	391	490
Lehigh Valley	13	33
Long Island	138	424
New York Central	79	457
New York Connecting	21	65
New York, New Haven & Hartford	127	628
Norfolk & Western	76	211
Pennsylvania	670	2,245
Pennsylvania-Reading Seashore	44	76
Reading	84	198
Richmond, Fredericksb'g&Potomac	3	24
Staten Island Rapid Transit	22	45
Virginian	138	228
	2,686	6,495

254. 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.

255. 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.

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

At the beginning of 1946, 101,519 miles of railroad track in the United States were protected by automatic block-signal systems—40,879 miles were protected by manual block-signal systems, 14,121 miles were protected by automatic train-control systems, 7,384 miles were protected by centralized traffic-control systems, and 6,599 miles were protected by automatic cab-signal systems. There are some duplications in these figures due to two systems sometimes being used on the same line of road. The great bulk of railway traffic moves over lines equipped with the types of signals mentioned above.

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

On January 1, 1946, there were 226,153 railway-highway grade crossings in the United States.

258. 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 when the train is in motion to grab mail pouches suspended on mail cranes. They are operated by railway mail clerks responsible for collecting mail en route.

259. 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 subfreezing temperatures the trough must be heated to prevent formation of ice. Such a device is practical only on lines of unusually heavy traffic.

260. 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. It then restores the car to an upright position and kicks it forward to make ready for the next car.

Passengers show their tickets to the gateman to make sure they are taking the right train. The railroads carry an average of more than 2,000,000 passengers a day.

Dumpers are used for transferring coal, ore, sulphur and other bulk commodities from open-top cars into holds of vessels. They are also used at terminals for transferring bulk materials from one car to another and at industrial plants for unloading bulk materials.

LOCOMOTIVES

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

At the beginning of 1946 there were 46,253 locomotives in the United States, of which 41,018 were operated by steam, 885 were operated by electricity, 41 were operated by gasoline, and 4,309 were operated by Diesel-electric power.

262. What is the weight of a steam locomotive?

Weights of steam locomotives vary greatly. The weights of freight locomotives purchased during the five-year period 1941-1945 ranged from 195 tons to 599 tons; those of passenger locomotives ranged from 216 to 397 tons; and those of switching locomotives ranged from 106 to 233 tons. These weights included tenders.

263. What is the weight of an electric locomotive?

Weights of standard electric locomotives employed in freight service range from 91 to 246 tons; those in passenger service range from 234 to 239 tons; those of switchers from 76 to 140 tons.

264. What is the weight of a Diesel-electric locomotive?

Weights of Diesel-electric locomotives vary widely. The weights of those employed in freight service range from 44 to 222 tons; those employed in passenger service range from 103 to 257 tons; those employed in switching service from 30 to 250 tons. Many of the heavier freight and passenger engines are in three or four connected units.

265. What is the power range of Diesel-electric locomotives?

From the original 300-horsepower Diesel-electric locomotive installed in switching service in 1925, and still in use, Diesel-electric power units have increased to 3-unit road engines of 6,000 horsepower and 4-unit road engines of 8,000 horsepower.

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

The tractive force of the average steam locomotive on the Class I railroads of the United States was 34,995 pounds in 1918, and 53,217 pounds in 1945—an increase of 52 per cent.

267. What country leads the world today in the use of Diesel-electric locomotives?

The United States surpasses any other country in the world in the development and use of Diesel motive power. In fact, one railroad company in the United States has more Diesel horsepower in service than is used by all the railroads of the world outside of the United States.

268. What is the cost of a locomotive?

The average costs of new locomotives installed by the railroads during the five-year period 1941-1945 were as follows:

	Minimum	*Maximum*	*Average*
Steam, Freight	$88,373	$428,598	$202,525
Steam, Passenger	98,742	367,750	154,732
Steam, Switching	60,610	87,286	78,462
Electric, Freight	28,097	317,521	186,677
Electric, Passenger	249,567	260,845	254,853
Diesel-electric, Freight*	36,833	248,622	133,455
Diesel-electric, Passenger*	87,965	178,722	168,184
Diesel-electric, Switching*	14,908	198,948	71,650

* A Diesel-electric locomotive is made up of 1, 2, 3 or 4 units. The cost figures in this table are for single units. A 4-unit 6,000 HP Diesel-electric freight locomotive or a 3-unit 6,000 HP Diesel-electric passenger locomotive costs upwards of $500,000.

SALUTE FROM THE ARMY

The American railroads were a vital part of the national defense team. Based on our war experience, the interest of the country in their welfare must long remain a national defense interest. The unity of their operation and of their response to national need is essential to the fulfillment of their mission in war.—*Major General Charles P. Gross, Chief, Army Transportation Corps.*

269. How many parts are there in a locomotive?

The number of parts varies with the type of locomotive and with construction details. A modern Pacific type steam locomotive has about 25,000 parts, excluding the tender.

270. 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, measured 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.

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

The capacity of passenger locomotive tenders ranges from 4,500 to 25,000 gallons, with the average between 16,000 and 20,000 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 of switching engines ranges from 7,000 to 19,000 gallons, with 9,000 to 10,000 gallons capacity the most commonly used.

272. 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 1.207 miles; in a Yellowstone type, 1.442 miles; in a Santa Fe type, 1.281 miles.

273. 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.

274. 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.

275. 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 under the cab. 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:

Wheel Arrangement	*Front to Back*	*Type or Class*
0-4-0	OO	4-Wheel Switcher
0-6-0	OOO	6-Wheel Switcher
0-6-6-0	OOO OOO	Mallet
0-8-0	OOOO	8-Wheel Switcher
0-8-8-0	OOOO OOOO	Mallet
0-10-0	OOOOO	10-Wheel Switcher
2-4-2	oOOo	Columbia
2-6-0	oOOO	Mogul
2-6-2	oOOOo	Prairie
2-6-6-0	oOOO OOO	Mallet
2-6-6-2	oOOO OOOo	"
2-6-6-4	oOOO OOOoo	"
2-6-6-6	oOOO OOOooo	Allegheny
2-8-0	oOOOO	Consolidation
2-8-2	oOOOOo	Mikado
2-8-4	oOOOOoo	Berkshire
2-8-8-0	oOOOO OOOO	Mallet
2-8-8-2	oOOOO OOOOo	"
2-8-8-4	oOOOO OOOOoo	Yellowstone
2-10-0	oOOOOO	Decapod
2-10-2	oOOOOOo	Santa Fe
2-10-4	oOOOOOoo	Texas
2-10-10-2	oOOOOO OOOOOo	Mallet
4-4-0	ooOO	American
4-4-2	ooOOo	Atlantic
4-4-4	ooOOoo	Baltimore
4-4-4-4	ooOO OOoo	Class N-1; T-1
4-4-6-4	ooOO OOOoo	Class Q-2
4-6-0	ooOOO	Ten-Wheel
4-6-2	ooOOOo	Pacific
4-6-4	ooOOOoo	Hudson
4-6-4-4	ooOOO OOoo	Pennsylvania
4-6-6-4	ooOOO OOOoo	Mallet
4-8-0	ooOOOO	Twelve-Wheel
4-8-0-4-8-4	ooOOOO ooOOOOoo	Class M-1
4-8-2	ooOOOOo	Mountain
4-8-4	ooOOOOoo	Northern, or Niagara
4-8-4-8	ooOOOO ooOOOO	Class V-1, Triplex
4-8-8-2	ooOOOO OOOOo	Mallet
4-8-8-4	ooOOOO OOOOoo	Mallet
4-10-0	ooOOOOO	Mastodon
4-10-2	ooOOOOOo	Southern Pacific
4-12-2	ooOOOOOOo	Union Pacific
6-4-4-6	oooOO OOooo	Class S-1
6-8-6	oooOOOOooo	Class S-2, Turbine

In war and peace, the steam locomotive is one of man's greatest servants.

276. 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 size of a dime, but of elongated oval shape.

277. 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.

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

From 1921 to 1945, the amount of coal (or its equivalent) consumed in locomotives on Class I

railroads was reduced from 162 pounds to 116 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 of service performed. This resulted in fuel savings of 28 per cent in freight service and 16 per cent in passenger service.

279. 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 approximately one ton of coal for each 9 miles of travel.

280. 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.

PASSENGER TRAIN EQUIPMENT

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

There were 47,712 passenger-train cars on the railroads of the United States at the beginning of 1946. Of the total, 17,668 were coaches, 13,671 were baggage, express and other non-passenger cars; 7,412 were parlor and sleeping cars; 1,552 were dining cars; 1,701 were U. S. Mail cars; 2,248 were combination coach cars; 278 were observation, club and lounge cars; 1,651 were troop sleeping cars; 739 were troop kitchen cars; and 292 were other passenger-train cars. The Pullman Company owned 6,186 of these cars, and operated 2,404 additional cars under lease. On August 1, 1946, 2,432 special troop sleepers and 794 troop kitchen cars were reported, half of them having been completed after V-J Day.

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

The average cost of new passenger-train cars installed by Class I railroads in the 5-year period 1941-1945 was as follows: Coaches, $55,895 each; combination cars, $60,152; parlor cars, $65,427; dining cars, $99,412; club, lounge and observation cars, $80,496; postal cars, $28,180; baggage, express and other passenger-train cars, $39,991 each. Owing to the scarcity of strategic materials, the construction of standard passenger-train cars was not permitted during the war. Construction was resumed after V-J Day.

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

Many light-weight, Diesel-powered, air-conditioned streamline passenger trains represent an investment of from $1,000,000 to $1,500,000 each, depending on size of power unit, length of train and other factors.

284. 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 nonstop 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.

285. How many streamline passenger trains are operated by the railroads of the United States?

Lunch counter cars, specializing in low-priced meals, are popular features of many trains.

There were approximately 172 streamline passenger trains in scheduled service on the railroads of the United States in 1945. After the war-time ban on new passenger car construction was lifted, the railroads placed orders with the manufacturers for many new trains. A few were delivered in 1946; many others will be delivered in 1947.

286. What has been the development of air conditioning of passenger cars?

Air conditioning of railway passenger cars began as "air-cooling" in 1884 when the Baltimore & Ohio equipped a passenger car with an ice-cooling system and the New Haven Railroad tried out cars similarly equipped. In 1906, the Baltimore & Ohio ice-cooled a dining car. The Santa Fe installed air-cooling in 33 dining and buffet cars in 1911-1914 and operated them until 1926. Mechanical air conditioning was tested by The Pullman Company in 1927-1929. The Baltimore & Ohio successfully tested mechanical air conditioning in a passenger coach in 1929. In 1930 the Baltimore & Ohio put in operation the first mechanically air-conditioned passenger train car to remain in continuous service to date. On May 24, 1931, the Baltimore & Ohio began operating the world's first completely air-conditioned passenger train. The first completely air-conditioned sleeping car trains began operating on the Baltimore & Ohio on April 20, 1932, and on the Chesapeake & Ohio on April 24, 1932. During the next several years progress was rapid. By the end of 1940 more than 12,000 air-conditioned passenger cars were in operation, and at the beginning of 1946 there were 13,367 air-conditioned cars in operation. Progress during the war was retarded due to the scarcity of strategic materials, manpower, and chemicals.

287. 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 a car, depending upon type of installation and other factors.

288. 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 streamlined "General Pershing" of the Burlington Railroad, placed in scheduled service between St. Louis and Kansas City on April 30, 1939.

289. What is the length of a passenger car?

Passenger cars range in length from about 60 feet to 88 feet, the average length being approximately 72 feet, outside over-all measurements. Most of the newer passenger cars are from 75 to 85 feet in length.

290. 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.

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

Weights of passenger-train cars vary considerably. Average weights on December 31, 1945, were as follows: standard coaches, 62.24 tons; baggage, express and other non-passenger cars, 51.74 tons; dining cars, 84.29 tons; club, lounge and observation cars, 75.55 tons; parlor cars, 76.13 tons; mail cars, 61.82 tons; Pullman sleeping cars, 75.23 tons.

292. How many passengers could be seated in all railway passenger-carrying cars at one time?

There were 28,724 passenger-carrying cars in operation on the Class I railroads of the United States, with Pullman cars included, at the beginning of 1946. Their aggregate seating capacity was 1,641,850.

293. 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 open-section standard Pullman sleeping cars, except that the furnishings are plainer. There are no rooms in tourist sleeping cars. The capacity of these cars ranges from 12 to 16 sections. This type of equipment was used extensively for the transportation of troops during the war.

294. 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.

295. 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.

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

The first all-steel passenger car operated on a steam railroad was the "City of St. Joseph," a private car built in 1889. The first all-steel baggage car was placed in service in 1904. In the same year, all-steel subway cars were installed. In 1905, all-steel cars were placed in electric suburban service. The first all-steel express cars and the first all-steel postal cars were introduced in 1905. The first all-steel passenger coach employed in steam railway operations was introduced in 1906.

297. What is a year's supply of linen for The Pullman Company?

In a recent 12-months' period, The Pullman Company purchased 226,968 sheets, 461,315 pillow slips, 1,705,231 hand towels, 12,251 head rest covers, 42,000 tidies, 13,511 tablecloths, 28,668 napkins, 17,248 dish towels, and 27,756 glass towels.

298. 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 porter's coats and six laundry bags. In addition, there are two pillows and two blankets for each berth.

299. 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: 200 tablecloths, 966 napkins, 200 towels, 940 pieces of chinaware, 946 pieces of silverware, 320 pieces of glassware, 200 items of pantry and kitchenware, 80 aprons and 75 waiter's coats.

FREIGHT AND WORK EQUIPMENT

300. How many freight train cars of the different types are operated on the railroads of the United States?

Railroads and other companies in the United States owned the following freight cars on December 31, 1945:

Types of cars	*Owned by Railroads*	*Owned by Other Companies*	*Total*
Box	745,901	1,832	747,733
Flat	71,092	111	71,203
Stock and poultry	54,484	2,597	57,081
Gondola and hopper	874,553	7,605	882,158
Refrigerator	21,001	117,020	138,021
Tank	9,030	138,348	147,378
Cabooses	25,198	.....	25,198
Other cars	11,012	596	11,608
Total	1,812,271	268,109	2,080,380

301. Do the railroads provide special equipment for commodities which cannot be satisfactorily handled in standard equipment?

There are many kinds of freight and express cars designed to handle particular commodities. Among them are special refrigerator cars for the transportation of dry ice, depressed-center freight cars and well hole flat cars for transporting transformers and other large machines and units of equipment; special gondola cars designed for carrying air-activated cement containers. There are drop-end gondolas, bottom-dump gondolas, twin hopper cars, quadruple hopper cars and side-discharge hopper cars, for carrying coal, coke, ores, and other heavy bulk commodities; covered hopper cars for handling cement, carbon black, phosphate, ore concentrates, etc.; cars for carrying iron ore and other ores; specially designed cars for transporting pulp wood; tank cars with 2, 3, 4, and 6 compartments of special design and construction for the transportation of nitric acid, peroxide, caustic soda, caustic potash, liquid gas, anhydrous ammonia, and other acids, chemicals and gases; also specially built cars for transporting helium, sulphur and other products. Some freight cars are fitted with 12 or 16 wheels, instead of the usual 8, and are capable of bearing loads up to 200 tons each.

302. What is the length of a freight car?

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

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

The capacity of 500,000 box cars owned by twenty-five leading railroad systems in the United States ranges from 1,167 to 5,901 cubic feet each, the average being 3,359 cubic feet.

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

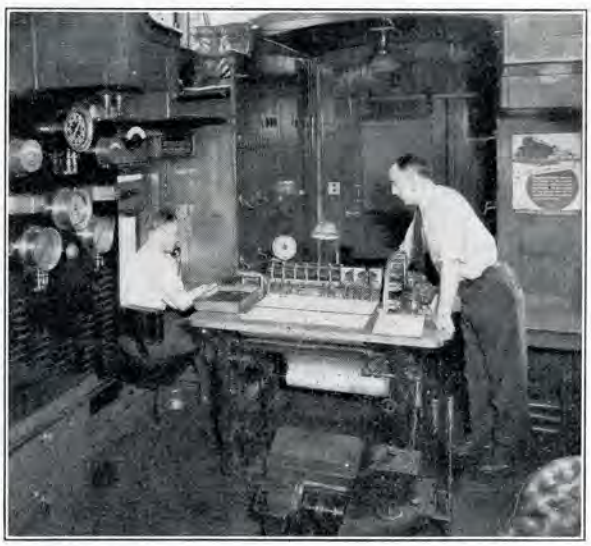
The capacity of the average railway-owned freight car in service increased from 39.8 tons in 1915, to 44.8 tons in 1925, to 48.3 tons in 1935 and 51.1 tons in 1945. The increase from 1915 to 1945 was 28 per cent.

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

The building of a box car provides approximately 2,200 man-hours of work (equivalent to about one year's work for one man), including the labor employed in the production of the steel and other materials which go into its construction.

306. 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



Interior of the dynamometer car—a traveling laboratory, equipped with instruments, gauges, and various other devices to test locomotive performance.

ESSENTIAL IN WAR AND PEACE

Here in the United States we were fortunate in having the greatest railroad system on earth, a system that was built basically for the expansion of our internal commerce but one that met the demands of protecting our national existence by handling over 90 per cent of the total military freight and furnishing the mass transportation which was so essential for war production. America needs all forms of transportation, if it is to grow and to maintain its leadership in the world. To this end, it must maintain a railroad system which is highly efficient and financially sound—a system that will be capable of meeting new peaks of performance both in peace and in war.—*Brigadier General Paul F. Yount, Assistant Chief of Transportation, U. S. Army.*

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 in 1946 were:

Company	*Cars*
General American Transportation Corp.	47,641
Union Tank Car Co.	38,559
Pacific Fruit Express Co.	36,665
Fruit Growers Express Co.	14,156
Merchants Despatch Transportation Corp.	11,401
American Refrigerator Transit Co.	9,844
Shippers Car Line Corp.	9,278
North American Car Corp.	7,000
Western Fruit Express Co.	6,874
Union Refrigerator Transit Lines	6,788

307. 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 snowplows.

308. What is a dynamometer car?

A dynamometer car is a traveling physical laboratory equipped with special scales and instruments for measuring and recording draw-bar pull and other data relating to locomotive performance and train haul conditions. It is manned by test engineers who are especially trained in the complex technical details of locomotive behavior. From these "laboratories on wheels" come the test data which help railroads and manufacturers to produce better locomotives. The testing of a locomotive sometimes extends over a period of several weeks, so the testing staff lives aboard the dynamometer car.

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

The United States Census of Manufactures reports 143 establishments engaged in the manufacture of railway cars in 1939. During that year these establishments employed an average of 28,487 persons; paid $43,493,819 in salaries and wages; spent $103,661,234 for materials and supplies, fuel and other purchased items, and produced equipment valued at $168,381,877.

310. What is the size of the "Railroad Navy"?

At the beginning of 1946, the railroads of the United States owned and operated 1,926 steamships, steamboats, tugboats, ferryboats, car floats, lighters, scows, hoisting derricks and other marine equipment.

INVESTMENT AND CAPITALIZATION

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

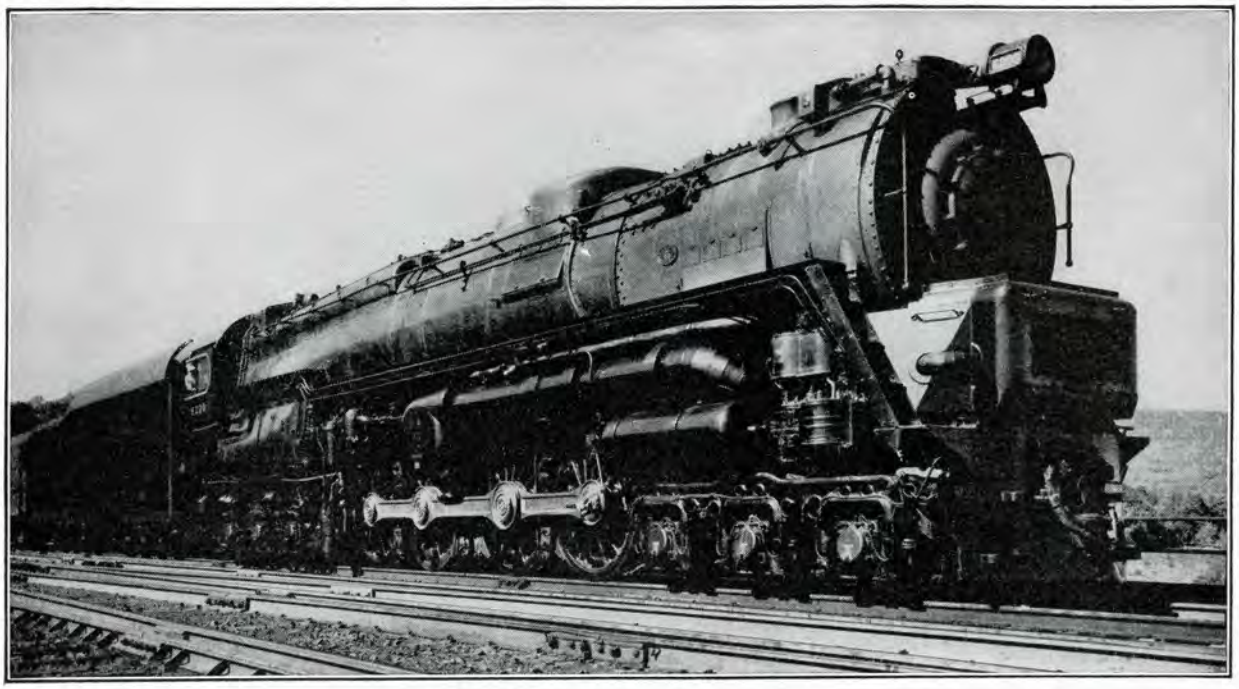
The recorded investment in railway property at the beginning of 1946 was $27,993,368,000.

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

At the beginning of 1946, 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 $119,664.

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

The Class I railway investment per employee increased from $9,561 in 1920 to $19,673 in 1946.



Railway history was made when this powerful direct-drive, coal-burning, steam turbine locomotive was placed on the rails. It is the first steam locomotive ever built in America without cylinders, pistons or driving rods. Engine and tender measure 123 feet in length and weigh about 500 tons.

314. What is meant by railway capitalization?

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

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

At the beginning of 1946, the total par value of railway stocks, bonds and other securities in the hands of the public was $16,243,684,267, of which $7,081,763,955 represented stock, and $9,161,920,312 represented bonds, equipment obligations and other funded securities.

316. 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, 1946, was $31,485, and that of all bonds and other funded obligations, including equipment obligations, was $40,734 — a total outstanding capitalization of $72,219 a mile, on the average.

317. 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 $11,750,000,000 greater than the aggregate par value of all stocks, bonds and other securities outstanding in the hands of the public.

318. 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."

319. 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 1945, the Federal Government spent $54,920,542 and the railroads spent $160,676,616, or a combined total of $215,597,158, to find the value of the railroads and to keep the valuation up to date.

320. What value does the Federal Government place upon the railroads?

The Interstate Commerce Commission reported a final value for rate making purposes for all railroads of the United States of $20,988,000,000 as of January 1, 1938, after allowing for depreciation and other factors. The Commission reported a value for rate making purposes of $19,571,000,000 for Class I railroads only, as of January 1, 1945.

321. How much have the railroads of the United States spent for additions and betterments in recent years?

In the ten years ended December 31, 1946, the Class I railroads spent approximately $4,645,000,000 on improvements to their properties. This was in addition to their expenditures for maintenance.

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

The Class I railroads of the United States reported 864,036 stockholders at the end of 1945. Most of these are individuals, although many firms, institutions and estates are included.

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

Stockholders of Class I railroads held an average of 93 shares each on December 31, 1945.

324. 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 four decades, as indicated below:

	Number of Stockholders		
Railroad	*1904*	*1918*	*1945*
Baltimore & Ohio	7,132	32,066	25,067
Boston & Maine	7,402	7,155	10,296
Chesapeake & Ohio	1,478	7,220	82,329
Great Northern	383	30,468	33,815
Illinois Central	9,123	11,324	12,508
Louisville & Nashville	1,672	5,154	11,882
New Haven	10,842	25,048	21,736
New York Central	11,781	31,767	59,495
Norfolk & Western	2,911	9,847	13,979
Northern Pacific	368	27,338	25,129
Pennsylvania	44,175	110,765	214,995
Santa Fe	17,823	49,796	61,219
Southern Pacific	2,424	38,502	44,304
Union Pacific	14,256	36,953	56,691
Total, 14 railroads	135,879	437,080	673,445

325. How many railway bondholders are there?

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

326. What is the average rate of interest paid by the railroads on outstanding bonds and other interest-bearing securities?

Approximately 4 per cent per annum was paid on outstanding obligations in 1945.

RAILWAY PURCHASES

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

The par 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 23 per cent of the nation's bituminous coal and nearly 20 per cent of the nation's fuel oil, lumber and iron and steel products.

328. 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.

329. 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 100,000 distinct items ranging from soap to steam locomotives, from toothpicks to telephone poles, from box cars to bituminous coal. In the six years 1941-1946, they spent an average of $499,589,000 a year for fuel, $135,693,000 a year for forest products, $478,012,000 a year for iron and steel products, and $314,849,000 a year for other products—a total average expenditure of $1,428,143,000 a year for all items, not including large sums spent annually for new equipment and for additions and betterments to fixed property.

330. How widespread are railway purchases?

In 1937, the latest year for which information is available, 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.

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

The value of year-end inventories of materials and supplies in Class I railway storehouses and storage yards averaged $471,000,000 during the ten-year period 1937-1946.

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

Locomotives of Class I railroads consumed 100,640,000 tons of coal in 1946, compared with 80,454,000 tons in 1940.

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

Based on a coal production of 1,576 tons per year for each miner employed, approximately 63,900 coal mine workers were employed to produce the coal consumed by locomotives on Class I railroads in 1946.

334. Are railroads heavy users of petroleum products?

Railroads are among the nation's largest users of petroleum products. In 1946, the Class I roads purchased 4,134,581,388 gallons of fuel oil, 559,187,983 gallons of Diesel oil, and 47,374,856 gallons of gasoline; also large quantities of lubricating oils.

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

The total expenditures of Class I railroads for fuel for all purposes in 1946 were as follows:

Bituminous coal	$386,464,000
Anthracite coal	4,745,000
Fuel oil	149,033,000
Gasoline	5,815,000
All other (coke, wood, etc.)	7,096,000
Total	$553,153,000

TAXES

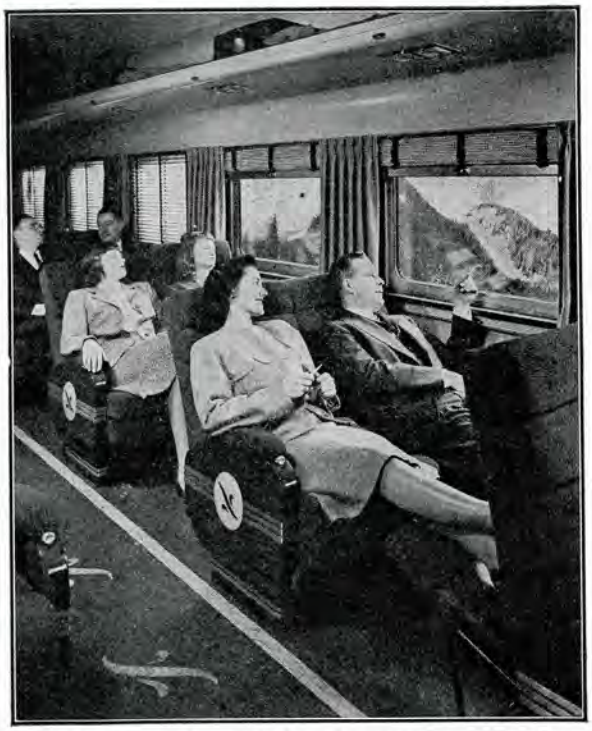
336. Who gets the larger share of railway earnings, the stockholders or the tax collectors?

For every dollar which the Class I railroads paid to their stockholders in dividends in 1946, they paid $2.13 in taxes to federal, state and local governments.

337. 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, transportation 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, motor vehicle use taxes, liquor and beverage taxes and special assessments.

Speed, strength and dependability are built into the modern steam locomotive. Engines of this type sometimes make runs of 1,000 miles or more in passenger service.



This new air-conditioned passenger coach provides the maximum of travel comfort. Many new coaches of this type are coming off the assembly lines.

338. What is the amount of the railway tax bill?

The size of the railway tax bill depends largely upon earnings. Before the war, taxes paid by Class I railroads ranged from $237,000,000 to $396,000,000 a year. During the war their taxes soared to unprecedented heights, reaching $1,849,000,000 in 1943. In 1946, with greatly reduced earnings, their taxes (after carry-back tax credits of $170,000,000) were $498,574,000, the highest for any peacetime year.

339. 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 1946, 6.5 cents were paid in taxes to the federal, state and local governments.

340. How much work do the railroads perform to earn taxes?

The Class I railroads performed 50,979,000,000 ton-miles of freight service in 1946 to earn enough money to pay their taxes.

341. How many days of the year do the railroads work to earn enough money to pay their taxes?

The railroads worked 24 days in 1946 to obtain enough money to pay their taxes.

342. Do railway taxes help support the public schools?

A large part of railway property taxes is spent for education. It is estimated that railway taxes used for school purposes in the United States are sufficient to defray the annual cost of providing common school education to more than 1,000,000 children.

343. What is the Federal Transportation Tax, and how much does it yield the government?

Railroads and other common carriers are required by law to collect from the public generally a tax on the transportation of persons, as well as freight and express, and to turn such collections over to the Federal Government.

The passenger tax became effective October 10, 1941, at a rate of 5 per cent. This rate was increased to 10 per cent on November 1, 1942, and to 15 per cent on April 1, 1944. The tax on freight except coal, and express, amounting to 3 per cent, became effective December 1, 1942. The tax on coal is 4 cents per ton.

Tax collections by all transportation agencies from October, 1941, to January, 1947, inclusive, totaled $1,770,593,000, of which $875,399,000 was from passengers and $895,194,000 was from freight.

344. Are the Federal Transportation Taxes mentioned immediately above included in regular railway taxes?

The transportation taxes referred to under Question 343 are over and above regular railway taxes. They are not included in the railway tax payments mentioned under Question 338.

MISCELLANEOUS

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

There is no distinction. The terms are used interchangeably in the United States. Of 135 Class I railroads in the United States, sixty-two

use *railway* and sixty-eight use *railroad* in their corporate names. Five use neither. Most electric street, subway, elevated and interurban lines are called *railways*. In the British Empire, *railway* is used in preference to *railroad*.

346. 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.

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

On January 1, 1947, there were 135 Class I, 171 Class II, 183 Class III line-haul railroads and 210 switching and terminal companies in operation in the United States—a total of 699 operating companies in the four groups.

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

In 1945, Class I line-haul railroads operated 94.89 per cent of the total railway mileage; represented 94.98 per cent of the recorded investment; owned 94.11 per cent of the locomotives; 98.48 per cent of the freight cars; 99.07 per cent of the passenger-train cars; performed 99.88 per cent of the passenger-miles and 99.54 per cent of the ton-miles; employed 98.68 per cent of the railway workers; paid 96.15 per cent of railway taxes, and reported 97.45 per cent of total operating revenues.

349. What is a line-haul railroad?

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

350. 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.

351. 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 13,108 miles of railroad, ranks first in miles of road operated. The Pennsylvania Railroad, with 24,974 miles of track, ranks first in miles of track operated. The Pennsylvania Railroad also ranks first in total investment ($2,813,391,249), in revenue passenger-miles (12,798,482,048), in revenue ton-miles (63,676,235,000), in total revenues ($934,778,-897), in units of equipment owned (4,718 locomotives, 5,981 passenger cars, 240,174 freight cars) and in the number of employees (161,436). The figures are for 1945 and exclude railroads which are controlled but operated separately.

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

The Valley Railroad, 1 mile in length, at Westline, McKean County, Pennsylvania, is the shortest line-haul railroad in the United States. This railroad derives its revenues entirely from freight and switching services. In 1945, the Valley Railroad employed ten persons. It is an independent company, rated as a Class III road.

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

The Beaufort & Morehead Railroad, 3 miles in length, between Beaufort and Morehead City, N. C., is the shortest railroad in the country performing all four services. Other short railroads performing all four services are: The Sandersville Railroad, Sandersville, Georgia, 4 miles in length; the Dardanelle & Russellville Railroad, Dardanelle, Arkansas, 5 miles in length; the Quincy Railroad, Quincy, California, 6 miles in length; the Rock Port, Langdon & Northern Railway, Rock Port, Missouri, 6 miles in length; and the Talbotton Railroad, Talbotton, Georgia, 7 miles in length.

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

The Dominion of Canada is served by two large railway systems, the government-owned Canadian

Rested and refreshed after a night's sleep these Pullman passengers start their sightseeing early.

National and the privately-owned Canadian Pacific, and by thirty-four smaller railroads and switching and terminal companies.

On December 31, 1945, there were 42,352 miles of railway lines in Canada, of which 42,262 miles were of standard gauge and 90 miles were of 3-foot gauge. Total length of all tracks was 56,811 miles. Rolling stock consisted of 4,431 locomotives, 6,211 passenger cars, 164,769 freight cars and 16,217 other units of equipment.

Canada's railroads represent an investment of $3,322,741,172. In 1945, their gross revenues totaled $774,971,360. They provided employment to an average of 180,603 persons during the year.

On December 31, 1946, the Canadian National Railways operated 23,535 miles of railroad lines, of which 21,672 miles were in Canada and 1,863 miles were in the United States.

The Canadian Pacific Railway, on the same date, operated 17,037 miles of railroad lines, of which 16,770 miles were in Canada and 267 miles were in the United States.

Other important Canadian railroad lines are: the 928-mile Northern Alberta Railway, extending northeastwardly and northwestwardly from Edmonton, Alberta; the 574-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, 1944: The New York Central, 489 miles; Pere Marquette, 319 miles; Wabash, 245 miles; Great Northern, 223 miles; Northern Pacific, 74 miles; Maine Central, 5 miles; Pennsylvania, 2 miles.

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

Sixteen operating railroads in Mexico embrace approximately 11,900 miles of railway lines, of which about 83 per cent is standard gauge and 17 per cent is narrow gauge. Equipment consists of about 1,330 locomotives, 22,000 freight cars, and 1,350 passenger cars. More than seven-tenths of the railway mileage is state-owned.

The state railways, known as the Ferrocarriles Nacionales de Mexico (National Railways of Mexico) operate 8,375 miles of railroad, of which 7,355 miles are standard gauge, and 1,020 miles are narrow gauge. In 1946, the National Railways of Mexico owned 1,030 steam locomotives, 17,747 freight cars and 1,009 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 476-mile Mexico North-Western Railway, with main line extending from Ciudad Jaurez, 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.

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

The 281,000-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 more than 7,000 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.

Approximately 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 Monterrey, 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.

357. 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, motor bus and motor truck lines, inland waterway carriers, freight forwarders and certain other transportation agencies engaged in interstate commerce. The Interstate Commerce Commission was created by the Interstate Commerce Act, approved February 4, 1887, effective April 5, 1887. It consists of eleven members, one of whom serves as Chairman.

The work of the Commission is carried on by seventeen Bureaus as follows: Administration, Accounts, Finance, Formal Cases, Informal Cases, Inquiry, Law, Locomotive Inspection, Motor Carriers, Personnel Supervision and Management, Safety, Service, Transport Economics and Statistics, Traffic, Valuation, Water Carriers and Freight Forwarders. The Commission is located in the Interstate Commerce Commission Building, Washington, D. C.

358. 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.

359. 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 and activities are also affected in various ways by city ordinances.

360. What is intrastate 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.

361. What is interstate 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.

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

In normal times, approximately 888 different reports are required each year by the forty-eight

Breakfast, luncheon, or dinner in the railway dining car is a pleasant feature of one's journey by train.

state governments and the Federal Government. Ten reports are daily, six are weekly, 294 are monthly, 73 are quarterly or semi-annual, 402 are on an annual basis, and 103 are for special purposes, the number and frequency depending upon developments and occurrences in the industry. During the war the number of reports required by the Federal Government was greatly increased.

363. What is The American Short Line Railroad Association?

The American Short Line Railroad Association, with headquarters in Washington, D. C., is an organization representing 313 steam and electric railway companies in the United States. Its member railroads range from 1 mile to more than 2,400 miles in length and have an aggregate investment of more than one billion dollars. Together these railroads employ 51,500 persons, have a payroll in excess of $133,000,000 a year, and do an annual business of more than $285,000,000.

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

Modern Railroads. Published monthly by Modern Railroads Publishing Company, 326 West Madison Street, Chicago 6, Ill.

Official Guide of the Railways and Steam Navigation Lines of the United States, Porto Rico, Canada, Mexico, Cuba and Central America. Published monthly by the National Railway Publication Company, 424 West 33d Street, New York 1, N. Y.

Official Railway Equipment Register. Published quarterly by the Railway Equipment and Publication Company, 424 West 33d Street, New York 1, N. Y.

Pocket List of Railroad Officials. Published quarterly by the Railway Equipment and Publication Company.

Railroad Magazine. Published monthly by Popular Publications, Inc., 2256 Grove Street, Chicago 16, Ill.

Railway Age. Published weekly by Simmons-Boardman Publishing Corporation, 30 Church Street, New York 7, N. Y.

Railway Engineering and Maintenance. Published monthly by Simmons-Boardman Publishing Corporation.

Railway Mechanical Engineer. Published monthly by Simmons-Boardman Publishing Corporation.

Railway Purchases and Stores. Published monthly by Railway Purchases and Stores, 9 South Clinton Street, Chicago 6, Ill.

Railway Signaling. Published monthly by Simmons-Boardman Publishing Corporation.

Traffic World. Published weekly by the Traffic Service Corporation, 418 South Market Street, Chicago 7, Ill.

Trains. Published monthly by the Kalmbach Publishing Company, 1027 North 7th Street, Milwaukee 3, Wisconsin.

365. What is the Association of American Railroads?

The Association of American Railroads is the central coordinating and research agency of the American Railway industry. It deals with matters of common concern in the whole field of railroading—operations, maintenance, engineering, research, safety, statistical reports, traffic, accounting, finance, valuation, taxation, legislation, transportation economics, and public relations. The Association's membership consists of 162 line-haul railroads, 23 switching and terminal companies, 3 electric railroads and one leased line, all in the United States, 5 Canadian railroads and 6 Mexican railroads, a total of 200 railroads.

The 122 Class I railroads of the United States which are fully participating members of the Association account for 96½ per cent of the mileage and 96 per cent of the revenues of all Class I railroads. Other railroads in the United States participate in many, but not all, Association activities. Railroads located in many foreign countries are associate members, receiving the benefits of the reports of the Association's technical and research committees.

The publications of the Association number more than 700 titles, ranging from pamphlets to extensive technical works of encyclopedic proportions.

366. How is the work of the Association of American Railroads organized?

The work of the Association is organized in the following departments: Operations and Maintenance; Law, including the Patent Division; Traffic; Finance, Accounting, Taxation and Valuation; Research; and the Bureau of Railway Economics. In addition, there are several bureaus and committees which function independently, including the Railroad Committee for the Study of Transportation, the Public Relations Office, the Division of Competitive Transportation Research, the Bureau of Explosives, the Committee on Automatic Train Control and Signals, the Joint Committee on Grade Crossing Protection, the Committee on Grade Crossing Elimination, the Committee on Mail Transportation, and the Freight Container Bureau, which carries on research for the improvement of packing and loading methods.

The Operations and Maintenance Department of the Association—by far the largest part of the organization—includes: (1) an Operating-Transportation Division, with eight separate sections, dealing principally with train operations, telegraph, telephone and radio communications, safety, medical and surgical services, police protection, fire protection, insurance, and freight station work; (2) an Engineering Division, with sections dealing with problems of construction and maintenance, signals and electrical installations; (3) a Mechanical Division, with a special section on electrical equipment; (4) a Purchases and Stores Division; (5) a Freight Claims Division; (6) a Motor Transport Division; and (7) a Car Service Division, responsible for preventing or alleviating car shortages, expediting traffic and obtaining the maximum utilization of freight and passenger equipment.

367. What sort of research work is done by the railroads?

The railroads, individually and through the Association of American Railroads, are extensively engaged in economic, engineering and other forms of research for the purpose of developing and placing in usable form basic data dealing with all phases of transportation.

A large part of the Association's economic research program and certain phases of its technical reseach program have been carried on by the Railroad Committee for the Study of Transportation and its fifteen subcommittees. Their studies cover a wide range of subjects, including accounting and statistics, taxation, finance, consolidation, labor and personnel, engineering and mechanical developments, operating methods and procedures, public relations, legislation, pipe line transport, water transport and air transport.

Most of the engineering, mechanical and other technical research of the Association is carried on through some 200 standing committees. Among the numerous subjects covered by these committees are: radio and radar, signals, automatic train control, track circuits, safety, accident prevention, grade crossing protection, track stresses, tie preservatives, continuous rail, transverse fissures, road-beds and drainage, track maintenance, tools and machinery, bridge impact, fatigue strength of structural welds, electrification, wheels and axles,

Large, upholstered chairs, carpeted floors, air-conditioning, and excellent lighting provide maximum travel comfort in the parlor car.

power brakes, draft gears, couplers, brake shoes, roller bearings, lubrication, air conditioning, alloys, loading and unloading devices, freight containers, standardization, conservation of fuel and materials, reclamation, transportation of explosives, freight yard operations, light infiltration in refrigerator cars, loss and damage reduction, fire prevention, eye strain, simplification of tariffs, accounting procedures, improvement and speeding up of paper work, application of special business machines, and use of microphotography.

368. How many experimental projects in roadway maintenance and design are now carried on by the Association of American Railroads?

Approximately fifty experimental projects looking toward increased safety and greater economy in roadway maintenance are now being carried on by the Engineering Division of the Association of American Railroads. This research has resulted in a reduction of more than 75 per cent in failures of rail during the first five years in track.

369. 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, students, educators, research workers and by the general public.

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

The Association of American Railroads, Transportation Building, Washington 6, D. C., issues for free distribution a bibliography 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.

371. Is there a published glossary of railway terms?

There is no complete glossary of railway terms, but the following books contain specialized glossaries: *Car Builders' Cyclopedia, Locomotive Cyclopedia,* and *Railway Engineering and Maintenance Cyclopedia,* published by Simmons-Boardman Publishing Corporation, *Freight Traffic Red Book,* published annually by the Traffic Publishing Company and *Statistics of Railways in the United States* (1932-1933), compiled by the Interstate Commerce Commission.

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

The Association of American Railroads, Washington 6, 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.

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

It is estimated that there are 100,000 model railroad hobbyists in the United States. 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.

374. 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.

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

Chicago, Illinois, enjoys this distinction. The city is served by twenty-two Class I railroads and nine switching and terminal companies. These railroads—including some of the largest in the country—embrace nearly one-half of the railway mileage of the United States. They own about one-half of all the locomotives and cars and perform about 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. Approximately 1,700 passenger trains and 2,400 freight trains originate or terminate in the city daily.

376. 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.

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

It is estimated that 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.

378. 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.

RAILWAY HISTORY

379. What was the first railroad 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.

380. 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. This road is now a part of the Baltimore & Ohio Railroad. About 1811 a tramroad was constructed on Falling's 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.

381. 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.

382. 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 3 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 operated by the New York, New Haven & Hartford) 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.

383. 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 windows of the observation cars present an ever-changing panorama of life in America. Travel is one of the greatest of teachers.

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.

384. 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 four locomotives which he purchased were the first European locomotives brought to America. The "Stourbridge Lion" is the only one of the four about which much is known. The "Lion" arrived in New York by sailing vessel on May 13, 1829. Driven by Allen, the engine made a trial run at Honesdale, Pennsylvania, on August 8, 1829, but it 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.

385. 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 "DeWitt 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.

386. 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.

387. 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; 93,296 miles in 1880; 163,597 miles in 1890; 193,346 miles in 1900; 240,439 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 1946 there were 226,696 miles. Mileage of all track increased from 115,647 miles in 1880 to 199,875 miles in 1890; to 258,784 miles in 1900; to 351,767 miles in 1910; to 406,579 miles in 1920, and to 429,883 miles in 1930, and declined to 398,054 miles at the beginning of 1946.

388. 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."*

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

The first railroad to serve as a public conveyor 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.

390. What railroads experimented with treadmills for motive power?

In the early stages of their development, both the Baltimore & Ohio Railroad and the South Carolina Railroad tried cars with treadmills 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.

391. 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.

392. 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, 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.

393. 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 2¼ miles from Baltimore, built by Colonel Stephen H. Long and completed early in 1830, is believed to have been 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.

From atop the caboose the brakeman signals the engineer to start the train rolling.

394. 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 crossties, 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.

395. 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.

396. 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.

397. What was the origin of the cowcatcher?

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 1830's. 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 crosswise bar much like the present-day bumper on an automobile, and from this evolved the present V-shaped cowcatcher.

398. 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 chief engineer of the South Carolina Railroad. 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.

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. In the 1850's kerosene lamps were introduced and soon came to replace 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 in 1881. In 1884 the first successful electric headlight—invented by N. M. Lynn—was introduced on the Pennsylvania Railroad. Today locomotive headlights are powerful searchlights.

399. 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 en route.

400. 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, the world's first express messenger, traveled regularly between New York and Boston. His business grew rapidly; a special package car was placed in 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.

401. 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, Stephen A. Douglas and others; and 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 gauge on the American continent.

402. 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.

403. 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 1946. Revenue per passenger-mile was reported by Doggett as 3.51 cents, contrasted with about 1.95 cents in 1946.

404. What was the first telegraph message?

The first telegraph message, *"What Hath God Wrought?"* was suggested by Miss Annie Ellsworth, of Hartford, Conn., daughter of the United States Commissioner of Patents, and sent by the

ESSENTIAL TO THE NAVY

The railroads are essential to the Navy in fulfilling its commitments. . . . From the standpoint of national security, the readiness of the railroads is equal in importance to the readiness of the Navy. . . . We look to the future with confidence that when the nation and our Navy turn their main dependence for transportation towards the railroads that confidence will not be misplaced.—*Vice Admiral Louis Denfeld, Chief of Navy Personnel, U. S. Navy.*

inventor, Samuel F. B. Morse, from the old Supreme Court chamber in the Capitol in Washington to Alfred Vail at the Baltimore & Ohio station in Baltimore, Maryland, on May 24, 1844. Bronze tablets were unveiled, with appropriate ceremonies, in the Capitol in Washington and at the Mount Clare station of the Baltimore & Ohio Railroad in Baltimore on the 100th anniversary of the telegraph, May 24, 1944.

405. 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.

Many of today's steam locomotives are geared and streamlined for high speeds.

406. 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." In his old age, Whitney lived in Washington, D. C., where he died in 1872, three years after the first railroad to the Pacific had been completed.

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

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

408. When and why were federal land grants made to railroads?

The federal land grants were made to railroads during the period 1850 to 1871. Their purposes were (1) to encourage the construction of railroads through undeveloped territory, (2) to attract settlers to those regions, (3) to enhance the value of and to create a market for vast tracts of Government-owned lands which theretofore had been unsalable because of their remoteness from markets, and (4) to increase taxable wealth.

409. What percentage of the country's mileage was built with federal land-grant aid?

Less than 8 per cent of the present railway mileage of the United States was built by aid of federal land grants. More than 92 per cent of the

country's mileage was built without federal land-grant aid.

410. Were federal land grants gifts to the railroads?

No. The railroads received approximately 131 million acres of land from the Federal Government, the estimated value of which, at the time of transfer, was approximately 94 cents an acre, or $123,000,000.

In return for the lands granted, the land-grant railroads, and railroads which compete with them, until 1946 carried government troops and all government property used for military purposes for one-half of standard rates. Prior to 1941 the land-grant railroads and competing lines also carried government property used for non-military purposes for one-half of established rates. In addition, the land-grant railroads until 1941 carried United States mails for four-fifths of standard rates. In December, 1945, Congress passed the Boren Act, repealing the land-grant rate provisions, effective October 1, 1946.

These land-grant rate deductions repaid the government many times over for the lands granted. In 1944, the Chairman of the Board of Investigation and Research, a Federal Government agency, estimated that land-grant rate deductions amounted to $580,000,000 to June 30, 1943, and subsequently averaged $20,000,000 a month. On this basis, deductions to the end of 1945 totaled $1,180,000,000—which is 9½ times as much as the value of the lands at the time they were granted to the railroads.

411. What was the first federal land grant to railroads, and how did it come out?

The first federal railroad land grant, approved September 20, 1850, conveyed to the State of Illinois 2,595,133 acres of lands which had been on the market for years, without purchasers, at $1.25 an acre. The State transferred the lands to the Illinois Central Railroad Company on condition that the railroad, when completed, would pay the State of Illinois a charter tax based on a percentage of its gross revenues, in lieu of other taxes, on its 705.5 miles of land-grant railroad in the State, and that it would carry U. S. troops, property and mails at reduced rates.

To the end of 1945 the Illinois Central had paid the Federal Government about $24,000,000 in reduced rates on government troops, freight, express and mails, on account of the land grant, and had paid the State of Illinois approximately $110,000,000 in gross revenue tax. It is estimated that the latter is about $36,000,000 greater than normal railway taxes would have been. Thus, to the end of 1945, the railroad had paid some $60,000,000 for lands which could have been purchased outright at the time they were granted for not more than $3,248,000.

412. 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 $167,746,490.

413. 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.

414. 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.

415. 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.

416. 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-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.

417. 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 fruits 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.

418. 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."

419. 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.

420. 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.

421. What was the ceremony known as "The Driving of the Golden Spike"?

This historic event occurred at Promontory, 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. Editors joined in a pean 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.

422. 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.

423. 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, in March, 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 Northern Pacific Railroad, pioneer railroad to the Pacific Northwest, was driven in Hell Gate Canyon, at Gold Creek, Montana, September 8, 1883.

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 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 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.

424. 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.

425. When were the first circus trains operated in this country?

In 1860, Lewis B. Lent's New York Circus, featuring bareback riders, trapeze performers and acrobats, commenced touring the country in a twelve-car railway train. The first circus in the modern sense was P. T. Barnum's "Menagerie, Museum, and Hippodrome," which was originally moved from town to town by wagons drawn by 600 horses. In the early 1870's Barnum purchased more than sixty railroad cars, painted in the most flamboyant manner, and began touring the country by rail. The circus train attracted much attention. Railroads frequently ran excursion trains to bring people from outlying communities to the circus. Barnum prospered, and in time many additional cars were required to transport "The Greatest Show on Earth."

426. 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.

427. 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. Oil lamps were introduced in 1850 and continued in use for many years. In 1860 gas was first used in car lighting. Pintsch gas was introduced in the early 1880's, and experiments in electric lighting began about the same time. 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.

428. 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-Schnectady branch of the New York, West Shore & Buffalo Railroad (now the New York Central) in January, 1882.

429. 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.

430. When was Standard Time adopted?

At the stroke of 12 o'clock noon, on November 18, 1883, more than sixty 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.

431. When was the locomotive whistle introduced?

The first locomotive equipped with a whistle is said to have been the "Sandusky," which was built in Paterson, N. J., and made its first run on what is now the New York Central Railroad out of Sandusky, Ohio, in 1837.

432. When did the vestibule come into use on American passenger cars?

In 1857 the Naugatuck Railroad (now a part of the New Haven System) equipped a passenger train with canvas devices which provided covered passageways between cars. This feature remained in use for several years. The built-in vestibule consisting of elastic diaphragms on steel frames was invented by George M. Pullman and patented in 1887. The first complete train to be so equipped was operated over the Illinois Central Railroad between Chicago and Otto, Ill., on April 11, 1887, and was placed in regular service on the Pennsylvania Railroad a few days later.

433. When were parlor cars first 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.

434. 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."

435. 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.

436. When and where was the first steam railroad electrification?

America's first electrified train service began on the 7-mile Nantasket Branch of the New York, New Haven & Hartford Railroad on June 28, 1895.

The first electrification of a main line was through the 3.6-mile Baltimore tunnel of the Baltimore & Ohio Railroad on August 4, 1895.

437. 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

The conductor, with watch in hand, counts off the seconds. Time is an important factor in railway operations.

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. The vertical plane coupler, invented by Colonel Ezra Miller, was introduced in the 1860's and gained widespread use on passenger equipment. As early as 1869 the Master Car Builders' Association, which later became the Mechanical Division of the Association of American Railroads, began a series of tests extending over many years. 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 a vertical plane automatic coupler invented by Major Eli H. Janney. From then on the Janney type automatic coupler rapidly replaced other types. 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. The Type "H" tightlock coupler, which eliminates slack and reduces noise in passenger trains, was adopted as standard by the Mechnical Division in 1944.

438. 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 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.

439. When were tank cars first used on the American railroads?

On November 1, 1865, about six years after the world's first oil well was opened at Titusville, Pennsylvania, the first tank car was loaded in that city. It was a flat car fitted with two wooden tanks shaped like inverted tubs. Many of these "rotary" oil cars, as they were called, were used for transporting oil from the Pennsylvania wells until replaced by the present type of horizontal cylindrical tank, fitted with a dome which allows the oil to expand without injury to the tank. The first of this type was introduced in 1868.

440. What Presidents worked for the railroads in their earlier days?

James Buchanan was president of the Harrisburg, Portsmouth, Mount Joy & Lancaster Railroad, in Pennsylvania, in the 1830's. This railroad is now a part of the main line of the Pennsylvania.

Abraham Lincoln was an attorney for the Illinois Central and Rock Island railroads in Illinois during the 1850's.

Harry S. Truman was a timekeeper on the construction of the Santa Fe Railway about 1902.

441. What noted military leaders of the Civil War were identified with railroads?

At least twenty-three generals in the War Between the States were railway officers before or after that conflict. They were:

Wirt Adams, president, Gulf & Ship Island Railroad;
Edward P. Alexander, president, Savannah & Memphis; Western Railway of Alabama; Central Railroad & Banking Company of Georgia; and vice-president, Louisville & Nashville;
Russell A. Alger, president, Detroit, Bay City & Alpena;

Nathaniel P. Banks, regional director, Illinois Central;
P. G. T. Beauregard, general superintendent and president, New Orleans, Jackson & Great Northern;
Mason Brayman, general solicitor, Illinois Central;
Napoleon B. Buford, president, Rock Island & Peoria;
Ambrose E. Burnside, cashier and treasurer, Illinois Central;
John A. Dix, president, Erie;
Grenville M. Dodge, chief engineer, Union Pacific;
Nathan Bedford Forrest, president, Selma, Marion & Memphis;
Henry W. Halleck, president, Pacific & Atlantic;
Ethan Allen Hitchcock, vice president, St. Louis, Iron Mountain & Southern;
Robert E. Lee, president, Valley Railroad of Virginia;
William Mahone, chief engineer of construction, Norfolk & Petersburg; president, Norfolk & Tennessee;
Daniel C. McCallum, general superintendent, Erie;
George B. McClellan, vice-president, Illinois Central; president, Ohio & Mississippi, and Atlantic & Great Western;
Thomas A. Morris, president, Indianapolis, Pittsburgh & Cleveland;
Rufus Polk Neely, president, Mississippi Central & Tennessee;
William J. Palmer, president, Denver & Rio Grande;
Horace Porter, vice president, Pullman; president, New York, West Shore & Buffalo;
Thomas A. Scott, president, Pennsylvania, Union Pacific and Texas & Pacific;
Daniel E. Sickles, president, Chicago, Saginaw & Canada.

442. Who was Casey Jones?

The hero of the song "Casey Jones" 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, grey-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.

443. 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 in Ohio in 85 seconds, or at the rate of 127.06 miles per hour.

444. 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 asked for a special train to take him to Chicago faster than any human being had ever made the trip before! 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" 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 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.

445. When did the Chicago, Milwaukee, St. Paul & Pacific 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.

446. 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. Car ferries which were formerly operated between Key West and Havana, are now operated between Port Everglades and Havana.

447. What was the fastest transcontinental run ever made?

In October, 1934, the Union Pacific Diesel-powered streamliner "City of Portland" (M10001) 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.

448. 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.

449. When was the first Pullman sleeping car built and placed in service?

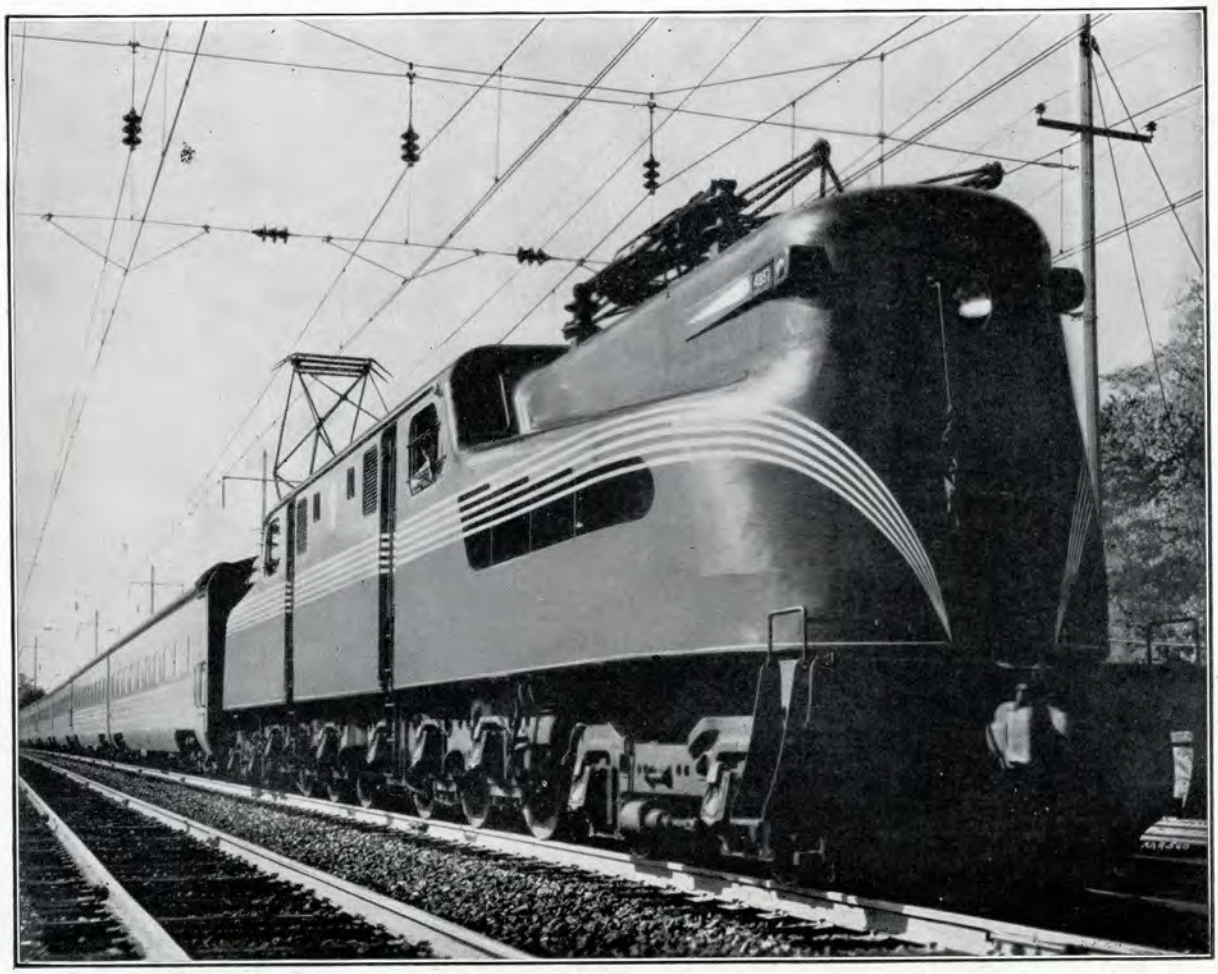
In 1858-59, George M. Pullman, a young Chicago contractor, converted two passenger coaches of the Chicago & Alton Railroad (Nos. 9 and 19) into sleeping cars at the railway company's shops in Bloomington, Illinois. The first of these cars—No. 9—made its initial trip from Bloomington to Chicago on the 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.

450. 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 6, D. C.; the Eastern Railroad Presidents Conference, 143 Liberty Street, New York 6, N. Y.; the Western Association of Railway Executives, 105 West Adams Street, Chicago 3, Ill., or to any railway company.

Over the railroads of the United States run some 17,500 passenger trains daily, providing a transportation service unsurpassed in all the world.



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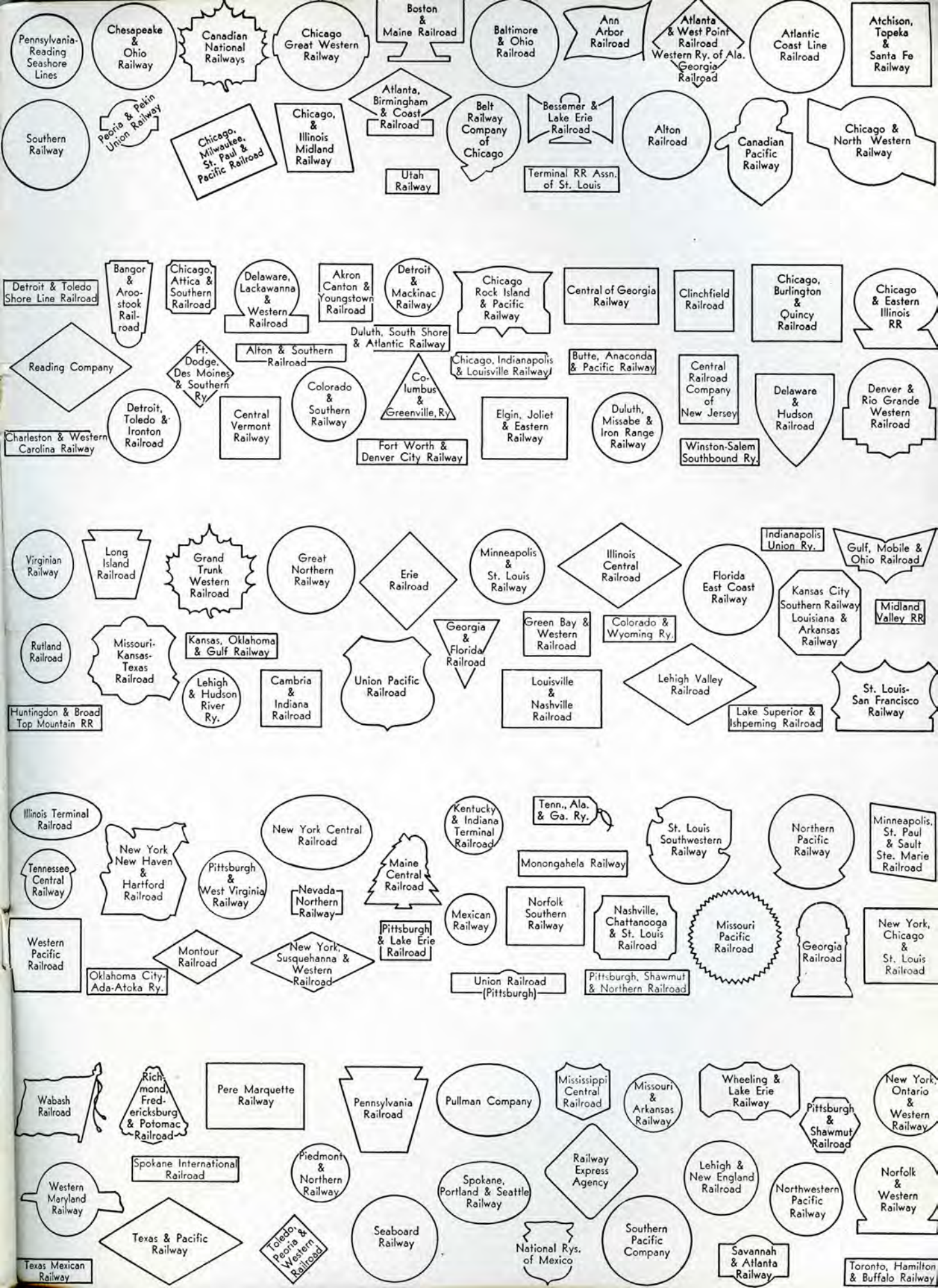
Pennsylvania-Reading Seashore Lines
Chesapeake & Ohio Railway
Canadian National Railways
Chicago Great Western Railway
Boston & Maine Railroad
Baltimore & Ohio Railroad
Ann Arbor Railroad
Atlanta & West Point Railroad Western Ry. of Ala. Georgia Railroad
Atlantic Coast Line Railroad
Atchison, Topeka & Santa Fe Railway
Southern Railway
Peoria & Pekin Union Railway
Chicago, Milwaukee, St. Paul & Pacific Railroad
Chicago, & Illinois Midland Railway
Atlanta, Birmingham & Coast Railroad
Belt Railway Company of Chicago
Bessemer & Lake Erie Railroad
Alton Railroad
Canadian Pacific Railway
Chicago & North Western Railway
Utah Railway
Terminal RR Assn. of St. Louis
Detroit & Toledo Shore Line Railroad
Bangor & Aroostook Railroad
Chicago, Attica & Southern Railroad
Delaware, Lackawanna & Western Railroad
Akron Canton & Youngstown Railroad
Detroit & Mackinac Railway
Chicago Rock Island & Pacific Railway
Central of Georgia Railway
Clinchfield Railroad
Chicago, Burlington & Quincy Railroad
Chicago & Eastern Illinois RR
Reading Company
Ft. Dodge, Des Moines & Southern Ry.
Alton & Southern Railroad
Duluth, South Shore & Atlantic Railway
Chicago, Indianapolis & Louisville Railway
Butte, Anaconda & Pacific Railway
Central Railroad Company of New Jersey
Delaware & Hudson Railroad
Denver & Rio Grande Western Railroad
Detroit, Toledo & Ironton Railroad
Central Vermont Railway
Colorado & Southern Railway
Columbus & Greenville, Ry.
Elgin, Joliet & Eastern Railway
Duluth, Missabe & Iron Range Railway
Charleston & Western Carolina Railway
Fort Worth & Denver City Railway
Winston-Salem Southbound Ry.
Virginian Railway
Long Island Railroad
Grand Trunk Western Railroad
Great Northern Railway
Erie Railroad
Minneapolis & St. Louis Railway
Illinois Central Railroad
Indianapolis Union Ry.
Gulf, Mobile & Ohio Railroad
Florida East Coast Railway
Kansas City Southern Railway Louisiana & Arkansas Railway
Midland Valley RR
Rutland Railroad
Missouri-Kansas-Texas Railroad
Kansas, Oklahoma & Gulf Railway
Georgia & Florida Railroad
Green Bay & Western Railroad
Colorado & Wyoming Ry.
Lehigh & Hudson River Ry.
Cambria & Indiana Railroad
Union Pacific Railroad
Louisville & Nashville Railroad
Lehigh Valley Railroad
St. Louis-San Francisco Railway
Huntingdon & Broad Top Mountain RR
Lake Superior & Ishpeming Railroad
Illinois Terminal Railroad
New York New Haven & Hartford Railroad
New York Central Railroad
Kentucky & Indiana Terminal Railroad
Tenn., Ala. & Ga. Ry.
St. Louis Southwestern Railway
Northern Pacific Railway
Minneapolis, St. Paul & Sault Ste. Marie Railroad
Tennessee Central Railway
Pittsburgh & West Virginia Railway
Nevada Northern Railway
Maine Central Railroad
Monongahela Railway
Mexican Railway
Norfolk Southern Railway
Nashville, Chattanooga & St. Louis Railroad
Missouri Pacific Railroad
Georgia Railroad
New York, Chicago & St. Louis Railroad
Western Pacific Railroad
Montour Railroad
New York, Susquehanna & Western Railroad
Pittsburgh & Lake Erie Railroad
Oklahoma City-Ada-Atoka Ry.
Union Railroad (Pittsburgh)
Pittsburgh, Shawmut & Northern Railroad
Wabash Railroad
Richmond, Fredericksburg & Potomac Railroad
Pere Marquette Railway
Pennsylvania Railroad
Pullman Company
Mississippi Central Railroad
Missouri & Arkansas Railway
Wheeling & Lake Erie Railway
Pittsburgh & Shawmut Railroad
New York, Ontario & Western Railway
Spokane International Railroad
Piedmont & Northern Railway
Railway Express Agency
Lehigh & New England Railroad
Northwestern Pacific Railway
Norfolk & Western Railway
Western Maryland Railway
Spokane, Portland & Seattle Railway
Texas & Pacific Railway
Toledo, Peoria & Western Railroad
Seaboard Railway
National Rys. of Mexico
Southern Pacific Company
Savannah & Atlanta Railway
Texas Mexican Railway
Toronto, Hamilton & Buffalo Railway


Santa Fe
Atlantic Coast Line
The West Point Route
Ann Arbor Railroad
B&O Linking 13 Great States with the Nation
Chicago Great Western Corn Belt Route Railway Company
Canadian National Railways
Seashore Lines
Chicago North Western System
Canadian Pacific
Aston Railroad Company
Bessemer
The Belt Railway of Chicago
ABC Railroad
Chicago & Illinois Midland
Chicago Milwaukee St Paul and Pacific
The Southern Serves the South
T. RR. A.
UTAH
Speed C&EI Service
Burlington Route
"The Clinchfield Route"
Central of Georgia
Rock Island
Detroit and Mackinac Railway
Lackawanna
Bangor and Aroostook Railroad
Scenic Maine
D. & T.S.L.
Rio Grande Royal Gorge Moffat Tunnel Scenic Line of the World
Soo Line
Duluth Missabe and Iron Range
Chicago Outer Belt Line
Alton and Southern
Colorado and Southern
Fort Dodge Line
Central Vermont Railway
D&I
Reading Lines
W-S.S.B.
B.A. & P.
Monon Route
Delta Route
D.S.S.A.
F.W. & D.C.
C. & W.C.
GM&O
I.U.R.
M.V.
Kansas City Southern
Florida East Coast Railway Flagler System
Illinois Central
Minneapolis & St. Louis Railway
Erie
Great Northern Railway
Grand Trunk Railway System
PRR
Virginian Railway
C. & W.
Green Bay Route
K.O. & G.
M-K-T
Rutland Railroad
Frisco Lines
L.S. & I.
L&N
Union Pacific
Cambria and Indiana Railroad
H. & B.T.M.
Northern Pacific
Cotton Belt Route
TAG Route
New York Central System
Railroad Illinois Terminal Company
Monongahela
Maine Central Railroad
N. N.
P&W
The New York New Haven and Hartford Railroad Co.
Nickel Plate Road
Missouri Pacific Lines
N.C.&St.L. The Dixie Line
Norfolk Southern
Pittsburgh Lake Erie Railroad
Mont Dur RR
Western Pacific
P.S. & N.
UNION
O.C.-A-A
W
W&L.E.
Mississippi Central
Pullman
PRR
Pere Marquette
Wabash
P&S
N&W Railway
Lehigh New England
Railway Express Agency
Spokane Int.
Northwestern Pacific
Spokane Portland and Seattle
Western Maryland
Southern Pacific Lines
Seaboard Railway
The Peoria Road
The Texas & Pacific Railway
Savannah & Atlanta
T.H. & B.
TEX.MEX.