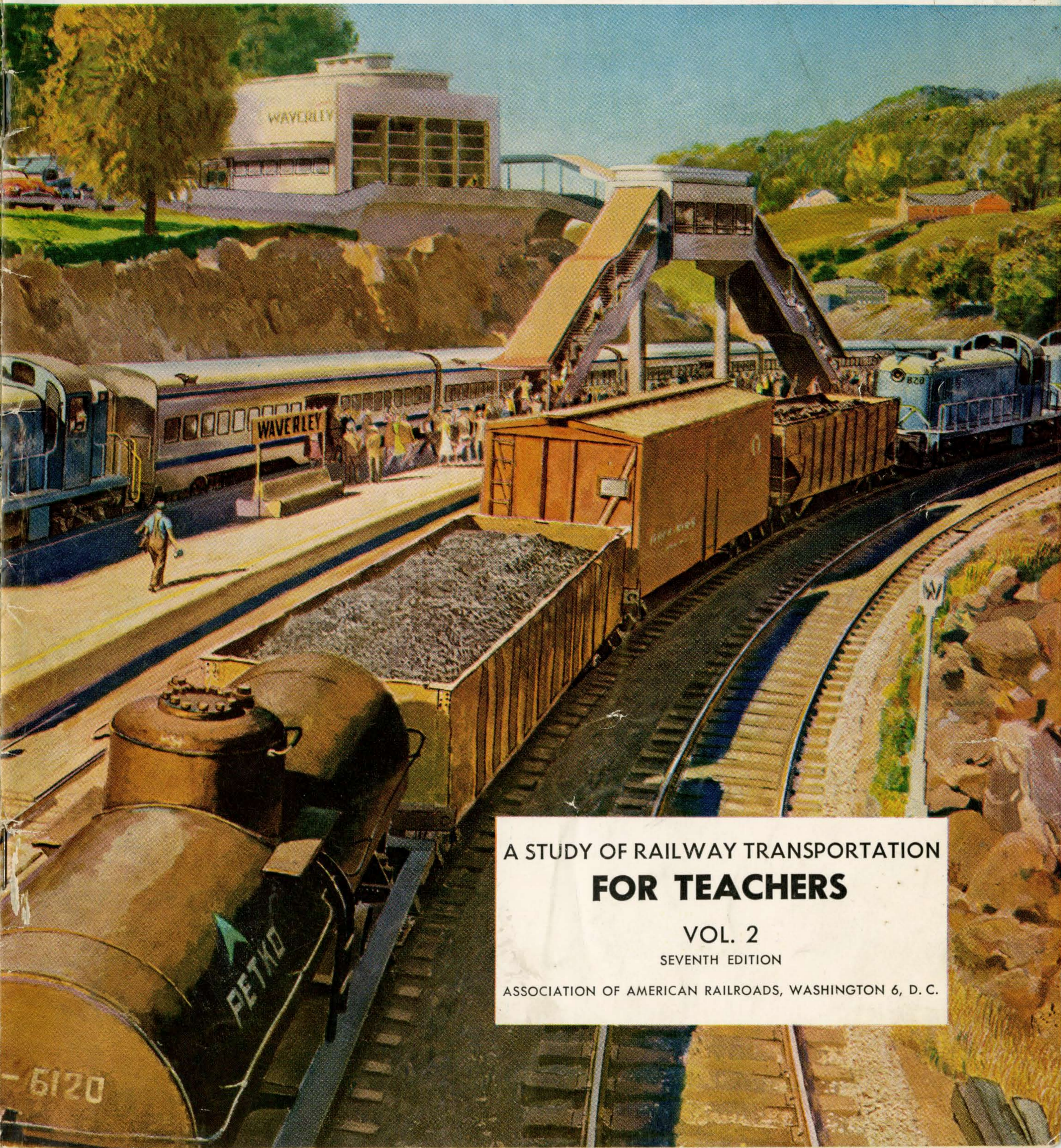
# THE *Stories* BEHIND THE PICTURES




A STUDY OF RAILWAY TRANSPORTATION

**FOR TEACHERS**

VOL. 2

SEVENTH EDITION

ASSOCIATION OF AMERICAN RAILROADS, WASHINGTON 6, D. C.

A STUDY OF RAILWAY TRANSPORTATION • VOLUME 2

# THE STORIES BEHIND THE PICTURES

## FOR TEACHERS

SEVENTH EDITION

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ASSOCIATION OF AMERICAN RAILROADS

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# FOREWORD

This booklet and the accompanying material have been made available in response to a widespread and increasing demand from schools for information on railroad transportation and related subjects. The content of *The Stories Behind the Pictures* is designed to provide the teacher with background material which will be helpful in discussing the set of large, separate pictures.

The pictures, repeated in this booklet in smaller size, have been selected because of their educational value and with a view to giving the pupil a broad understanding of what the railroads are, what they do, how they work, and the part they play in the life of the community, the state, and the nation. Many phases of railway transportation are covered—including railroad history, the effect of railroads upon the development of the country and upon social and economic conditions, the several kinds of transportation service provided by the railroads, the present-day operations of the railroads, and the relation of rail transportation to our great basic industries as well as to our individual lives.

Among other things, the text describes many railroad occupations, emphasizes safety in railway operations, mentions the advantages of standardized equipment, and refers to the services of railroads in time of war.

The Association of American Railroads welcomes inquiries from teachers on aspects of railway operations or railway transportation not adequately covered by this booklet and the accompanying material.

ASSOCIATION OF AMERICAN RAILROADS.

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# ROMANCE OF THE RAILS

> Was there ever a boy living near a railway line whose heart didn't beat faster when he heard the big engine coming up the grade—maybe two engines if it was a lucky day. Up they came—flats, gondolas, and box-cars—up the grade and over, gathering speed, swaying around the bend, shooting sparks as the brakes went on, shaking the ground, a god in greasy cap leaning out of the cab window, demigods running along the tops or perched in the Olympus of the caboose.
>
> —*New York Times.*

The railway train holds a strong fascination for most of us. Even though we have seen thousands of trains and have ridden on many of them, we still experience a thrill at the spectacle of a big locomotive and its train of cars or a sleek and shining streamliner hurrying along the rails.

Why does the speeding train excite our interest and stir our imagination? Is it the roar of the powerful engine? Is it the glamour and romance that attaches to the epic story of the Iron Horse pushing back the frontiers, blazing new trails across the continent? Or is it the lure of adventure that always clings to railway travel?

Perhaps each of these contributes its part, but there is also the realization that we are witnessing one of the wonders of the modern age—the American railroad in action! We are aware that such a vast, systematic, and efficient system of transportation never existed before in all the world's history.

We see in the modern railway train the symbol of American progress, the expression of dynamic American enterprise. And we are justifiably proud of the fact that we have in America not only the world's greatest system of railroads, but also the finest and fastest fleet of passenger and freight trains the world has ever known.

We realize, too, that thousands of improvements which have contributed to our modern railway system have sprung from the inventive genius of our own people. The locomotive was of British origin, but American inventors and engineers improved it in a thousand ways. Entirely American in origin are the Pullman sleeping car, the dining car, the observation car, the refrigerator car, the hopper car, and the tank car. America also produced the air brake, the automatic coupler, the vestibule, the telephone, fluorescent lighting, air conditioning, and countless other features which have contributed so greatly to railway safety, comfort, and efficiency.

The story of American railway development is rich in romantic interest. It is a story of empire building on a magnificent scale—a story of bold enterprise and dauntless courage, of amazing progress, and stupendous achievement.

When Andrew Jackson traveled from his home in Nashville, Tennessee, to Washington, in 1829, to take the oath of office as President of the United States, there was not a locomotive in operation on the American continent. The President-elect traveled by stagecoach. Four weeks were consumed in the journey!

During Jackson's administration several short rail lines were opened, and "Old Hickory" was the first President to ride on a railroad train.

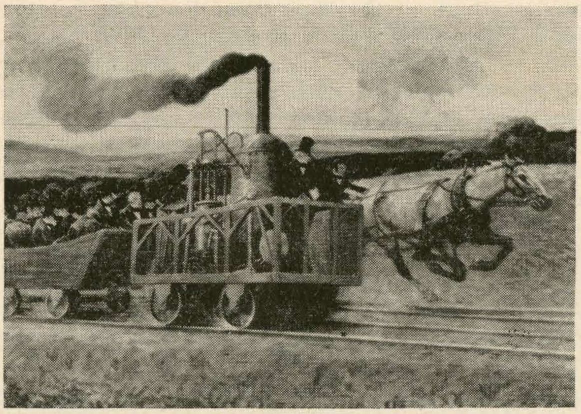
Before the introduction of railroads, travel was slow and difficult. The few highways that existed bore little semblance to those of the present day, and during certain seasons of the year snows or heavy rains rendered them almost impassable. The cost of transporting freight long distances by wagons was prohibitive. For instance, the cost of hauling a ton of merchandise by wagon from New York to Buffalo was $100, and the trip took twenty days. In Illinois, $10 a ton for each twenty miles was not uncommon in pioneer days. High transportation costs greatly retarded settlement and development in the interior.

River commerce was slow, sometimes hazardous, and uncertain, and for months of each year waterborne commerce over a large part of the country was entirely suspended because of ice.

Railway transportation was affected by neither ice nor low water. The railroads brought speedy, dependable, low-cost, all-year-round transportation to the remotest regions of the interior. They pushed back the frontiers. With the extension of their lines through the interior, settlers followed in great numbers; agricultural production increased; homes, hotels, churches, and schools were established; the log cabins of the pioneers gave way to frame and brick dwellings. The lumberman, the mine operator, the manufacturer, and the merchant contributed their parts to the transformation.

The thousands of towns and cities which sprang up and flourished along the new arteries of commerce and communication became markets for the products of farms and forests and mines and factories. Thus America forged ahead year after year, decade after decade, to become the world's foremost agricultural and industrial empire.

# 1. THE RACE OF THE IRON HORSE AND THE HORSE CAR



This little engine was so small,
It hardly seemed like one at all.
Ran a race with a horse one day,
Engine broke down—horse ran away!
—M.T.S.

This verse tells in simple fashion the fascinating story of the beginning of steam transportation on one of America's pioneer railroads. The events that led up to the race form an interesting chapter in American railroad history.

In 1829, the people of Baltimore were greatly interested in the new railroad to Ellicott's Mills, thirteen miles away. This railroad was crudely built of wooden rails capped with thin strips of iron. The iron strips added to the durability of the rails and provided a running surface for the wheels. The railroad company transported passengers and freight in horse-drawn cars. In its efforts to find a better type of motive power, the company also experimented with treadmill cars and cars equipped with sails.

Peter Cooper, an enterprising young manufacturer with a mechanical turn of mind, had been hearing about the success of experiments with steam locomotives in England. Mr. Cooper decided to try his hand at building one. He discussed his plans with the people who were interested in the Baltimore railroad, and they agreed to let him try out the engine on their road.

Mr. Cooper learned all he could about steam engines and spent many weeks building his locomotive. It was a strange little contrivance, not much larger than the modern sectionmen's motor car. It was built of odds and ends. Old gun barrels were used as flues in the boiler. Because of its small size, Mr. Cooper called the locomotive the "Tom Thumb." Mr. Cooper had a great deal more confidence in the successful operation of his locomotive than did some of the persons who watched him put it together.

The "Tom Thumb" was placed on the track and tried out in September, 1829, but it was not a success. Instead of giving up, Peter Cooper took the engine apart and rebuilt it. Finally, its defects were overcome to such an extent that it would run for miles under its own power.

One day in August, 1830, the directors of the railroad rode from Baltimore to Ellicott's Mills and back in an open car pulled by the "Tom Thumb." It was indeed a strange experience. Never before in American history had a locomotive been used to transport passengers. People lined the railroad to witness the strange spectacle of an "Iron Horse," driven by steam, pulling a carriage or car on rails at a speed equal to that of the best horseflesh!

On the return trip the "Tom Thumb" was met by a car drawn by one of the fastest stagecoach horses in that part of the country. The driver of the horse car challenged Mr. Cooper to a race. Mr. Cooper accepted, and the contest was soon under way. One of the passengers on that historic trip wrote that "the start being even, away went horse and engine, the snort of the one and the puff of the other keeping time and time."

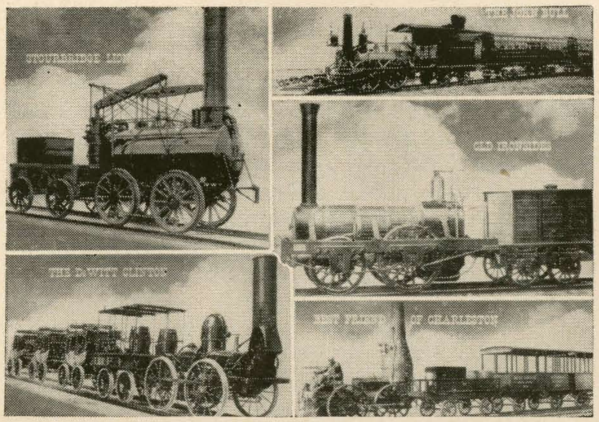
For a while the horse had the best of it and forged ahead. Then, as the steam pressure increased, the locomotive picked up speed until it began to gain on the horse. But, alas, just when the "Tom Thumb" was getting the better of the horse and success seemed about to be achieved, a belt on the engine's blower slipped! Before Mr. Cooper could restore the belt to its proper position, the steam pressure had dropped and the "Tom Thumb" had fallen behind. By the time steam was up again, the horse was too far ahead to be overtaken, and the "Iron Horse" lost the race!

But, despite its mishap, the performance of the little engine convinced the railroad managers of the practicability of steam power for the movement of railway cars. Many men, including Matthias Baldwin, E. L. Miller, John B. Jervis, and Phineas Davis, began to interest themselves in this new type of machine. Other and better locomotives and other railroads were built, and before many years had passed, steam rail transportation had been introduced in several states, from Maine to Georgia and as far west as Illinois, Kentucky, Tennessee, Mississippi, and Louisiana.

---

1. **Why was Peter Cooper's engine called the "Tom Thumb"?**
2. **Why did the horse win the race?**
3. **What other types of power did the railroad company try out?**
4. **How does the engine in the picture differ from those of today?**
5. **How were the tracks of the first railroad built? Compare them with the tracks of today.**
6. **What makes a locomotive run?**
7. **What were the advantages of steam power over horse power?**
8. **In what part of the country were the first railroads built?**
9. **What were the purposes of the early railroads?**
10. **Who were some of the pioneer locomotive builders?**

# 2. "PUFFING BILLIES"



The first locomotives aroused a great deal of interest. People traveled many miles just to see them. What made them go was a mystery to many persons. People called them "Iron Horses," "Puffing Billies," and "Steam Wagons."

Among the famous locomotives of pioneer days, in addition to the "Tom Thumb," were the "Stourbridge Lion," the "Best Friend of Charleston," the "DeWitt Clinton," the "John Bull," and "Old Ironsides."

The "Stourbridge Lion" was the first locomotive to be operated on a regular railroad in America. It was built in England and shipped across the Atlantic in a sailing vessel. Its first trip under its own power was made on the line between Honesdale and Carbondale, in Pennsylvania, in August, 1829. Young Horatio Allen, who purchased the engine in England, was the engineer. Because of the dangers involved, no one was allowed to ride with Allen. Although the "Lion" weighed only seven tons, it was found to be too heavy for the bridges and tracks, so the railroad operators returned to the use of horses or mules for motive power.

The "Best Friend of Charleston" was the first locomotive to be placed in regular daily service in America. This historic locomotive was built at the West Point Foundry, in New York City, and shipped by sailing vessel to Charleston, South Carolina, in October 1830. It made its first trial trip with a number of passengers over a few miles of completed railroad out of Charleston on November 2, 1830, and was placed in regular scheduled service on Christmas Day of that year. The engine continued in service for several months. Then one day the fireman fastened down the safety valve in an effort to stop the hissing noise caused by escaping steam. The boiler blew up, seriously injuring the fireman and ending the career of the "Best Friend" under that name.

The "DeWitt Clinton" was the first locomotive to haul a train in New York State. This engine also was built at the West Point Foundry. It made its first trip from Albany to Schenectady in August, 1831. On that historic occasion the locomotive drew a train of carriages with a distinguished passenger list. The "DeWitt Clinton" was named for Governor DeWitt Clinton, of New York, who signed the railroad charter and was a great friend of canals and railroads.

The "John Bull" was the first locomotive to pull a train of cars in New Jersey and the first locomotive in the world to be equipped with a "cow catcher." It was named "John Bull" because it was built in England. The engine made its first run over a railroad at Bordentown, New Jersey, on November 12, 1831, and it ran on that road for many years. In 1893, after years of idleness, the engine, pulling two pioneer coaches, made a 920-mile trip under its own power to Chicago, where it was a World's Fair attraction. The historic locomotive is now one of the permanent exhibits of the Smithsonian Institution in Washington.

"Old Ironsides," the pioneer locomotive of Philadelphia, began running regularly on a railroad between Philadelphia and Norristown on November 23, 1832. Its builder—Matthias W. Baldwin—was a jeweler and watchmaker. When business fell off, he turned to the manufacture of tools and textile machines. A steam engine was needed to run his factory. Instead of buying one, Mr. Baldwin decided to build it himself. The engine was so successful that he decided to try his hand at locomotives. "Old Ironsides" was the result, and thus began Mr. Baldwin's notable career as a locomotive builder.

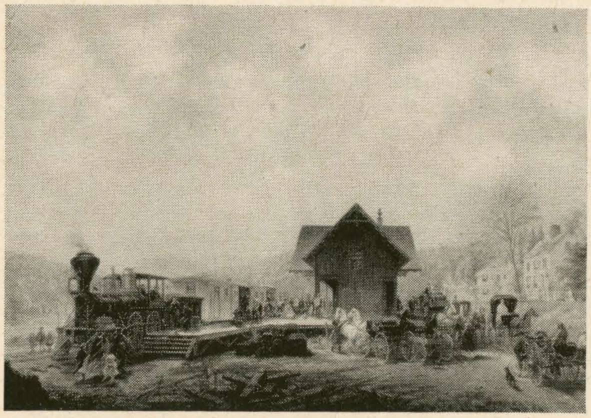
When these engines were built and placed in service, transportation in America was slow and difficult. Travel and transportation by land was largely by horseback, stagecoach, ox cart, and Conestoga wagon. There were few good highways.

Railway transportation represented a great improvement over the modes of transportation then in common use.

---

1. **What were some of the nicknames of locomotives in the early days, and why were they so called?**
2. **What were the names of some of the early locomotives in America?**
3. **Tell some interesting facts about the locomotives in the picture.**
4. **What kind of fuel did the pioneer locomotives burn?**
5. **Why did this country import locomotives from England?**
6. **How did people travel and ship goods before railroads were introduced?**
7. **How did such travel and transportation compare with railway transportation?**
8. **How did people regard the railroads at first?**
9. **How does railway travel in the 1830's compare with railway travel today?**
10. **When did railway transportation come to your community?**

# 3. A RAILWAY STATION AND TRAIN IN THE 1860's



Great and many were the changes in railway transportation from the 1830's to the 1860's, and great and many indeed have been the changes since then.

This is a typical railway scene in the 1860's. With the arrival and departure of each passenger train, the station platform and grounds presented a busy scene. At the right in the picture is an assortment of conveyances—an ox cart, a drayman's wagon, smart carriages, a hansom cab, and a stagecoach—typical of the highway vehicles of that period.

Before railroads were introduced, stagecoaches provided passenger and mail service for long distances, with many changes of horses and drivers and many stops for rest, refreshments, and sleep en route. When the railroad was opened, many stagecoaches turned to providing service between the railroad and communities located off the rail route.

Of course, the locomotives of the 1860's were much smaller than those now in use. Most of them burned wood for fuel. A conspicuous feature of the wood-burning locomotive was its large "balloon-shaped" smokestack, which was often fitted with a screen to prevent sparks from flying out and setting fire to the wooden cars, to the wood in the tender or to buildings, bridges, or forests along the route. In extremely cold weather, the little locomotives had much difficulty in keeping up steam, and few of them maintained their schedules. Sometimes in blizzard weather they became stalled in snow drifts for hours or even for days. When conditions were favorable, passenger trains in those days usually averaged about fifteen or twenty miles an hour.

The light wooden passenger cars were a great improvement over those of a generation before, but they lacked many of the comforts of the all-steel passenger cars of today. They were heated by wood-burning or coal-burning stoves. In some cars there were stoves at both ends; in others there was one stove in the center. Stoves did not distribute heat uniformly throughout the car, and passengers frequently complained that the cars were either too hot or too cold.

Ventilation was poor, especially when the weather did not permit the windows to be opened. There were no screens, so that when the windows were opened, smoke, cinders, and dust entered the car to the discomfort of the passengers.

Cars were lighted by flickering coal-oil or gas lamps and so dimly that reading by lamplight was almost out of the question.

Only a few passenger cars in the 1860's were equipped with vestibules, or enclosed platforms, somewhat as they are today, and it was dangerous for passengers to go from one car to another when the train was in motion.

Club, lounge, and observation cars were then unknown, and there were very few sleeping cars.

The roadbeds of even the best railroads were lightly and crudely built when measured by modern standards, and trains did not ride nearly so smoothly as they do today. Moreover, signal systems were in their infancy and there were few safety devices.

Not only have the speed of trains and the comforts, conveniences, and safety of passenger travel been greatly increased since the period depicted by this picture, but the cost of railway travel has been very substantially reduced since then.

Railway transportation revolutionized life in the older parts of the country and opened up vast regions for settlement.

Wherever the rails were laid and the "Iron Horse" appeared, communities took on new life and a new outlook. As the rails were pushed through the mountains and valleys and across the prairies, farms were opened; homes, schools, churches, stores, and mills were established; forest and mineral resources were developed, and the foundations were laid for the agricultural and industrial development which has made the United States the great nation it is today.

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1. **How does this scene differ from a modern passenger station scene?**
2. **What were some of the difficulties of railroading in the 1860's?**
3. **What present-day conveniences and comforts were then lacking?**
4. **How were passenger cars heated and lighted then?**
5. **What are vestibules, and what is their purpose?**
6. **How was the food problem solved without dining cars?**
7. **What was the average speed of passenger trains in the 1860's, and how does it compare with the speed of trains today?**
8. **Why do trains ride more smoothly today than in the early days?**
9. **What forms of local transportation were then in vogue?**
10. **How did railroads help develop agriculture and industry?**

# 4. WHEN THEY DROVE THE GOLDEN SPIKE

The discovery of gold in California in 1848 gave great impetus to the westward movement. In the years that followed, while scores of railway lines were being pushed through the fast-growing Ohio and Mississippi Valley regions, thousands of gold seekers and other adventurous spirits were making their way by various routes to the new "El Dorado."

Many took passage on sailing vessels around "The Horn," a hazardous voyage that required months. Many others went by clipper ships or steam vessels to the Isthmus of Panama, crossed fifty miles of jungle, and embarked on other vessels bound for California—a journey of several weeks. Still others braved the perils and hardships of an overland journey on horseback, or by stagecoach, or covered wagon, across plains and deserts and over dangerous mountain trails. Fortunate indeed was the traveler who made the trip from St. Louis or St. Joseph to California in three or four weeks of strenuous travel.

In 1850, there was not a mile of steam railroad anywhere west of the Mississippi River.

The first locomotive to turn a wheel west of the Mississippi River ran out of St. Louis in 1852. At that time the talk of railroads was on nearly every tongue, and a few railroads were actually getting under way in the West. From St. Louis and Hannibal, Missouri, and from Burlington, Davenport, Clinton, and Dubuque, Iowa, railway lines soon began pushing westward from the Mississippi River.

Before the close of the decade 1850 to 1860, several railway lines were in operation in Iowa and Missouri, and the "Iron Horse" had penetrated as far west as the Missouri River at St. Joseph. From 1850 to 1860, railway mileage in the United States increased from 9,021 to 30,626 miles. Ever since then this country has led all other countries in railway mileage.

Meanwhile, the country had been growing by leaps and bounds, with the railroads playing a major role. Many railroads were being built; other railway projects were in contemplation. One of these was a line of railroads, 1,776 miles in length, extending from the Missouri River all the way to the Pacific Ocean!

The proposed rail route would be two and one-half times longer than the longest railroad then existing in the world.

One day, in 1863, President Abraham Lincoln, sitting at his desk in the White House in Washington, signed a document that fixed the eastern terminus of the proposed rail route at Omaha, Nebraska Territory. In California, another company was organized to build a railroad eastward from San Francisco to meet the road from Omaha. Within a short time dirt was flying in Nebraska and California.

Thousands of workmen, large numbers of teams, many supply trains, and vast quantities of equipment and supplies were employed in carrying this stupendous project forward. Each month the gap between the two construction forces became shorter, and finally, on May 10, 1869, after six years of strenuous effort, the rails were joined at Promontory, Utah.

A train from the East and a train from the West, each bearing a group of distinguished passengers, approached and halted within a few feet of each other. Then, between the noses of the two locomotives, a memorable scene was enacted. The symbolic last spike—a spike of California gold—was driven, signalizing the completion of the first chain of railroads to span the American continent!

The driving of the golden spike in Utah on that eventful day marked an epoch in American history. It brought to an end the isolation of the Far Western country. It united and cemented the East and the West—brought the cities of the Atlantic and Pacific within a week's journey of each other. It opened up a vast region for settlement and development. It rendered unnecessary the perilous cross-country journeys by stagecoach or covered wagon or the long hazardous journeys by water around Cape Horn or by way of Panama.

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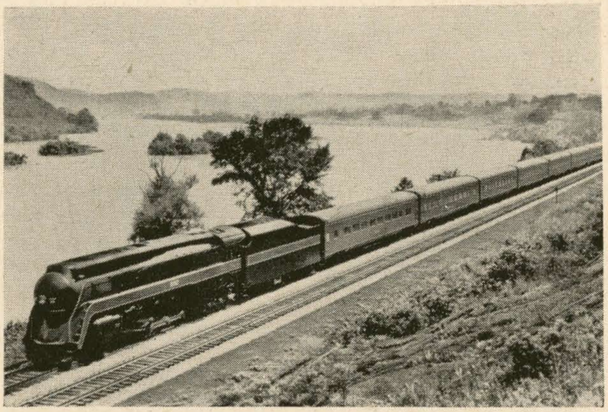
1. **What effect did the discovery of gold have upon Western development?**
2. **How did gold-seekers and others reach California before the railroads were built?**
3. **How long did it take them to make the journey by the different routes?**
4. **When was steam transportation introduced west of the Mississippi River?**
5. **What President signed the bill providing for the first transcontinental rail route?**
6. **Tell what you can about the golden spike.**
7. **What was the effect of railroads upon Western development?**
8. **What advantages did railway transportation have over (a) Pony Express, (b) stagecoaches, (c) covered wagons, (d) flatboats, (e) sailing vessels, (f) steamboats?**
9. **How did railroads help to settle the interior?**

# 5. A STEAM PASSENGER TRAIN



The modern passenger train represents more than a century of scientific research and engineering advancement. It embodies comforts and conveniences which were unknown a generation or two ago. Into the passenger train of today are built many of the latest technological developments of mechanical engineers, electrical engineers, air-conditioning engineers, metallurgists, chemists, designers, and countless other scientific experts.

This is a picture of a modern long-distance streamlined steam passenger train. Trains of this type run for many hundreds of miles, frequently traveling night and day, with one or several changes of locomotives and crews en route.

Each train runs on a definite time schedule, which is published in the railroad company's timetables and also in the *Official Guide of the Railways*, so that all railway employees and all other persons may know exactly when the train is due to start and complete its run and when it is due to arrive or depart at each station en route.

The tender, which carries the fuel and water for the steam locomotive, is attached to the rear end of the locomotive. The tender has a compartment for coal or oil and a compartment for water. Before a steam locomotive starts on its run, its tender is filled with fuel and water. Many tenders are large enough to carry sufficient fuel to enable the engine to run hundreds of miles without refueling. When the engine stops for fuel or water, it is the fireman's job to see that the tender is filled. Immediately behind the tender are the cars for express, mail, and baggage. Next to them are the passenger coaches, and behind the passenger coaches are the sleeping cars. The dining car and the lounge or club car are usually located about midway in the passenger-carrying part of the train. If an observation car is carried, it is usually the last car in the train.

On many of the large railroads, where traffic is heavy, a typical long-distance, main-line passenger train operating on an overnight run or for a longer distance, may consist of a mail car, a baggage and express car, one or more passenger coaches, from one to several sleeping cars, a dining car, and a lounge, club or observation car.

Frequently, when mail, baggage, and express shipments each do not require a full car, combination cars (having compartments for mail and express, or baggage and express, or baggage and passengers) are used.

The modern passenger train may be likened to a hotel or home. The lounge car, club car, observation car, or parlor car correspond to the lobby of a hotel or the living room of a home; the dining car is the restaurant or dining room; and the sleeping cars are the bedrooms. With dust and smoke no longer a problem, the interior decorations and furnishings are done in cheerful and attractive color schemes.

Today's steam locomotive is many times larger than the locomotive of early days. It is also much faster and many times more powerful. To support the great weight of the modern locomotive and its heavy train, the railroads have much stronger bridges than were formerly used; roadbeds are more solidly built; rails are heavier and stronger.

The modern streamlined passenger train is built of steel or other strong alloys. It is fitted with double glass windows. Platforms and passages between the cars are enclosed and protected from the weather. All streamlined trains are air-conditioned; lighted throughout by electricity; and are equipped with comfortable seats, water supply, toilet facilities, and many other conveniences.

The railroads operate many thousands of passenger trains in the United States each day. Somewhere in this country a passenger train starts on its run every few seconds, day and night.

Today, most of these trains are powered by Diesel-electric locomotives, as described in a succeeding page.

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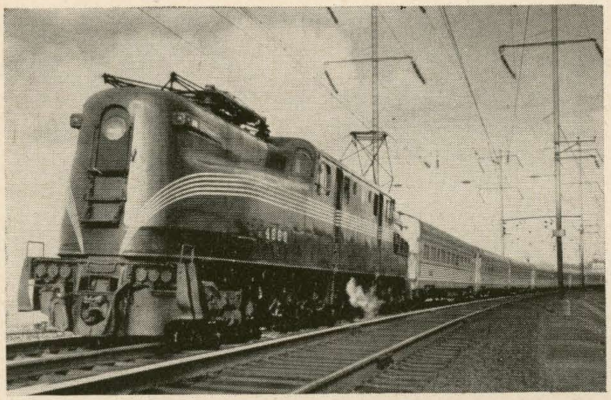
1. **What does a passenger train do?**
2. **How does the passenger train help us?**
3. **How far do some passenger trains travel?**
4. **What kinds of cars are in the passenger train?**
5. **What is the purpose of each type of car?**
6. **How are modern trains lighted?**
7. **Why do tracks and bridges have to be stronger now than ever before?**
8. **How do present passenger train speeds compare with those of grandfather's boyhood?**
9. **Name some of the passenger trains with which you are familiar.**
10. **Between what important cities do they run?**
11. **What does a steam locomotive use for fuel?**
12. **How does a locomotive carry fuel and water?**

# 6. AN ELECTRIC PASSENGER TRAIN



On many railroads electric locomotives as well as steam and Diesel-electric locomotives are used for hauling trains and for switching cars. The electric locomotive can pull heavy trains over steep mountain grades. It can run forward or backward with equal facility, thus eliminating the time and expense of having to be turned around at the end of each run. It can pick up and reduce speed rapidly.

Electric locomotives are sometimes used for heavy freight and passenger service in mountainous regions, for switching service in metropolitan areas, and for passenger service in highly developed, high traffic density zones where rapid acceleration and high speeds are essential and where station stops are frequent. They are also sometimes used for pulling trains through long tunnels.

An electric engine in good condition is ready for instant service. There is no fire to build or steam to generate before it starts on its run. As will be noted from the picture, the electric locomotive differs in appearance from the steam locomotive. For one thing, its driving wheels are smaller. It has no smokestack. Its bell is usually concealed. Electric locomotives are equipped with horns for sounding warnings or sending signals. In some electric locomotives, the engineer has two control rooms, one for use when the engine is going in one direction and the other for use in driving the engine in the opposite direction. Within his reach when he is seated are many switches, gauges, and controls which enable him to keep the engine running properly.

The engineer's helper (corresponding to the fireman on a steam locomotive) sits on the opposite side of the room, or cab, and helps the engineer operate the train and also looks after the motors.

Railroad electrification is of two kinds—(1) overhead power wires, as shown in the picture, and (2) third rail construction. In either case, there must be a point of contact between the locomotive and the wire or rail that supplies the current. With overhead electrification, a pantograph, or hinged framework which can be folded down on the roof, is attached to the locomotive or motor car. On top of the pantograph, as can be seen in this picture, there is a metal "shoe" which runs along the copper wire to carry the current into the motor by means of relays and switches.

The method of picking up electrical current from a third rail, which is usually located just outside one of the wheel rails, is similar to the overhead wire system except that the metal "shoe" hangs down from the side of the locomotive or motor car and slides along the third rail.

Electricity to run the trains comes from power houses, sometimes located long distances from the railroad.

Thomas A. Edison pioneered in the development of electric locomotives. He built a small experimental model in 1880 and tried it out on a specially built track at Menlo Park, New Jersey. The first electric locomotive operated regularly on an American railroad was placed in service at Baltimore in 1895. Today, there are hundreds of electric locomotives in operation in the United States.

In addition, several railroads operate electric motor cars in suburban passenger train service to and from metropolitan centers. These cars draw their current either from third rails or from overhead power distributing systems, or catenary wires, similar to those shown in the picture. Electric motor cars are usually operated in multiple units of two, four, six, eight, or more cars, every other car being equipped with electric motors, somewhat similar to an electric street car. (The interior of each electric motor car is fully occupied by seats for passengers, as the motor equipment is located beneath the car floor.)

The second car of a two-car unit is known as a trailer. Although it has no power unit and cannot therefore be operated independently, it is equipped with control mechanism connected with the motor car to which it is attached and other motor cars in the train, so that the train can be operated by a motorman located in the trailer car.

The man who runs a steam, electric, or Diesel-electric locomotive is called a locomotive engineer or engineman, while the man who runs an electric motor car train is called a motorman.

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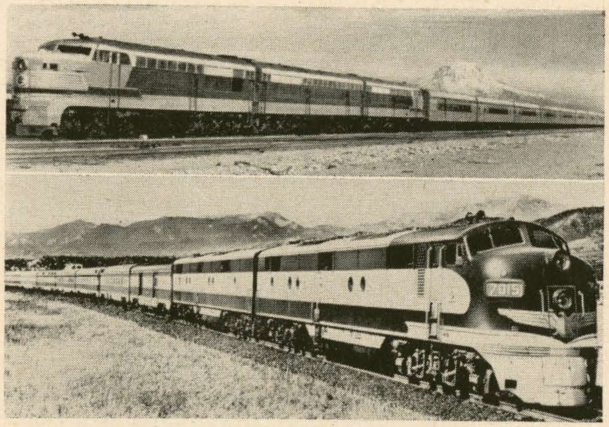
1. Who pioneered in the development of the electric locomotive?
2. When was the first electric locomotive built?
3. How long has it been since the first electric locomotive was placed in service in America?
4. What are the characteristics of electric locomotives?
5. Where are they especially useful?
6. Have you ever seen an electric locomotive or an electric motor train in operation? If so, where?
7. Where does the electric power come from?
8. In what services are motor cars or motor trains used?
9. What is the man called who operates (a) an electric locomotive, (b) a motor car train?

# 7. DIESEL-ELECTRIC PASSENGER TRAINS



Most modern passenger trains are pulled by Diesel-electric locomotives, and many are streamlined—built of strong, lightweight metals which weigh less than the standard train.

Two Diesel-electric passenger trains are pictured here. The one at the top is pulled by a three-unit Diesel locomotive. The other is powered by a two-unit Diesel.

The first Diesel-powered streamlined train was placed in regular scheduled service in this country in 1934. Since then many trains of this type have been built. Today, Diesel-powered trains are in operation in all parts of the country. They are designed for fast travel, and embody all the comforts and conveniences known to modern engineering science.

The Diesel-electric locomotive is a self-contained power unit. Its internal combustion engine, burning fuel oil, runs a generator which produces electricity, and the electricity drives the motors which turn the locomotive's wheels. A Diesel locomotive may consist of an "A" unit—one with a cab—operated singly, or it may consist of two, three, or four "A" and "B" units for extra power. "B" units have no cabs and are not operated as lead units on a locomotive combination.

The Diesel-electric locomotive is capable of running long distances—from Chicago to Miami, or from Chicago to the Pacific Coast and back again, for instance, with little or no time lost for refueling or repairs. The cost of a Diesel-electric locomotive is much greater than that of the average steam locomotive, but it has distinct operating advantages.

Most streamlined passenger trains, whether pulled by electric, Diesel, or steam locomotives, are constructed of alloys which are lighter and stronger than ordinary steel. A streamlined train is designed and built so as to reduce air friction or wind resistance to a minimum. This permits greater speed with a given amount of power. The ends of the cars are joined closely together, and usually the locomotive and cars are painted in lines of continuous color from front to rear, giving the train a symmetrical appearance. Trains built of stainless steel are not painted, as the weather does not affect that metal.

Air conditioning shuts out dust, smoke, cinders, drafts, cold, or heat and provides clean, washed air at temperatures that assure passengers the maximum of comfort. The hermetically sealed windows also shut out or greatly reduce train noises, thus enabling passengers to converse with greater ease and to sleep more restfully at night than was possible before air conditioning was introduced.

Excellent meals are served on most of these trains. Refreshments are served at nearly all hours. Lounge or observation cars are equipped with comfortable chairs and divans, as well as with radios and writing desks. Some trains have dome cars with some of the seats "on top of the car" under a glass roof. Passengers can see easily in any direction.

In addition to the regular train crews, many streamlined trains have nurse-stewardesses to look after the wants and comforts of the passengers.

Passenger trains travel much faster today than they did a generation or two ago. For instance, a railroad journey from New York to Jacksonville, Florida, required $27\frac{1}{3}$ hours in 1900. By 1930, the time required for such a journey had been reduced to $22\frac{2}{3}$ hours, and by 1954, to less than 18 hours.

The running time of the fastest trains between New York and San Francisco was 114 hours in 1900, 76 hours in 1930, and 55 hours in 1955.

In 1930, there were only one or two dozen passenger train runs in the United States of a mile-a-minute or faster, from start to stop. Today, there are more than 3,100 passenger train runs of a mile-a-minute or faster, start to stop. More than 164,000 miles are covered each day by runs at 60 miles-per-hour or faster, while over 21,200 miles of this total are covered at 70 miles-per-hour or faster by similar runs. Many of today's trains attain maximum speeds at some points on their runs of from 75 to 100 miles an hour.

Rail Diesel Cars—self-propelled and equipped with one or more compartments for mail, baggage, and express—are used for local passenger service on several railroads in the United States.

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1. **What is meant by the term streamlining?**
2. **How does a streamlined train differ from other passenger trains?**
3. **Have you ever seen a streamlined train? If so, tell about it.**
4. **What kinds of power are used for streamlined trains?**
5. **How do the following types of locomotives differ: (a) steam, (b) electric, (c) Diesel-electric?**
6. **What is air conditioning?**
7. **What comforts has air conditioning brought to railway travel?**
8. **Is air conditioning confined to streamlined trains only?**

# 8. A PASSENGER STATION IN A BIG CITY

Who has not experienced a thrill on entering the waiting room or the concourse of a great railway station? All day long the hustle and bustle continues —an endless ebb and flow of humanity—people coming and going, some making business trips, others on sightseeing or vacation trips, some on their way to visit friends or relatives, some returning to school or college, soldiers on their way to or from camp, sailors going home on leave, people greeting relatives and friends or bidding good-bye to those who are going away.

There are also people buying tickets, asking questions at the information desk, studying timetables and maps, watching train bulletins, attending to baggage, sending telegrams, making telephone calls, buying newspapers, magazines, and books to read on the journey and making other preparations for railway travel.

In other parts of the station, trucks loaded with mail are on their way to or from the trains. Other trucks piled high with trunks, suitcases, and packages are hurrying from the baggage room to the baggage cars. "Red caps," or station porters, are hurrying up and down the platforms with passengers' luggage, or hurrying off to help travelers with their bags and packages. Conductors, engineers, trainmen, and train porters are busy with last-minute details necessary to get the trains away on schedule.

Somewhere in or near the station, unseen to train crews and passengers, is the train dispatcher or towerman who controls and directs the movements of trains by means of signals. This is done by a system of electrically operated controls which set switches and signals for trains moving in and out of the station—operations which are described in following pages.

Train arrivals are telautographed to all parts of the station, such as the stationmaster's office, the information booth, and the baggage and mail rooms. "Red caps," too, must know the platform numbers of arriving trains so that they can be on hand to assist the incoming passengers with their baggage.

On the bulletin board in the station concourse or waiting room is marked the exact time of the departure of each train and the track on which the train is located.

This is a picture of the waiting room in one of the largest railway passenger stations in the United States. About 225 trains leave or enter this station daily. A few are suburban trains to and from outlying residential districts; the others are trains which run to and from distant cities.

On the right are doors leading to the concourse and train platforms, some of which are below the street level. To the left is a circular information booth where clerks answer questions about train schedules, train connections, railway fares, and other travel details.

Behind the information booth are the Pullman and coach ticket windows, the entrance to the baggage room, and an exit to a taxicab loading platform.

Between the far entrance to the concourse and the ticket window alcove are the Western Union desk, a room with public telephones, and a locker unit with individual compartments for checking baggage quickly. Similar locker units are installed elsewhere in the waiting room and also in the concourse. The desk on the right is used only at night. Sleeping car passengers leave their tickets here before boarding the trains, so that the conductor will not have to awaken them later to collect the tickets.

Each railway station is under the supervision of a station agent or a stationmaster. He has charge of the ticket office, the baggage room, the parcel check room, the information booth, the red-cap service, the announcement of trains, the handling of passengers, baggage, mail, and express through the station, and other matters pertaining to station operations.

Of course, railway stations vary in size just as cities and towns and villages vary in size. To accommodate the traveling public, big cities are provided with large railway stations; small cities with smaller railway stations; and towns and villages with still smaller stations. Likewise, the number of station employees is large or small depending upon the importance of the communities and the business done.

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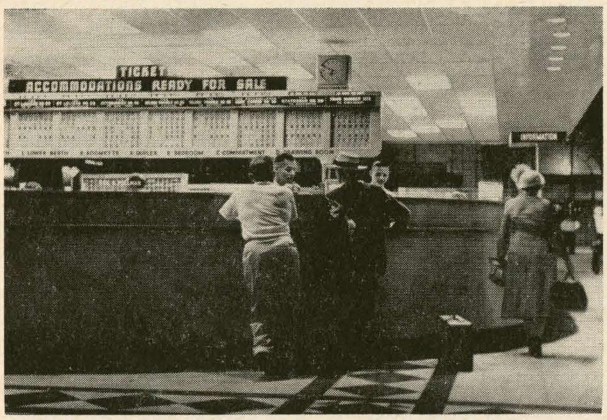
1. **What is a railroad station?**
2. **What are some of its features?**
3. **What is the purpose of a railway station?**
4. **Why are some stations larger than others?**
5. **Is there sometimes more than one railroad in a city?**
6. **What is a union station?**
7. **To whom may one apply for travel information?**
8. **How does one know what train to take?**
9. **What are some things people do at railway stations?**
10. **Who is in charge of the railway station? What are his duties?**
11. **Tell about some railway station you have visited.**

# 9. BUYING TICKETS IN THE STATION




When one goes to the movies, he steps up to the ticket booth and buys a ticket. One does the same thing before he starts on a railroad journey. In the railroad station the place where tickets are sold is called the ticket office. The individual who sells tickets is usually called the ticket agent or the ticket seller.

The ticket is a receipt for the money one pays for a train ride. It tells the conductor of the train that the passenger has paid his fare and is entitled to ride on the train.

There are many kinds of railroad tickets. There are tickets good for travel in standard coaches; there are others good for travel in sleeping and parlor cars. There are one-way tickets and round-trip tickets. There are round-trip excursion tickets which sell for less than standard fare tickets. There are commutation tickets for use in suburban zones of the large cities, good for 10, 12, or 25 rides. There are monthly commutation tickets good for 50 or 60 rides during any one month.

And there are coupon tickets. Coupon tickets are made up of a series of "coupons," or detachable tickets, one for each railroad over which the passenger desires to travel. A coupon ticket may also include tickets for station-to-station transfers, steamboat trips, or side trips by motor bus. A long coupon ticket usually denotes a long journey.

A child under 5 years of age when accompanied by a parent or guardian is allowed to ride free (except when the sole occupant of Pullman space, in which case one-half railroad fare and full Pullman fare are charged). Children from 5 to, and including, 11 years of age ride for one-half as much as is charged for a person 12 years of age or over.

If one wants reserved space in a Pullman sleeping car, he buys a Pullman ticket, in addition to his regular railroad ticket. A Pullman ticket may be purchased for an upper or lower berth, a section, roomette, duplex room, bedroom, compartment, drawing room, or a master bedroom, in a sleeping car. Reserved seats in sleeping cars and parlor cars for daytime travel are purchased in the same manner. Rates for Pullman accommodations are published in the passenger train timetables of many railroads.

The ticket agent knows a great deal about cities and towns, railroads and railroad routes, train schedules, and the prices of various kinds of tickets. He is always ready and willing to answer questions. He is honest and dependable. He is careful to charge the correct amount for each ticket sold and to return the proper change to the customer. He keeps a careful record of sales, and at the end of each day's work his sales and receipts are carefully checked.

The ticket agent sends his receipts for the day to the treasurer of the railroad company or deposits the money in the local bank for his company. The railroad company uses this money and that received from other agents to pay wages to its workers, to buy fuel, materials and supplies; also to pay taxes, rents, interest on bonds, and to meet other necessary expenses.

Railroads never sleep. In some of the larger cities, station ticket offices are kept open day and night. In smaller cities, the station ticket office is closed a few hours each night, while in many towns, villages, and country stations one agent is employed to handle all business and the ticket office is kept open as train schedules require.

If one boards a train without a ticket—as is sometimes necessary if the ticket office is closed or if one does not have time to purchase a ticket and reach the train—the conductor will collect the fare and give the passenger a receipt which serves as a ticket.

A number of railroads participate in the Rail Travel Credit Plan. This consists of a Rail Travel Card, issued by the Rail Travel Credit Agency, which, when properly signed, may be used in lieu of cash for the purchase of railroad tickets of any class on any of the participating railroads. No deposit is required and there is no service charge. The subscriber is billed monthly for the transportation purchased.

Some railroads also co-operate with local banks to provide qualified applicants with rail transportation on the installment plan. This is known as the Rail Traveloan Service.

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1. **What is a railroad ticket?**
2. **Why are tickets used?**
3. **What is shown on the ticket?**
4. **Where may tickets be bought?**
5. **What is the individual who sells tickets called?**
6. **What kind of tickets do the railroads issue?**
7. **Why are different kinds of tickets necessary?**
8. **Can one travel on a railroad train without a ticket?**
9. **Do tickets for children differ from other tickets?**
10. **What must the ticket agent know?**
11. **How does a knowledge of arithmetic help the agent?**

# 10. A CITY TICKET OFFICE


Many railroads maintain downtown ticket offices in the larger cities for the convenience of the traveling public. These offices are located in the cities' business, shopping, and hotel districts so as to be within easy reach of those who wish to purchase tickets, make reservations, or transact other business pertaining to railway travel.

A city ticket office is usually managed by a City Ticket Agent or a City Passenger Agent. In the larger city offices, he has a staff of assistants, all well informed on passenger-train schedules, passenger fares, railroad and steamship connections, and other matters of interest to the traveling public.

Among the many duties of the city ticket office staff are: selling railroad and Pullman tickets, making sleeping and parlor car reservations on telephone requests, quoting rates and fares, and helping prospective travelers plan their business trips or vacation tours. It is important that each member of the staff be well informed and accurate in quoting rates and fares, in making reservations, in selling tickets, and in giving out travel information.

In the larger cities, some railroads maintain more than one downtown office for the handling of passenger business. One or more of these offices, usually managed by a Division Passenger Agent or a District Passenger Agent, may devote its efforts largely to promoting special movements and selling the services of its railroad in connection with conventions and meetings, specially conducted tours, and so on. Passenger representatives also solicit the patronage of baseball, football and basketball teams, theatrical troupes, and other organized groups. They keep in close touch with persons in charge of such movements as well as steamship offices, theatrical agencies, and colleges and schools, and are always ready to assist in working out itineraries, organizing special tours, and supplying information concerning railroad schedules, hotel accommodations, steamship services, points of interest, and vacation resorts.

Many railroads also maintain downtown offices in the larger cities for the convenience of manufacturers, wholesale houses, commission merchants, storage warehouses, importers, exporters, grain merchants, and other shippers of freight. The representative in charge of this office is usually called a Division Freight Agent, a District Freight Agent, or a Commercial Agent. He and his staff must be thoroughly familiar with the industrial and commercial resources and activities in their territory. They must also be thoroughly familiar with the transportation facilities and the traffic of the territory. They keep in touch with shippers and work with them by quoting rates, routing shipments, and attending to many other matters in connection with railroad freight traffic.

These city traffic offices are equipped to provide shippers with immediate information regarding rates, rules and regulations, train schedules, available shipping facilities, and steamship arrivals and sailings. They are maintained and equipped to render every possible assistance to the shipping public.

Some representatives specialize in a particular field of traffic work. For instance, there are District Coal Agents, District Livestock Agents, and Perishable Freight Agents who devote their attention exclusively to particular classes of traffic.

A railroad may employ a General Agent or a City Passenger and Freight Agent who has charge of both freight and passenger business and who acts as the sole representative of his railroad in a certain city.

Traffic offices such as those described above are not always confined to cities located on the railroad which they represent. As will be seen from an examination of railway timetables, many railroads maintain traffic offices in "off-line" cities from coast to coast. These off-line traffic offices supply the public not only with information concerning the railroad which they represent but also with information concerning the agricultural, industrial, and commercial resources and advantages of the railroad's territory, its recreational and scenic attractions, and other information of interest.

If you live in a large city, you will find a list of city ticket offices and other railway offices listed under "Railroads" in your classified telephone directory. Each railroad also lists in its passenger timetable its passenger and freight offices—both on-line and off-line—with street addresses and the names of officers in charge.

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1. **What is a city ticket office?**
2. **What is its purpose?**
3. **Who is in charge of the city ticket office?**
4. **What must city ticket office employees know?**
5. **Have you ever seen or visited a city ticket office?**
6. **What other representatives do the railroads have in the large cities?**
7. **What are their duties?**
8. **Where can one find a list of railway offices?**
9. **What is an off-line traffic office?**

# 11. THE CONDUCTOR AND ENGINEER COMPARE WATCHES


Time is a factor of major importance in railway operations. Every one of the many thousands of passenger and freight trains operated daily on the American railroads must move and meet and pass and arrive and depart on a definite time schedule. If a train falls behind its set schedule, it must run on a delayed time schedule.

Train crews, station employees, and numerous other railroad men must report for duty and perform their assigned tasks on a definite schedule. Locomotives must be put in readiness, cars must be assembled, trains must be made up, stations, ticket offices, baggage rooms, and mail and express offices must be opened and closed according to schedules. Foremen in charge of track repairs must know when each train is due to pass over his section so that the track will be in readiness.

On each railroad there are designated standard clocks which are corrected daily to conform with the time signals telegraphed throughout the country from the United States Naval Observatory in Washington, D. C.

Unless otherwise provided in railroad rules, watches carried by train dispatchers, conductors, enginemen, brakemen, yardmasters, and foremen of yard engines must be compared with a designated standard clock before commencing each day's work.

Conductors and enginemen always compare their watches before starting on a run, and other members of the train crew must compare their watches with the conductor's or engineman's watch at the first opportunity.

The standard rule for the regulation of watches on the railroads is that no watch may vary more than 30 seconds per week from perfect time. On most railroads, certain employees in the operating, maintenance of way, and mechanical departments, whose duties require them to carry standard railroad timepieces, must submit their watches to official watch inspectors for comparison weekly, semi-monthly, or monthly, and for inspection monthly, quarterly, or semi-annually.

Some of the employees who are required to carry approved standard watches and have them regularly cleaned and inspected include trainmasters, train dispatchers, station agents, telegraph operators handling train orders, yardmasters, road and yard conductors, engineers, firemen, brakemen, switchmen, road foremen of engines, train baggagemen, track supervisors, section foremen, supervisors of bridges and buildings, signal supervisors, signal foremen, and foremen of crews working on bridges, buildings, and roadways.

Prior to 1883, communities throughout the United States went by "sun" time and each railroad adopted the local time of some city on its lines. There is no telling how many different "local times" there were before 1883, but there were about 100 different standards of time used by the railroads.

In an effort to correct this confusion of times, the railroads devised and sponsored a uniform standard of time in each of four time zones based upon the mean "sun" time on the 75th, 90th, 105th, and 120th meridians west of Greenwich, each time zone being one hour apart. (See map on page 33.)

At exactly 12 o'clock noon on November 18, 1883, all the different times were abolished throughout the United States and every railroad clock and every railroad man's watch was set to standard time in each of the four time zones. Cities and towns in all parts of the country promptly adopted standard time, and since then standard time has been adopted by the peoples of other countries until today it is in almost universal use.

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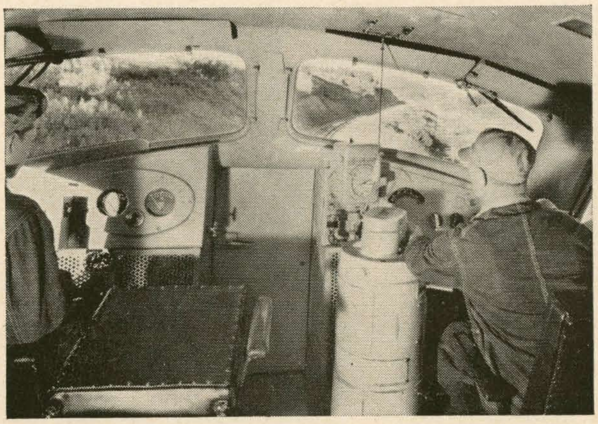
1. **What is standard time?**
2. **How is standard time determined?**
3. **What is a time zone?**
4. **How many time zones are there in the United States?**
5. **When was standard time adopted?**
6. **What method of reckoning time was in use prior to the adoption of standard time by the railroads?**
7. **Why was that method unsatisfactory?**
8. **How many different times were used by the railroads of this country before standard time was adopted?**
9. **Why is time important in railway operations?**
10. **What railroad employees are required to keep correct time?**
11. **How do definite time schedules contribute to the safety of railway operations?**

# 12. THE LOCOMOTIVE ENGINEER IN THE CAB



Under the expert control of the engineer or engineman, as he is also called, the big locomotive performs prodigious tasks. A powerful, throbbing piece of mechanism, the locomotive is a symbol of dynamic energy and strength.

For more than a century, the steam locomotive has been the chief source of motive power on American railroads. Today, greatly increased in size and power, the steam locomotive continues to do many useful tasks. Some giant steam engines haul long, heavy freight trains; other locomotives, geared for high speed, pull fast passenger trains.

In addition to steam locomotives, there are electric locomotives (See Chapter 6) and Diesel-electric locomotives (See Chapter 7). Today, more than four-fifths of all freight, passenger, and switching service is performed by Diesel-electric locomotives. Several gas turbine electric locomotives are now in service and more are being built. Another new type of turbine locomotive—the coal-fired steam turbine electric drive locomotive—is now undergoing road tests.

The fireman's job furnishes the training ground for the job of locomotive engineer. Every locomotive engineer is selected from the ranks of firemen.

When a man becomes an engineer, his first job is usually running a switching engine, pushing and pulling cars back and forth and making up trains in railroad yards. Then he is assigned to a local freight run, and finally, as he gains experience and seniority, he gets a fast or long distance freight or passenger run. Sometimes he may work during the daytime; sometimes at night; for railroads never sleep.

Because the efficiency and safety of railway operations depend upon the skill and reliability of those who run the trains, the locomotive engineer must be alert, dependable, and trustworthy.

Before the engineer is allowed to run a locomotive, he must pass a rigid examination to prove that he is thoroughly familiar with the technical details of locomotive operation, air brakes, and signals, and also that he is thoroughly familiar with the rules of railroading as published in the railroad rule book. And he must be acquainted with all the features of the road on which he operates his train. He must also pass a physical examination and an examination on the rule book periodically.

To insure against over-fatigue, neither the locomotive engineer nor any other member of the train crew is allowed to start his day's work unless he has been off duty for at least eight hours.

Engineers and other train service employees are assigned to the different runs on the basis of seniority, the man with the longest service record having the first choice, the man with the second longest service record having the second choice, and so on.

Sitting on the right side of the cab, the engineer keeps his eye on the track ahead of the speeding train, as he is doing in the picture, to note the position of every signal and to see that the track is clear for the passage of the train. As the train approaches each signal, the engineer notes carefully what message it conveys and checks his observations with the fireman to make certain that he has read it correctly. (On some railroad lines, signals are displayed in the locomotive cab.) The engineer and fireman must also be alert for signals from the conductor or brakeman.

The cab of a steam locomotive is usually situated behind the boiler and firebox. It contains the controls required in the operation of the engine and train—the throttle, the air brake controls, the sand controls, and several gauges and indicators which tell the engineer and the fireman how well the locomotive is performing. All fast or heavy locomotives in passenger or freight service are equipped with automatic stokers whereby coal is conveyed by machinery from the tender into the locomotive firebox. The mechanism which controls the operation of the stoker is also in the cab.

To start the engine, the engineer releases the air brakes and pulls the throttle slowly toward him. This lets steam from the boiler into the cylinders which are located on each side of the engine ahead of the driving wheels. As steam moves the piston to and fro, piston-rod, cross-head, main-rod, and side-rods also move, turning the wheels and moving the locomotive. To stop the engine, the engineman applies the air brakes and moves the throttle in the other direction.

The air brakes, which extend the entire length of the train, are controlled by a small lever near the engineer's right hand. By turning this lever, he sets the air brakes on all cars almost at the same instant, and thus controls the longest and heaviest trains.

The cab of a Diesel-electric road locomotive is high up in the front end. The picture shows the interior of a Diesel road engine cab. As in a steam locomotive, the engineer sits on the right side and the fireman on the left. On the right side of the cab is the control stand. The engineman's left hand is on the throttle; below his left elbow may be seen the reverse lever. The large dial on the instrument panel in front of the control stand is the speed recorder. To the right of it is the load and transition indicating meter which shows the amount of electric current being used, and indicates when "transition" or shift should be made from one to another of the engine's four traction motor connections. The small dials below and to the right are the air gauges. The automatic brake valve shows over the engineman's right shoulder, and just above the control stand is the air horn cord. On the instrument panel in front of the fireman are the fuel and water gauges.

By means of the whistle on a steam engine and the air horn on a Diesel, the engineer signals the train crew and sounds warnings upon approaching crossings, stations, and persons or animals on the track. When the train nears a station, the engineer sounds one long blast. On approaching a grade crossing, he sounds two long, one short, and one long blast. Several short toots warn persons or animals to get off the track. The engineer also has several whistle combinations for communicating information to the conductor and other members of the train crew.

On a passenger train the train crew communicates information to the engineer by means of a signal cord extending through the entire length of the train and attached to a little whistle beside the engineer in the cab. When the train is standing, two short pulls on the signal cord tell the engineer to start the train; three shorts tell him to back up; four shorts tell him to apply or release air brakes. When the train is in motion, two short pulls on the bell cord signal tell the engineer to stop at once; three shorts, stop at next passenger station; four shorts, reduce speed.

Since freight trains are not equipped with signal cords, the conductor and trainmen signal the engineer by means of hand, flag, and lantern signals. On an increasing number of railroads, radio is used for communication between moving trains, between trains and fixed points, and from end to end of trains. Thus, instant communication may be had between conductor and engineer and between dispatcher and wayside station operators or crew members of a train operating over any part of a radio-equipped division.

The locomotive is a wonderful machine. It performs tasks which thousands of horses working together could not do. It pulls heavy passenger and freight trains for long distances at great speed. But it would be helpless and useless without the locomotive engineer and the fireman. They control its power and direct its energies. Under their direction it becomes one of our great and valuable servants.

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1. **What training must a man have to become a locomotive engineer?**
2. **What must the locomotive engineman know to perform his job?**
3. **Where is the engineer's cab in the steam locomotive? In the Diesel?**
4. **On what side of the cab does the engineer sit?**
5. **Who is the engineer's assistant?**
6. **How do the locomotive engineer and conductor signal each other?**
7. **How does the engineer start and stop the train?**
8. **What is the throttle for?**
9. **Does the picture show a steam, electric, or Diesel-electric locomotive?**
10. **How does a Diesel locomotive get its power?**

## THE IRON HORSE

Behold a steed with thews of iron,
A heart and brain of fire;
His voice a thousand trumpets shames;
His sinews never tire.

Of body dark, gigantic, vast,
His way no arm can bar;
Resistless as the battle gods,
His flight is like a star.

His path, twin bands of virgin steel,
That stretch from East to West;
O'er beams the invaded forest gave,
Now fixed in nature's breast.

He speeds where storm or avalanche
Have torn the mountain side;
Or through the peaceful valley, where
The evening shadows hide.

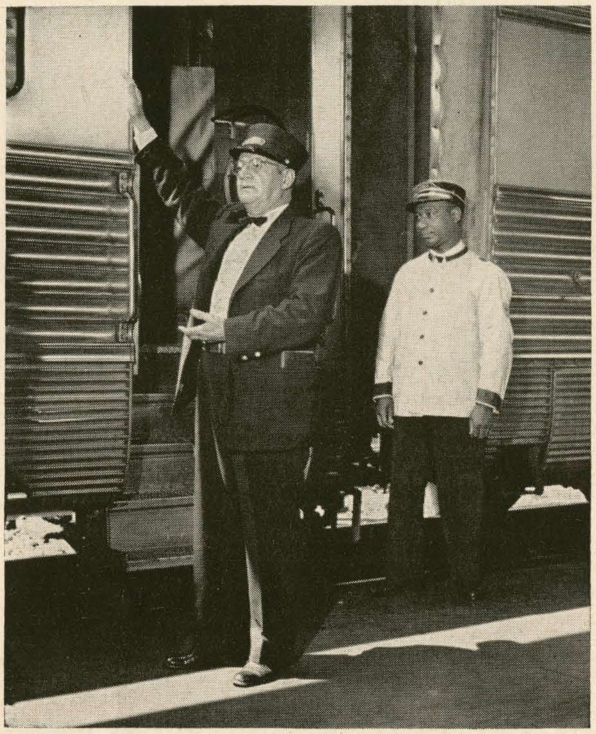
* * *

Here pygmy hands and hearts of flame
Have pierced the mountain-base;
There rock and steel are intertwined,
To bridge the chasm's space.

For men have planned, have delved and wrought,
Have struggled night and day
To blaze a trail from coast to coast,
And build his great high-way.

—*E. B. Rittenhouse*

# 13. THE CONDUCTOR SIGNALS "ALL ABOARD"



What the captain is to the ship, the conductor is to the railway train. He is responsible for carrying out all orders pertaining to the operation of his train, for the conduct of his crew, for the comfort and safety of passengers, and for the collection of tickets and fares. He sees that his train displays the proper flags or lights and that each member of the train crew performs his duties according to well-established rules.

The conductor is under the supervision of and reports to the superintendent or the trainmaster of his division. He reports for work sufficiently in advance of the scheduled time of departure to see that his train is properly made up and inspected and that other members of the crew are on duty. Before leaving the terminal, the conductor inspects his train to see that the cars are clean, that there is fresh water in the coolers, and that the temperature in the cars is properly regulated.

After the train is on its way, the conductor collects tickets and fares from passengers taking short trips and punches the tickets of other passengers who may be stopping off along the way, or going to another part of the railroad, or traveling over other railroads. At the end of his run, the conductor makes a detailed report of his ticket and cash receipts, and these are carefully checked later by the auditor's office.

Members of the passenger train crew who are under the conductor's supervision include an engineer, a fireman, one or more brakemen (sometimes called trainmen or flagmen), a baggageman, if the train carries a baggage car, and on some railroads a porter for the coaches. The Pullman conductor, Pullman porters, and dining car crew are also under the general supervision of the conductor.

The brakemen and the porters assist the conductor by announcing stations, opening and closing vestibule doors at the stations, helping passengers on and off trains with their baggage, and performing such other duties as the conductor may direct.

Every train makes its run under specific orders as to the time of departure from each station, the stops to be made, and the time of arrival at destination. The conductor must see that the train leaves each station on the exact time specified in his schedule. Under no circumstances is the train allowed to leave a station ahead of schedule. If the train should be delayed en route, it must proceed to its destination in accordance with definite instructions from the train dispatcher's office.

The conductor is responsible for carrying out these instructions. Train orders are addressed jointly to the conductor and engineer, but the engineer is governed by the directions of the conductor so far as train movements are concerned.

Before a man can qualify for the position of conductor, he must serve for years as a brakeman; he must be thoroughly familiar with operating rules and practices, and he must have demonstrated that he is a man of sound judgment and good habits. His first years as a conductor are usually in freight yard switching service; later he is advanced to regular freight train service and still later to a passenger run.

A star or bar on a conductor's sleeve indicates the number of years he has been a railroad employee. On some railroads, for example, a star on a conductor's sleeve represents 25 years of service; a bar or stripe represents five years of service. Thus, a star and two bars represent 35 years of service.

Conductors and other members of the train crew must have good health and excellent eyesight in order to qualify for their positions. Physical examinations, eye tests, and hearing tests are made at intervals to make certain that the men are fully qualified to perform their duties.

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1. **Who is in charge of the railroad train?**
2. **How does the conductor qualify for his job?**
3. **What examinations must he pass?**
4. **What are the duties of the train conductor?**
5. **What are some of the things he must know?**
6. **To whom does the conductor report?**
7. **When does he collect a ticket?**
8. **Does he collect money as well as tickets from passengers?**
9. **What does a star or bar on a conductor's sleeve indicate?**
10. **Why is it necessary for him to have correct time?**

# 14. IN A PASSENGER COACH

Singing through the forests,
  Rattling over ridges,
Shooting under arches,
  Rumbling over bridges,
Whizzing through the mountains,
  Buzzing o'er the vale—
Bless me! this is pleasant,
  Riding on the Rail!

—*From "Rhyme of the Rail," by* JOHN G. SAXE

A trip by train is always an adventure for young people. And what person, young or old, does not enjoy each new experience of railroad travel regardless of how many previous trips he or she may have made or how long or short those trips may have been.

In the stories about the "Tom Thumb" and the "Puffing Billies," we learned about the first passenger trains in America. They ran more than a hundred years ago, and they were followed by many trains which would look strange indeed to the boys and girls of today. Extraordinary changes have taken place in railway transportation during the last century.

It is a far cry, indeed, from the dimly lighted, poorly ventilated, hard-seated passenger cars of pioneer days to the attractive, smooth-riding, comfortable, streamlined passenger coaches of today. In pioneer days, coaches were built of wood; today, coaches are built of steel or light-weight alloys.

Cars of pioneer days were heated by wood-burning or coal-burning stoves; many of today's passenger cars are air-conditioned, which means that, by aid of special mechanisms, their temperatures are regulated throughout, at all seasons of the year. They are kept warm in winter and cool in summer.

Cars of pioneer days were lighted by flickering tallow candles. Later on, cars were lighted by kerosene lamps or by gas lights. Today's cars are illuminated by electricity. In numerous other ways the modern passenger coach is vastly more comfortable than were the coaches of pioneer days or of even a short generation ago.

This is a picture of the interior of one of the passenger coaches of a modern streamlined train. This type of car is commonly called a day coach. In addition to being air-conditioned, the car is equipped with indirect lighting which may be dimmed at night, double windows and insulated walls to shut out noises, individual seats with adjustable backs, padded aisle carpets to deaden interior noises, window blinds to reduce the sun's glare by day and to shut off outside lights by night, and spacious baggage racks for small luggage.

Many streamlined coaches are equipped with radios, individual side lights for reading, and electric water coolers. Separate dressing rooms for men and women are equipped with wash basins, hot and cold water, soap and towels. The men's dressing rooms have electric razor outlets and mirrors for shaving. Those for women have vanity tables and full length mirrors.

The modern passenger car is the result of many years of study and experimentation by engineers, designers, metallurgists, and railway operating men. It represents the cumulative research and knowledge of thousands of scientific minds. Just as the cars of 1925 were superior to the cars of 1900, so are the cars of today much superior to those of 1925. Efforts to improve the comforts, conveniences, wearing qualities, and efficiency of cars and other parts of the railway plant are constantly being made.

The railroads of the United States carry more than 440,000,000 passengers annually for distances ranging from a few miles to thousands of miles.

It is a well-known fact that railway passenger trains provide the American people with their safest form of travel. Indeed, insurance statistics show that one is safer while traveling on a railroad train than in his own home.

In this picture, the porter is helping a passenger adjust her luggage. The porter is always at the service of the passengers. Many streamlined trains also employ stewardesses to look after the comfort and wants of the passengers. Most train stewardesses are registered nurses. They are especially helpful to women and children.

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1. **How does the passenger coach differ from other railway cars?**
2. **In what ways does it differ from coaches of the early days?**
3. **Of what materials is the modern coach made?**
4. **How many passengers can be seated in a railway coach?**
5. **How does air conditioning contribute to passenger train comfort?**
6. **How are the cars lighted at night?**
7. **What railway employee is seen in the picture?**
8. **How can train service employees be distinguished from passengers?**
9. **Have you ever traveled in a passenger train? If so, tell about the experience.**

# 15. DINNER IS SERVED IN THE DINING CAR

In the early days of railway travel, trains which ran long distances stopped at certain stations to enable the passengers who did not carry their lunches to obtain meals at nearby hotels or restaurants. When the train came to a halt and the conductor shouted "Twenty minutes for refreshments," there was frequently a "mad scramble," every passenger seeming to be bent upon getting out of the train and into the restaurant ahead of the others. Plates of food were on the tables or counters in readiness. The first-comers fared pretty well, but those who came in last sometimes had to hurry back to the train before they had finished their meals.

In 1863, trains running between Philadelphia and Baltimore introduced a car fitted with an "eating bar"—something new in railroading. These cars had no kitchens, the food being cooked in restaurants in Philadelphia and Baltimore and placed in "steam boxes" in the cars just before the train's departure.

A few years later, George M. Pullman, who had won fame as a builder of sleeping cars, introduced what he called a "hotel car," equipped with a kitchen for preparing meals, with tables for serving meals, and with berths for sleeping, so that passengers could actually live in the car as they could in a home or a hotel.

Then, in 1868, Mr. Pullman introduced a dining car, equipped with a kitchen—the first passenger car designed exclusively for cooking and serving meals. This car was very popular, and before many years had passed dining cars were in use on many railroads.

Today, hundreds of passenger trains in the United States carry dining cars, providing travelers with a wide variety of foods and as excellent service as may be obtained in a first-class hotel or restaurant.

The interiors of modern dining cars are decorated in attractive style, many of them in gay pastel shades. Some have novel seating and table arrangements, including built-in lounge seats. Diffused lighting, colorful window drapes, and soft carpets suggest the friendly atmosphere of a neighborhood club or a home dining room. Tables prepared with snow-white linen, gleaming silverware and sparkling glasses, give promise of an appetizing meal to come. Air conditioning has made dining on the train a greater pleasure than ever before.

The dining car steward greets his guests at the door and ushers them to their tables. The white-coated waiters help them in the selection of their meals from the menu, place their orders with the chef, serve the dishes in proper style, and attend to the patrons' every want.

On some trains buffet cars are operated. There are also lunch counter cars which specialize in light lunches or meals at popular prices. Some trains include grill cars, a combination of cafeteria and soda fountain. These cars are especially popular on overnight trains. On many trains, tray service is provided, from the dining car direct to the passengers' seats. Pullman passengers frequently have tables put up in their rooms or compartments and have dining car meals served to them there.

When the passenger has finished his meal, the waiter brings the order blank (or check) on which the steward has written the amount of the meal. The passenger pays the waiter, and the waiter turns the order blank and money over to the steward. At the end of the run, the steward turns all order blanks and money over to the superintendent of dining car service or his assistant for forwarding to the treasurer.

Dining car crews—stewards, chefs, cooks, and waiters—are carefully selected. Each man must undergo a thorough physical examination before entering the service and at frequent intervals thereafter.

Newly employed cooks and waiters usually attend a school for dining car employees conducted by the railway company before they are allowed to go on the road. The school teaches them their duties and responsibilities. They are instructed in such matters as courtesy and deportment. Only in this way are the railroads able to maintain their high standard of service.

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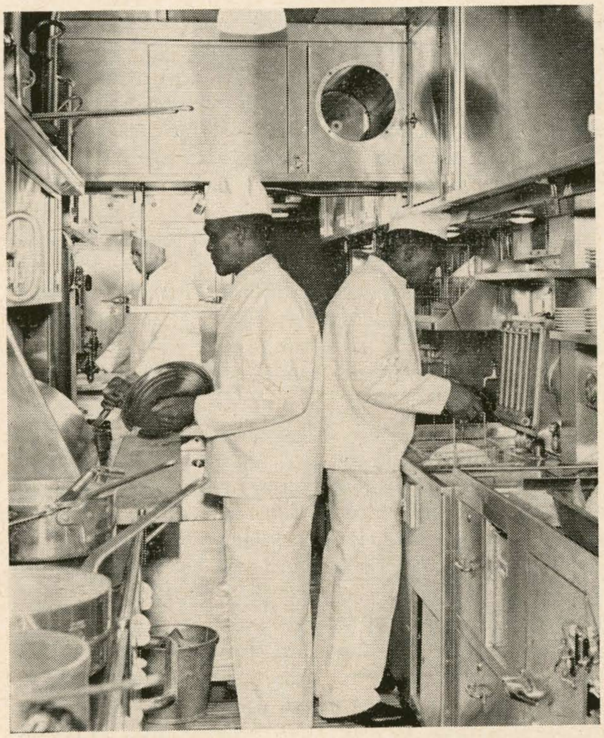
1. How did travelers obtain meals before dining cars were introduced?
2. Why was the dining car an improvement over the old method?
3. Who is in charge of a railroad's dining car operations?
4. What are his responsibilities?
5. Who is in charge of a dining car in a train?
6. What are his responsibilities?
7. What other workers are required in the operation of a dining car?
8. How are dining car workers trained for their jobs?
9. How does one know what foods are available in the dining car?
10. Whom does one pay for his meal?
11. Are meals and refreshments served elsewhere on the train?

# 16. PREPARING DINNER IN THE DINING CAR KITCHEN



Many persons have wondered how it is possible for the railroad to prepare excellent meals for a trainload of passengers in a dining car kitchen smaller even than the kitchen of the average home. The secret is that the dining car kitchen has been designed with great care so as to get the maximum use out of every foot of space. There is a place for everything, and everything must be in its place.

The kitchen takes up a little less than one-fourth of the dining car. It is fitted with a large cooking range, a steam table to keep the food hot until served, electric mixers, refrigerators for meats and dairy products, coffee urns, cabinets, cupboards and shelves for dishes, silverware, and kitchen utensils. Overhead electric exhaust fans keep the kitchen ventilated.

At one end of the kitchen are drainboards, service tables, and an electric dishwasher. At the other end of the kitchen, nearest the dining room, is the pantry. Here are refrigerators and chill boxes for salad materials, cold dishes, ices, ice cream, and other foods which must be kept cold—all ready to be tastily arranged in dishes and served by the waiters.

The dining car steward is in charge of the entire dining car, including the kitchen. Directly in charge of the kitchen is the chef, who is a master of the culinary art, familiar with the preparation of all sorts of dishes. Nothing leaves the kitchen which fails to meet his discriminating approval. On an important run, where many meals are served, the chef usually has three assistants to help prepare the food. One man cooks the meats, another prepares the vegetables, and a third man makes up the salads, desserts, and cold plates. Within the broad range of their larder, these men can prepare almost any desired dish on short order. They are always glad to prepare special dishes for patrons who are "on a diet," or for the sick, or for infants and small children who cannot eat the regularly prepared dishes listed on the dining car menu.

When meals are being served, waiters are constantly coming and going, placing orders with the chef, and carrying away trays of dishes as rapidly as they are made ready for serving. At such times, the dining car kitchen presents a busy scene.

Careful study and planning are required to keep a railroad's fleet of dining cars fully equipped at all times. The railroads maintain commissaries at important terminals, stocked with provisions of all kinds, and equipped with refrigerators for the storage of meats, eggs, fish, butter, cheese, and other articles which must be kept cold. Expert buyers are employed by the railroads to purchase meats, fish, poultry, dairy products, fruits, vegetables, and other provisions.

Products from nearly every state in the Union are purchased by the railroads for use in dining cars.

The average dining car carries approximately 1,700 pieces of tableware and kitchenware and 1,330 pieces of linen. The tableware and kitchenware must be restocked frequently. The linen is laundered many times each year.

Before a dining car starts on a trip, its kitchen must be stocked with sufficient supplies to provide for any reasonable number of meals which it might be called upon to serve until it reaches another supply terminal. This calls for careful and intelligent planning to avoid wastage and unnecessary cost and also to avoid shortages.

Railway dining cars, lunch-counter cars, and buffet cars, as well as many railroad restaurants, are operated under the direction of a dining car superintendent.

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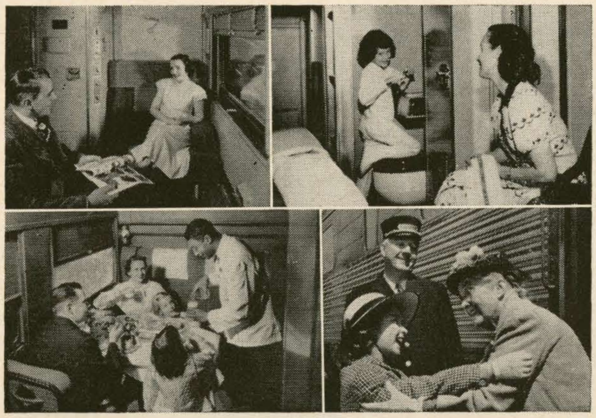
1. **In what kind of trains are dining cars operated?**
2. **Who is in charge of the dining car kitchen?**
3. **To whom does he report?**
4. **What is the chef required to know?**
5. **What are some of the features of the dining car kitchen?**
6. **Where does the dining car obtain its provisions?**
7. **What is a commissary?**
8. **How are the provisions kept from spoiling?**
9. **How does the railroad company do its shopping for dining car provisions?**
10. **Why is careful planning necessary in stocking a dining car?**

# 17. TRAVELING IN THE PULLMAN CAR



The world's first sleeping car was introduced in Pennsylvania in 1836-37. It was nothing more than a small wooden railroad coach equipped with four tiers of three bunks each. The car was heated by a stove and lighted by candles. Each passenger provided his own blankets. From that humble beginning has been evolved the luxurious all-steel, electric-lighted, air-conditioned sleeping car of today, embodying every comfort and convenience known to engineers and designers.

The Pullman Company and the railroads operate thousands of sleeping cars of various types with many different kinds of accommodations, including upper berths, lower berths, sections, bedrooms, roomettes, duplex roomettes, duplex single-rooms, compartments, and drawing rooms.

Each *section* consists of an upper berth and a lower berth. The *upper berth* is the lowest priced accommodation in a sleeping car. A safety ladder makes access and exit easy. The *lower berth* is directly under the upper berth. When made down as a bed, it is about the same height above the floor of the car as an ordinary bed. The upper and lower berths are each equipped with electric lights, hammocks or racks for clothing, parcels or other belongings, and hangers for suits, dresses, and overcoats.

Each berth is furnished with spring or foam rubber mattresses, sheets, blankets, and pillows. Sections are separated by metal partitions. Heavy curtains, fastened by the occupant from the inside, insure privacy. Every section car is equipped with separate dressing rooms for men and women.

Some passengers prefer to occupy a complete section but to use the lower berth only. This type of accommodation is called a *single occupancy section,* and it is available at a slight additional charge if there is no demand for the upper berth.

During the day each section consists of two double seats facing each other. The porter makes down the lower berth at night by sliding the seats forward until they meet and moving the backs of the seats to a horizontal position. The upper berth drops down like a large shelf from the side wall of the car. Mattresses, pillows, and blankets are kept in the upper berth during the day. Sheets, pillow-slips, and towels are kept in a locker at one end of the car. It takes the skillful porter only a few minutes to make down a berth or a section at night or to convert the section into seats in the morning.

Some standard sleeping cars consist mainly of sections with the addition of one or more drawing rooms, compartments, or bedrooms. However, a great many cars are made up entirely of roomettes or duplex-roomettes or a combination of the various types of enclosed private room accommodations.

The *double bedroom* has two full size beds when made down for night occupancy and comfortable seating space during the day. Each room is equipped with complete toilet facilities, large mirrors, well arranged lighting, blower fan, individual ice water supply and air-conditioning with personal control of air flow and heat. Each room also has provision for a desk or table for work or play or which may be used for dining when desired.

Most *double bedrooms* are built in pairs with a partition between them that may be opened up to make a suite of rooms called a *bedroom suite.* This accommodation, having four beds as well as twice the amount of space and two of each of the facilities of the bedroom, is a very comfortable accommodation for a family or group of four or more persons traveling together. The rooms may be used as a suite during the day and as separate rooms during the night if so desired.

The *compartment* in the standard sleeping car will accommodate two to four persons. It has an upper and a lower berth, complete toilet facilities, separate heat control, and other conveniences, such as large mirrors, night lights, and wardrobe.

The *roomette* is a private room with a folding wall bed which can be lowered when desired. It provides individual regulation of ventilation, heat and light; complete toilet facilities, with washstand folding into the wall when not in use, and above it a mirrored cabinet for toilet articles; provision for hanging clothes, and a large rack for luggage.

The duplex car consists of single rooms on two levels. The *duplex roomette* is equipped with toilet facilities, a full-length bed, clothes hooks, luggage rack, individually controlled heat, light, air conditioning, and drinking water. There is also a shoe receptacle for the porter's convenience in getting shoes for shining without disturbing the passenger. The *duplex single-room* has the same comforts and conveniences as the roomette. The main difference is in size and arrangement. The room is larger than the roomette and its bed extends across the car instead of lengthwise.

The *drawing room* in a sleeping car is large enough to provide sleeping accommodations for three to five passengers. It contains a wall bed, a sofa and an extra long upper berth. For night travel, the wall bed and the upper berth drop down and the sofa is converted into a third bed. This leaves dressing space and access to the toilet annex, clothes closet, and entry doors. The drawing room is equipped with electric lights, electric fan, temperature regulators, mirrors, a table if desired, and folding lounge chairs.

Sleeping cars are built to eliminate shocks and noises as far as possible. They are of sound-proof construction throughout, and, with thickly padded carpets on the floors, they are designed to give the traveler a quiet and restful journey.

In the lower-right picture, a young traveler is greeted as she leaves the train. In the upper-right picture, a little girl is getting ready for bed in a compartment. The upper-left picture shows a bedroom arranged for daytime travel. In the lower-left picture, a family of four enjoys a meal served in their drawing room.

Your sleeping car ticket assigns you to a reservation, or to a reserved space, on the train—Lower 5, in Car 50, or Room A, in Car 100, for example—just as you would be assigned to a room in a hotel. Sleeping car tickets may be reserved or purchased where railroad tickets are sold.

Space may also be purchased from the Pullman conductor on the train. It is always best to buy Pullman reservations in advance, however, as only a limited number of berths or rooms are available, and frequently all of them are sold out well in advance of the departure of the train.

When there are several Pullman cars in one train, a Pullman conductor has charge of the porters, collects tickets, and sells reservations in the cars. When there are only one or two Pullman cars in the train, the Pullman porters collect Pullman tickets and sell reservations.

The Pullman conductor or porter usually collects the sleeping car ticket soon after the passenger boards the train. He gives the passenger a coupon or receipt upon which is shown the reservation to which the passenger is entitled.

The Pullman porter helps the passenger on and off the train with his or her luggage, and looks after the passenger's comfort during the journey. He is on duty at all hours of the day and night—always ready to be of service to the passengers on his car.

If you wish, he will bring you a table for playing games, for writing letters, or for meal service. He will assist you in sending telegrams and ordering refreshments. He will supply pillows for daytime comfort, or furnish such information as he can about hotels, train connections, and points of interest. He will awaken you at any time you desire in the morning. In every berth and room of the car is a push button by which the passenger can summon the porter at any time.

Some trains provide valet, maid, or secretarial service for the accommodation of passengers. On such trains the porter will arrange to have suits and overcoats and other garments pressed while the passenger sleeps. On some trains there are also shower baths and barber service. Some trains employ hostesses or nurse-stewardesses.

Sleeping cars are kept clean en route and are thoroughly cleaned inside and out after each trip. Linen is laundered after it is used; mattresses, blankets, pillows, and carpets are cleaned and aired frequently.

Pullman service is available throughout the United States and on lines in Canada and Mexico. To provide this service there are Pullman cars of all types rolling across the country in every direction and other Pullman cars equipped and ready in railroad yards awaiting call. There is balanced and well-matched equipment for all trains, with an adequate reserve supply of cars to meet peak demands. Through its unified, international system, the Pullman Company is able to shift its cars in season, increasing the supply the country over for holidays, for winter travel to and from Florida and California, for spring travel to and from the Virginias and Carolinas, for summer travel to lakes, mountains, and seashore—everywhere.

The number and types of sleeping cars carried by each train are determined by public patronage. A brief description of the sleeping cars and other equipment carried by each train, the cities between which each car is operated, and Pullman fares are usually published in the railroad's passenger-train timetables for the information of the traveling public.

On an average 300-mile overnight railway journey, Pullman accommodations, in late 1955, cost $5.00 for a lower berth; $3.80 for an upper berth; $5.55 for a duplex-roomette; $7.00 for a roomette for one; $8.00 for a duplex single room for one; $9.50 for a bedroom for one, or $11.05 for a bedroom for two; $11.30 for a compartment for one, or $14.45 for a compartment for two or more; $15.05 for a drawing room for one, or $19.00 for a drawing room for two or more. In addition, there is a Federal transportation tax of 10 per cent.

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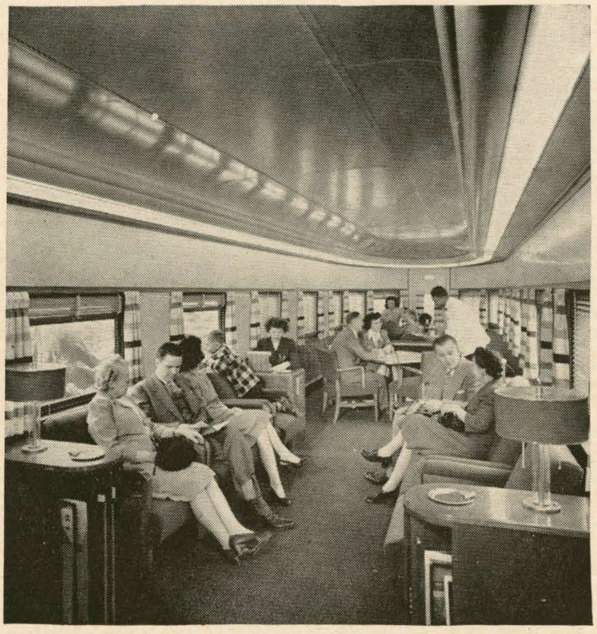
**1. What is a sleeping car, and how does it differ from a coach?**
**2. Why are sleeping cars called Pullmans?**
**3. What is an upper berth; a lower berth; a bedroom?**
**4. What other types of sleeping accommodations do the railroads provide?**
**5. What is a tourist sleeper, and how does it differ from a regular sleeping car?**
**6. What is a sleeping car reservation?**
**7. Where can sleeping car reservations be purchased?**
**8. Why is it wise to purchase reservations well in advance of the departure of the train?**
**9. Who has charge of sleeping cars in the train?**
**10. What are the duties of the Pullman conductor?**
**11. Who makes down the berths in the sleeping car?**
**12. What are some of his other duties?**
**13. How do sleeping cars contribute to travel comfort?**

# 18. RELAXING IN THE OBSERVATION CAR



The modern long-distance passenger train may be compared to a hotel on wheels. It provides the traveler with sleeping quarters, dining facilities, and, on many trains, lounge, club, or observation cars comparable with the lobby of a fashionable hotel or the library of an air-conditioned town club. The hotel or club may have beautiful paintings upon its walls, but the speeding passenger train provides its patrons with an ever-changing panorama of American scenes, in "technicolor," through every car window, scenes more beautiful and more impressive in many instances than any artist could paint.

Many observation cars and some club and lounge cars are equipped at one end with bedrooms or sections similar to those found in other sleeping cars. Many club and lounge cars have kitchen facilities, and a compartment is reserved for serving meals similar to those served in standard dining cars. Others are combination parlor-observation cars and have a glass partition separating the parlor section from the observation section. Seats in the parlor section may be reserved by passengers upon payment of the usual charges for such accommodations. The observation lounge is for the occupancy of passengers.

All trains are not alike; in fact, scarcely any two trains are alike, and that is one thing that makes railway travel so interesting. Some trains carry coaches only; some carry coaches and sleeping cars only; some are made up entirely of sleeping cars plus a dining car and an observation car. A train may include coaches, sleeping cars, parlor cars, club cars, and an observation car. Many combination cars are operated.

The equipment regularly assigned to each passenger train is listed in the railroad's timetable.

The observation car, club car, or lounge car is the "living room" of the train.

This picture shows the interior of an observation-lounge car attached to the rear end of the train. Its many spacious windows afford excellent opportunity for passengers to view the passing scenery on both sides of the train as well as to the rear. The car is attractively furnished with comfortable chairs and sofas, draperies at the windows, a rug on the floor, and paintings on the walls. It is also equipped with a table for playing games or for refreshments and with a writing desk for those who want to write letters.

Stationery and sometimes post cards are provided by the railroad company. Many observation cars are equipped with a radio for the entertainment of passengers. The latest magazines are provided for those who wish to read.

On a few railroads, observation cars with open rear platforms are operated to accommodate passengers who prefer to view the passing scenery out in the open. In mountainous regions, the open platform observation car also affords passengers an opportunity to take photographs while the train is in motion.

Other passengers prefer the enclosed air-conditioned observation cars, which enable them to sit inside and view the passing scenery in perfect comfort regardless of weather conditions outside. Some cars have glass-enclosed rooftop observation domes.

Club or lounge cars, usually located near the center of the train, have furnishings quite similar to those in observation cars, and, in addition, they have facilities for serving refreshments and light lunches.

An atmosphere of sociability prevails in observation, club, and lounge cars. Here passengers come to lounge and relax, to listen to radio programs, to read, to smoke, to write, to obtain refreshments, to watch the scenery, and to converse with fellow passengers.

Under normal conditions, passengers occupying sleeping cars or parlor cars may occupy seats in observation, club, or lounge cars without extra charge. Some of the new streamlined coach trains also have lounge cars.

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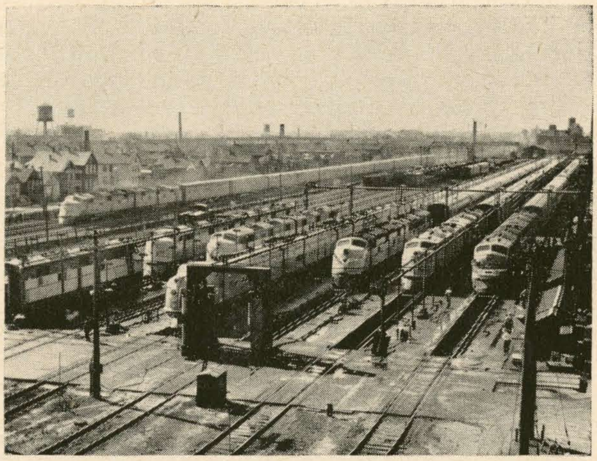
1. **What is an observation car?**
2. **Why is it so called?**
3. **Where is the observation car located in the train?**
4. **Why is it so located?**
5. **What are club and lounge cars, and how do they differ from the observation cars?**
6. **How are these cars furnished?**
7. **What special features do they have?**
8. **Why do travelers like to ride in these cars?**
9. **What trains carry observation, club, or lounge cars?**
10. **What can one do in the observation car?**
11. **Have you ever traveled in an observation car? If so, relate your experience.**

# 19. PASSENGER TERMINAL FACILITIES



Chapter 8 describes a big city passenger station with its waiting rooms, baggage rooms, ticket offices, concourse, and train platforms. These are facilities which passengers see as they enter or leave the station. But there are many other facilities connected with station operation which they do not see. In most big cities, the railway passenger station is really only a part of the larger facilities which make up the passenger terminal—often covering acres of ground and containing many tracks, switches, and signals. Railroad offices, storehouses, shops, and other buildings are usually located within the terminal area, also.

Passenger trains begin and end their runs in passenger terminals. Trains are also "relayed" there; that is, one locomotive is taken off the train and another put on, and crews are changed.

Generally speaking, the passenger terminal in a large city includes all the facilities for the passenger station proper, baggage, mail, and express service, and track and street approaches. Also, it usually includes all the necessary switching facilities, a locomotive terminal, coach yards where cars are stored when not in use, and locomotive servicing facilities for Diesel-electric engines and coal, oil, and water stations for steam locomotives.

At any point where a railroad terminal is located, all the facilities for receiving and discharging passengers and freight and the passenger and freight stations and yards, too, are commonly called "terminal facilities." At smaller cities and towns where passing trains make "local" stops, the term "station facilities" is used.

In some of the largest terminals where trains enter and leave the station through tunnels, the tracks and switches form an underground network of steel. In these man-made caverns, signals flash their messages and switches are opened and closed automatically by electro-pneumatic interlocking installations, operated from control towers. In the office of the dispatcher or operator who controls and directs the movements of trains, electrically lighted boards show "maps" of the terminal tracks, and lights tell the operator the exact position of each train. By means of levers and push buttons, he controls traffic movements through the area.

The picture shows the railway terminal where locomotives and passenger cars are cleaned and serviced. The train service platforms, built of concrete, accommodate 20-car trains with 3-unit Diesel-electric locomotives. On the train servicing platforms, spaced at 90-foot intervals, are pollution-proof hydrants for watering cars. At each end of the platform structure are fuel and water stands for Diesel engines; coal and water stations for steam locomotives are located nearby.

After passengers have been discharged and mail, baggage, and express unloaded from an incoming train, the cars are switched to the coach yard to stay until needed for departing trains. Trains leaving the terminal are "made up" in the yard and taken to the station for the beginning of their runs.

In the coach yard, passenger cars are cleaned, inspected, and repaired. Seat cushions are cleaned with vacuum cleaners; all dust and dirt is removed from carpets. The car floors are scrubbed with soap and water, and the car bodies and windows are washed inside and out. In some terminals, automatic washers clean the exterior of passenger cars. The picture shows (lower center) one of these automatic washing devices used to wash a streamliner before the beginning of its run. As the train passes along the track, between revolving brushes, the washer sprays water over both sides of the cars.

Pullman cars are also cleaned in the passenger yards. The mattresses and pillows of sleeping cars are vacuum cleaned frequently and, when possible, are exposed to the fresh air and sunshine. At frequent intervals, the drinking water containers are cleaned and sterilized with live steam.

The railroads are especially careful to keep dining cars clean and sanitary. At the end of every trip, the food supplies left over are inspected and, if not in perfect condition, are discarded. An important part of the work of the passenger terminal is to keep all cars "spic and span" for travel comfort and safety.

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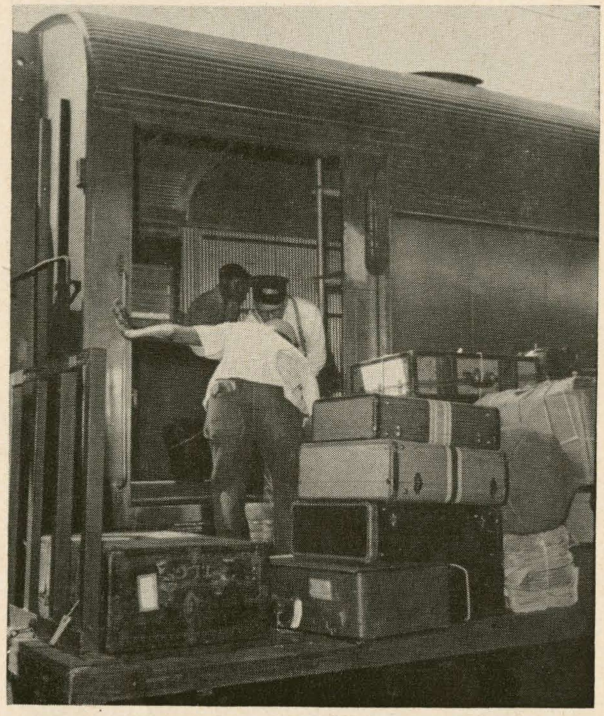
1. **Where do passenger trains begin and end their runs?**
2. **What are some of the facilities of a passenger terminal?**
3. **What is meant by "relaying" trains?**
4. **What is the difference between "terminal facilities" and "station facilities"?**
5. **Are terminal tracks sometimes underground?**
6. **What is the "nerve center" of a railway terminal?**
7. **Where are passenger cars taken for cleaning and storage?**
8. **How are cars sometimes washed on the outside? On the inside?**
9. **Why is car cleaning and servicing an important part of the work of a passenger terminal?**

# 20. LOADING THE BAGGAGE CAR



When brother or sister leaves for college or when mother and dad go to the seashore, they take along their clothes and other personal belongings. Frequently they take with them one or more trunks and several smaller pieces of baggage. It is for the accommodation of passengers that the railroads provide special cars in their trains to transport trunks and other luggage.

Each year the railroads carry, usually without charge, hundreds of thousands of trunks and other hundreds of thousands of pieces of hand luggage for the convenience of their passengers. The baggage car is also used for the transportation of skis and bicycles, also dogs, cats, birds in cages, and other pets accompanying their owners.

In every large railway station there is a baggage room where baggage is received and checked for forwarding by train or for delivery to passengers or their representatives. A baggage agent or baggage master is in charge of the handling and storing of baggage. Baggage which is to be forwarded by train is loaded on electrically operated trucks or on trailers drawn by electric trucks and hauled to the proper train for loading. At small stations, baggage and express parcels are loaded on a platform truck and pulled by hand to the baggage car door by the baggage agent, or the station agent, or one of the station assistants. Incoming baggage is handled in the same manner, except that the movement is reversed.

The baggage car is usually located in the train just behind the express and mail cars and ahead of the passenger-carrying cars. The railroad employee in charge of the car is called the baggageman. In addition to looking after the passengers' baggage, the baggageman sometimes receives and distributes newspapers in bundles. He also receives, sorts, and distributes the railroad company's business mail passing between railway offices and agents. Railroad business mail handled in the baggage car does not pass through government post offices.

While the train is speeding along, the baggageman arranges the baggage, mail, and newspapers in convenient piles, ready to be put off at the proper stations. The baggageman examines each piece of baggage to see that it is properly wrapped, locked, tagged, and addressed. He keeps a record of what he takes on and puts off at each station.

For each piece of baggage received, the baggage agent or his assistant uses two checks, each bearing identical numbers, one of which is attached to the baggage and the other given to the owner of the baggage as a receipt. The baggage is reclaimed by the owner upon presentation of the duplicate check.

Many years ago baggage could not be checked over two or more railroads. But the railroads worked out a plan whereby a passenger can check baggage from any city or town in the country to any other city or town reached by a railroad.

There is no limit to the amount of baggage a passenger may check for shipment, but the maximum weight allowed for any piece of baggage is 300 pounds, and the maximum length permitted for any piece of baggage is 72 inches. Baggage may be insured. The highest valuation or risk accepted by the railroads on one passenger's baggage is $2,500. Some railroads make a slight charge for checking baggage; others carry baggage free, within certain weight and size limitations.

For the convenience of their patrons, the larger railway stations maintain parcel rooms where hand bags, parcels, overcoats, wraps, and other articles may be checked for a small charge for each 24 hours or less. In many stations there are also metal lockers for the same purpose, usual fees being 10 cents for small lockers and 25 cents for large.

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1. **What is baggage?**
2. **For whom do the railroads carry baggage?**
3. **Where is baggage kept and stored in the station?**
4. **Who is in charge of the baggage room?**
5. **Where is baggage carried in the train?**
6. **Who looks after baggage in the train?**
7. **How is baggage transferred from station to train?**
8. **What other things are carried in the baggage car?**
9. **What are the weight and size limits on baggage?**
10. **Can baggage be checked through to destination when the journey is over two or more railroads?**

# 21. SORTING MAIL IN A RAILWAY POST OFFICE CAR

Before railway transportation was introduced, the mails were carried on horseback, by stagecoach, by sulky, by canal packet, and by steamboat.

Mail was slow, schedules were uncertain, and in many out-of-the-way places deliveries were sometimes as much as three weeks or a month apart. Postage rates were high.

Railway transportation greatly speeded up the movement of mails, increased the dependability and frequency of deliveries, and reduced postage rates.

The first known instance of mails being transported by train was behind the locomotive "West Point" at Charleston, South Carolina, in November, 1831. By 1838, when Congress declared all railroads to be post routes, mail was being carried on 1,500 miles of railroad in this country. From that time forward, the route mileage and the volume of mail carried by rail increased rapidly.

In 1864, a train pulled out of Chicago hauling a car that looked like a cross between a box car and a passenger coach. It was a Railway Post Office car bound for Clinton, Iowa, in the inauguration of a postal service that was to revolutionize our system of carrying and distributing mail.

The vast expansion of the Post Office Department since the advent of railroads is shown by the fact that total government postal receipts increased from $2,000,000 in 1830 to over $2,275,000,000 in 1954 (fiscal year ending June 30).

The picture shows a typical scene in one of the numerous Railway Post Office cars which speed daily over the railroads of the United States.

After a letter is cancelled at the local post office, it is placed in a mail pouch with other mail moving in the same general direction. The pouch is locked, labeled for a certain train, and taken to the railway station by a mail messenger or some other authorized person. In the larger cities, where the post offices are located adjacent to the railroad station, the mails are sent to the station by chutes and conveyor belts and railroad employees deliver the mail to the postal transportation clerks on the train.

If the train does not stop at a particular station, the pouch is attached to a mail crane and picked up in the manner described in the next chapter. Once inside the car, the pouch is opened and the letters are placed on large tables. Racks are located in front and back of these tables to hold open pouches. Each pouch is labeled for a certain post office, distribution point, or connecting train. Attached to the walls of the car are large boxes for mail that has been distributed. Letter cases containing up to about 1,000 pigeon holes are also fastened to the walls. These so-called "letter cases" are used in distributing the letter-mails not only for the state through which the train might be passing, but also for distant states to speed delivery between sender and addressee.

Letters and postal cards are sorted and tied into bundles, each bundle bearing a slip showing the destination, the railway post office's stamp and the clerk's name. Packages and newspapers are placed in sacks, each of which is labeled for a particular post office or connecting train. Postal transportation clerks also distribute the mails for the larger cities to the various delivery stations from which the letter carrier operates. Only the railroads provide such vast distribution facilities. In recent years, the Post Office Department has authorized distribution of mail en route in a limited number of specially designed motor vehicles some of which are operated by the railroads.

Railway postal clerks develop remarkable speed and skill in the sorting and handling of mail. They know hundreds of railway mail routes. They memorize thousands of post offices and train connections, so it is not necessary for them to keep looking up such information in books or bulletins. Thus their memory helps them to do more work than would otherwise be possible.

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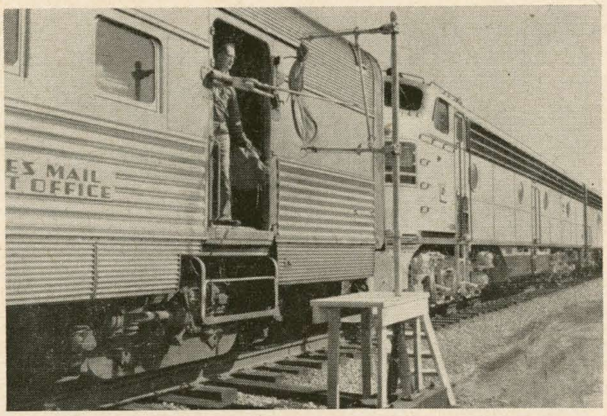
1. **Where and when was mail first carried by railroads?**
2. **How did the railroads help to improve mail service?**
3. **How has railway mail service been speeded up?**
4. **How long does it now take for a letter to cross the continent by rail?**
5. **Describe a Railway Post Office car.**
6. **What is a mail pouch?**
7. **How do railway postal clerks sort mail?**
8. **Does sorting mail on the train help to speed up mail service?**
9. **How are pouches in the mail car labeled?**
10. **What knowledge is especially valuable to railway postal transportation clerks?**

# 22. HOW THE TRAIN CATCHES A MAIL BAG




The postman brings the mail to our homes each day, and we drop the letters which we write into the nearest mail box or into the local post office. How many of us have ever paused to consider what a vast amount of work is involved and how much planning is necessary to collect, distribute, and deliver the mails throughout the United States? Those who have an opportunity to look "behind the scenes" and see how the mail is handled from the time it is collected until it is delivered, sometimes thousands of miles away, are impressed by the important part which the railroads play in mail transportation.

Here are a few facts: (1) United States mails are carried in about 5,000 trains daily. (2) These mail trains travel an aggregate distance of over 600,000 miles daily. (3) Of more than 11,000,000,000 pounds of mail handled by the Post Office Department in 1954, about 10,000,000,000 pounds moved by rail during all or part of the journey. (4) In 1954, the railroads carried more than 44,000,000,000 pieces of United States mail. (5) The railroads of the United States own and operate approximately 2,600 Railway Post Office cars and apartment mail cars for the handling of United States mails. Mail is also carried in more than 11,500 mail, baggage, and express cars.

United States mails are carried in some of the fastest passenger and express trains in the country. In order to maintain fast schedules, these trains stop at only the larger cities en route. However, with the aid of mail cranes such as we see in the picture, it is possible for small communities along the railroad to have adequate mail service at all times. The mail crane, which is located alongside the track, enables the train to pick up a bag of mail without stopping or slowing down. A mail messenger employed by the railroad or by the local post office, or some other authorized person, attaches the mail pouch to the crane a short time before the train is due. As can be seen from the picture, the mail pouch hanging in the crane is tied in the middle.

On each side of the mail car is a steel V-shaped catcher arm. As the train nears the crane, a clerk in the mail car sights through a windshield and aims the catcher arm at the mail pouch where it is tied in the center. The catcher arm picks the pouch from the crane, the narrow center of the bag fitting securely into the neck of the steel arm. The picture shows the catcher arm just as the clerk is about to swing it into the car and remove the mail pouch. While he makes catches, he also puts off bags of mail at designated stations.

More than 38,000 persons are employed in the Postal Transportation Service of the Post Office Department. Some 15,000 of them are postal clerks who receive, sort, and distribute mail in Railway Post Office cars. One to fifteen clerks are usually assigned to each car. Some of the more important mail carrying trains have three R.P.O. cars and about 30 clerks. For mail carried in baggage and storage cars, railroads furnish employees to handle, pile, and store the sacks and parcels.

The railroads transport United States mails in their own cars, but the Post Office Department specifies the types of railway postal cars desired, the route of each car, and the frequency of the service. These cars must conform to certain specifications as to size, construction, and interior furnishings.

Although payments to the railroads are on a space basis, records kept by the Post Office Department show that, for carrying a first class letter on which the postage is 3 cents or more, the railroads received an average of about 1/8 of 1 cent. Low cost and efficient railway service makes low cost and efficient postal service possible.

The car in Picture 21 is a regular Railway Post Office car, often referred to as an R.P.O. When the amount of mail to be handled does not require a full-sized car, a combination mail-and-baggage car or mail-and-express car is used.

The railroads provide fast, dependable, and frequent mail transportation service to and from cities and towns in every part of the country. The importance of railway mail service is strikingly shown by the fact that the railroads carry approximately 85 per cent of all the non-local mail—including everything from post cards to parcel post packages. And if you count just the first class mail, the railroads carry about 90 per cent of the intercity mail in the United States.

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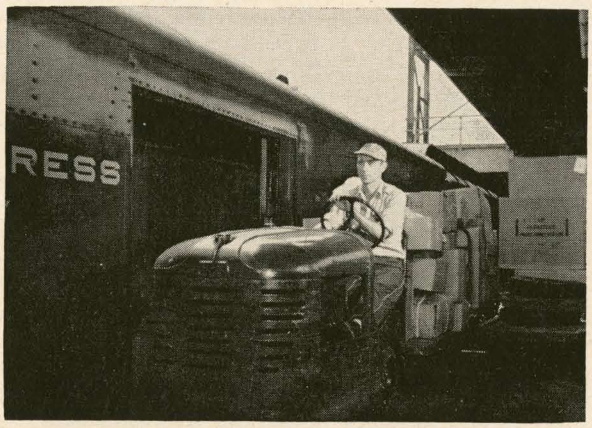
1. **How are United States mails transported?**
2. **What do the initials R. P. O. stand for?**
3. **In what kinds of trains are U. S. mails carried?**
4. **What is a mail crane?**
5. **What is a mail bag catcher arm?**
6. **How does the railway mail clerk get the bag from the crane?**
7. **How do these devices help to speed the mails?**
8. **What percentage of U. S. mails is carried by train?**

# 23. LOADING EXPRESS SHIPMENTS




For more than a century the word EXPRESS has stood for speed—speed and romance. In 1839, William F. Harnden, one of the pioneer railroad conductors of New England, had an idea. The idea took hold of him so strongly that he quit his job with the railroad and became the world's first railway express messenger, traveling between Boston and New York by the fastest conveyances of that day, carrying a carpet bag. The carpet bag contained packages of money, documents, jewelry, gold, and other valuables and articles entrusted to his care.

Gradually Harnden's express business expanded. The carpet bag became inadequate, and in time a railroad car was needed to hold all of the things that people wanted him to carry for them.

With the growth of railroads and the rapid development of the country, other express companies entered the field. Wells-Fargo, the pioneer express company of the Far West, the famed Pony Express, Adams Express, American Express, and others—each provided service by the fastest conveyances of its day.

The successor to all of these famous express services of earlier days is the Railway Express Agency. Its far-flung organization surpasses in scope of operations all of the earlier companies combined.

Today, as in early days, the man in charge of an express car is called an express messenger. He puts off and receives shipments, keeps records, and is responsible for the safe delivery of all goods in his car.

Performing complete pick-up and delivery service, collecting shipments from homes, offices, factories, and other places of business, and delivering them to the doors of consignees in important cities and towns in all parts of the country, the Railway Express Agency handles an average of about 300,000 separate shipments, large and small, every day in the year.

In the performance of its extensive nation-wide service, the Agency maintains offices scattered throughout the United States. It uses over 177,000 miles of railway lines, over 12,000 miles of water routes, nearly 113,000 miles of air lines, and more than 77,000 miles of motor-truck lines in its regular daily operations. Railway Express Agency traffic moves in about 5,500 passenger trains daily.

For the collection and delivery of express shipments, the Agency operates a fleet of some 13,500 motor vehicles of its own—the largest commercial motor fleet in the United States under one management. Altogether, the agency employs about 45,000 express handlers, agents, messengers, truck drivers, inspectors, clerks, and other workers. Its service extends to Alaska, Hawaii, Cuba, Central and South America.

In addition to millions of express shipments in packages, crates, cases, boxes, cartons, bags, and other containers, the Agency operates refrigerator cars for the transportation of perishables, special cars for the transportation of horses and other animals, and tank cars for the transportation of live fish. It handles shipments of blood plasma, valuables, motion picture films, delicate instruments, plants and flowers, family pets, and many other shipments requiring special care or speedy deliveries.

Many of the delicacies that are served on American tables are brought long distances by Railway Express. Fresh oysters from Chesapeake Bay, shrimp from the Gulf Coast, live lobsters from Maine, soft crabs from the Virginia capes, and many other seafoods, thanks to express service, are served in hotels, restaurants, homes, and dining cars in all parts of the country.

When one wants to send something by express he telephones the local office of the Railway Express Agency. The Agency will pick it up and deliver it to any individual, firm, or institution in thousands of cities and towns in the United States. Some shipments are sent with express charges prepaid and some with express charges to be collected from the consignee. Also, the shipper may pay part of the charges and the consignee the balance upon delivery.

An attractive feature of express service is its C.O.D. system. By this method any person in the United States can place orders with firms anywhere in the country and pay the local express agent for the value of the merchandise at the time the shipments are delivered. Railway Express forwards the payment to the shipper. C.O.D. means collect on delivery.

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1. **What is express service?**
2. **When was it introduced in America?**
3. **Who was the world's first railway express messenger and how did he begin?**
4. **What do you know about Wells-Fargo and the Pony Express?**
5. **What is the Railway Express Agency?**
6. **What kinds of shipments are handled by railway express?**
7. **What modes of transportation are used by the Railway Express Agency?**
8. **What kinds of trains and cars are used for the transportation of express?**
9. **Who looks after express shipments on the train?**
10. **How does express service help us?**

# 24. KEEPING TRACK OF FREIGHT CARS

Every day, about 100,000 railroad cars are loaded with freight. They are loaded not only at railroad freight houses and team tracks but at factory sidings, on mine spurs, at industry tracks—at probably a million or more separate locations scattered all over this continent. Every day, these cars are gathered up by railroad switch engines and assembled into trains, for mass movement between terminals. Every day, they are switched out of trains at way stations, or are classified and distributed at terminals for delivery to connections or for "spotting" on industry tracks or at freight houses or team tracks to be unloaded or reloaded. And any and every one of these cars, as long as it complies with the interchange rules of the Association of American Railroads, can go anywhere on the nearly 470,000 miles of tracks of the standard-gauge railroad systems of the United States, Canada, Mexico, and Cuba.

Many persons wonder how it is possible for each railroad to keep constant track of its wandering freight cars. This is done by an elaborate nation-wide system of checks and reports. When a freight car leaves its own railroad and moves onto another railroad, the agent at the junction point reports the interchange movement to the Car Record Office of his railroad. Thus by daily telegraphic, teletype, and written reports the Car Record Office is kept informed of the progress of the car. Through these offices and a car's waybills, a car or shipment can be quickly located at any time. A Car Record Office is shown in the picture.

The method of payment to the railroad owner of a car for its use by other lines is called per diem. For each day it has a "foreign" car (car from another railroad), empty or under load, on its tracks, a railroad owes the owner $2.40. For each of its own cars away from "home," it is due to receive $2.40 a day. (These figures are for 1954.) Settlement is made between roads periodically, on the net balance due according to their records.

Per diem payments, however, are not a sufficient means to cause cars to flow "home" automatically in times of active demand. Nor could the system operate to marshal the great fleets of cars needed for peak loads such as the movement of a major crop. Those results are accomplished by the car service rules, agreed to by all railroads and administered by a central organization, the Car Service Division of the Association of American Railroads. Cars made empty are started back to or toward their owners, loaded if a load going in that direction is available, empty if not.

The Car Service Division, in addition to overseeing nation-wide distribution of freight cars, works constantly with the railroads and their patrons to secure the utmost efficiency in the use of freight cars.

When extraordinary demands arise, as they do at harvest time or in time of flood or great emergency such as war movements, the Car Service Division has power to meet the need either by speeding up the home flow of cars to particular areas or to particular railroads, or by turning cars of any ownership to the task at hand. The Division's steady, everyday job, however, is keeping check on the regular return of cars of all types to their home roads, as a means of maintaining the distribution of cars which most nearly meets ordinary traffic demands.

Besides accounting for the use and care of the wandering freight car, there must also be arrangements to account for the revenue the car earns. Where railroads do not agree on the division of revenue, they may submit the matter to the Interstate Commerce Commission. The divisions agreed upon by the railroads or established by the I.C.C. are applied through the accounting departments of the railroads.

Every joint-line freight shipment produces revenue and, unfortunately, not a few of them give rise to claims for loss and damage. These claims are filed with either the originating or the delivering railroad, which investigates, adjusts, and settles them for the account of all the lines concerned, and prorates the cost among them. Here, again, there is occasional need for adjustment among the railroads which pay the bills. This is accomplished through the arbitration procedures maintained by the Freight Claim Division of the Association of American Railroads.

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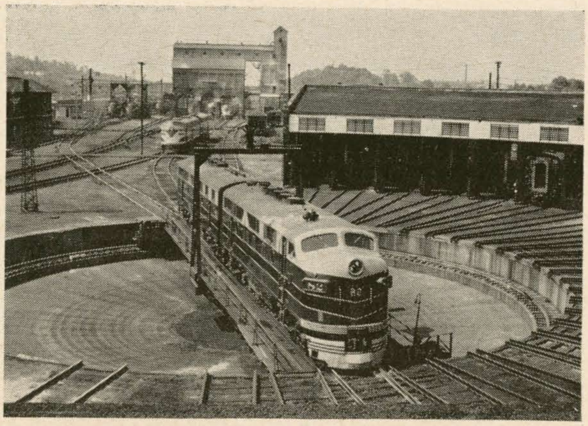
1. **Why do freight cars belonging to one railroad often move over other railroads?**
2. **How do railroads keep track of their wandering freight cars?**
3. **What is the freight car owner's fee called?**
4. **What does a railroad's Car Record Office do?**
5. **What central organization helps all the railroads in the nation-wide distribution of freight cars?**
6. **How does this organization meet emergency needs, such as harvest or movements of war materials?**
7. **What is a "foreign car"?**
8. **How are loss and damage claims settled?**

# 25. THE ROUNDHOUSE AND THE TURNTABLE



When the steam locomotive came into use, nearly all wheeled vehicles were pulled by animal power. The locomotive was looked upon as a sort of mechanical horse; hence, it was popularly called the "Iron Horse," just as in later years the first automobiles were commonly called "horseless carriages." Today, we do not often call the locomotive an "Iron Horse," nor do we call the enginehouse or roundhouse in which locomotives are kept a stable, but the places in the roundhouse where the locomotives are kept are still called "stalls," and the roundhouse men who look after the locomotives and take them in and out of their stalls are still called "hostlers." Although Diesel shops are replacing the roundhouses, the latter remain a colorful part of American railroading.

When a locomotive finishes its run, it is usually taken to an engine terminal. At the terminal is the roundhouse, where engines are cleaned and given light or "running" repairs, and made ready for their next runs. The engine terminal may include a coaling station, a water tank, a sand house, an oil house, and an ash pit. Today, however, Diesel fuel pumps and locomotive washing facilities are more common.

On its arrival at the engine terminal, the engine is taken to the coaling or Diesel station to be refueled. The sand box is filled with dry sand from the heated sand house. In the case of a steam locomotive, its tender is filled with water from a tank or column. Then, the engine is moved to the ash pit where the fire-grates are cleaned and ashes and cinders are removed from under the firebox.

If the engine requires further attention to put it in condition for the next run, it is taken to the roundhouse. Some engine terminals have two or three roundhouses, others have only one; some roundhouses have many stalls, others have only a few, depending upon the number of engines to be serviced.

The roundhouse is a sort of locomotive garage. Its name is derived from its shape. Many roundhouses are semi-circular in shape, many others form a complete circle except for one or two openings for entrance and exit tracks.

Each locomotive stall is fitted with large doors on the inner side. There are windows above the doors and also on the outer side. Each stall bears a number over its entrance or on its door.

Long pits between the tracks in the stalls permit inspection and repair of locomotives from underneath.

Adjacent to or in the roundhouse is a machine and blacksmith shop. There are also rooms for storing supplies, a tool house, lockers for the workmen, and a small office for the master mechanic or foreman in charge of the roundhouse.

One of the most interesting features of the roundhouse is the turntable, by which locomotives are turned so as to enter or leave the stalls, or by which locomotives may be turned around.

(Trains, locomotives, and cars can also be turned around on wye tracks, i.e., two tracks leading off from another track, forming a junction and ending in a single track like the letter Y.)

The turntable is pivoted at the center and is supported at the ends by wheels which run on a circular track. From the turntable, tracks spread out fanwise.

When an engine is in position on the turntable, as shown in the picture, the operator moves the turntable slowly, by means of an electric or gasoline motor, to a track leading to an empty stall or to the terminal yard. Small turntables are sometimes moved by hand. Turntables must be built to accommodate the heaviest and longest locomotives used on the railroad, or at least on the local division of the railroad.

There are many workers at the roundhouse—machinists, electricians, boilermakers, helpers, wipers, and so on. A foreman is in charge. He receives reports from the locomotive engineers and inspectors on the condition of the engines and decides what work shall be done on them. At each engine terminal there is at least one hostler. One of his jobs is to drive the engines in and out of the roundhouse. In the picture, a hostler has driven an engine onto the turntable, which is being turned to place the locomotive in line with the track leading to a roundhouse stall.

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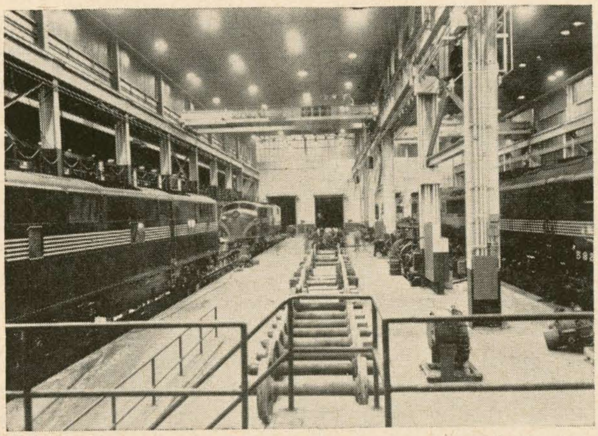
1. **What is a roundhouse?**
2. **Why is it so called?**
3. **What is the roundhouse for?**
4. **Why is a roundhouse like a garage?**
5. **Where is the roundhouse located?**
6. **Who is in charge of the roundhouse?**
7. **What other workers are employed there?**
8. **What are the duties of a hostler?**
9. **What is a stall and why is it so called?**
10. **Of what use is the turntable?**
11. **How is a locomotive turned without a turntable?**
12. **Do freight and passenger cars have to be turned around to run in the opposite direction?**
13. **What types of work are done in a roundhouse?**

# 26. IN THE LOCOMOTIVE SHOP



In addition to their facilities for making light repairs to locomotives in service, the railroads own and operate hundreds of large shop plants for overhauling, rebuilding, and reconditioning locomotives—commonly called "heavy repairs" or "back shop" work. The roundhouse may be likened to a first aid station; and the repair shop plant (commonly called "railroad shops") may be likened to a completely equipped hospital for performing major operations. However, on some roads, both running repairs and heavy repairs on Diesel locomotives are made at the Diesel shop.

Many large railroad shops are equipped to build as well as to overhaul and repair locomotives. However, most locomotives—steam, electric, and Diesel-electric—are built for the railroads by manufacturing companies. Each order placed by the railroads for new locomotives is accompanied by detailed specifications and blueprints showing complete information concerning them. The manufacturing company builds the locomotives according to the railroad's specifications.

This also applies to passenger and freight cars. Some railroads are equipped to build their own cars, but many of them buy new passenger and freight cars from the car building companies.

Some railroad shops are for overhauling and repairing locomotives only; others rebuild or repair railroad cars only; while many railroad shops are equipped to rebuild and repair both locomotives and cars.

A typical, fully equipped shop plant usually covers many acres and may include a locomotive erecting shop; a Diesel-electric shop; a machine shop; a blacksmith shop; a power house; a boiler shop; a tank shop; a tool room; a tin, copper, and pipe shop; an oil house; an electric shop; a foundry; a planing mill; a paint shop; a storeroom and storage yards.

Railroad shops which are equipped for building or reconditioning freight and passenger cars as well as locomotives, may also include a wood mill, a wheel shop, and an upholstery shop. Several miles of railway tracks connect and extend through some of these buildings and through storage yards and grounds.

Among the most impressive features of the locomotive erecting shop are the huge overhead electric cranes such as the one shown in the picture. These cranes move back and forth, above the main floor of the shop, and are capable of picking up and carrying the heaviest locomotives from one end of the shop to the other.

The work to be done on each locomotive is covered by a shop order. The job of overhauling and repairing the engine may require several weeks. The shop order may call for extensive replacements of worn-out parts such as flues, wheels or tires, and the repair or replacement of valves, brakes, springs, bolts, pipes, and so on. With Diesel-electric locomotives, it may be necessary to remove, clean, and repair generators, traction motors, and other electrical devices. When the job is finished, the locomotive will be painted and put in condition for operation.

Some locomotive shops employ hundreds of workmen, some employ thousands. Railway shop forces include foremen, inspectors, electricians, boilermakers and boilermakers' helpers, machinists and machinists' helpers, blacksmiths and blacksmiths' helpers, lathe operators, electric drill operators, riveters, carpenters, painters, engine cleaners, sandpipemen, crane operators, motor truck and tractor operators, laborers, watchmen, and many other workers, skilled and unskilled.

The picture shows the interior of a railroad company's locomotive shop. Several Diesel-electric units may be seen on the repair tracks. Down the center of the shop is a line of wheels. Steam, Diesel-electric, and electric engines are repaired in company locomotive shops.

Approximately one out of every four persons employed by the American railroads is engaged in keeping locomotives and cars in good condition. Railroad shops are a big industry in themselves.

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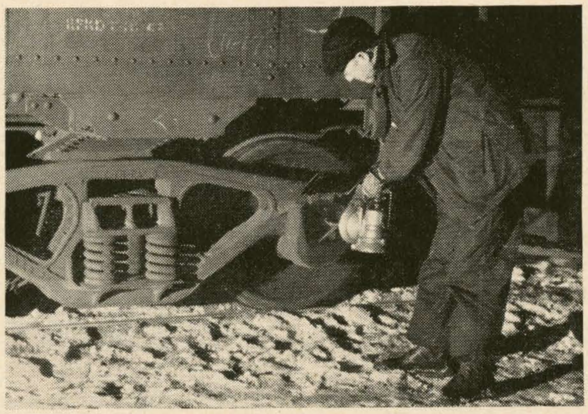
1. **How does the locomotive repair shop differ from the roundhouse?**
2. **Can locomotives be built in some railroad shops?**
3. **Where else are locomotives built?**
4. **Where are freight and passenger cars built?**
5. **Where are freight and passenger cars rebuilt or repaired?**
6. **What are some of the buildings found in a shop plant?**
7. **What is a shop order?**
8. **What workmen are employed in railway shops?**
9. **What device in the picture lifts locomotives?**

# 27. THE CAR INSPECTOR AT WORK



The car inspector is one railroad man who is always "looking for trouble." In looking for trouble, however, he is looking for ways to promote safety. His job is to examine the cars to make certain that they are in good condition, or to discover defects which might lead to accidents or delays. He must have sharp eyes, keen ears, and an alert mind as he goes up and down the train looking for defects.

This picture shows the car inspector examining the journal box to see if it is properly packed with oiled cotton waste. A journal box which is not adequately packed and oiled is likely to become overheated from friction, and this may make it necessary for the train to stop until it cools off.

Incoming passenger and freight trains at important stations and yards are examined carefully. Under, around, inside, and on top of the cars the inspector clambers, his expert eye searching trucks, gears, and other parts for signs of defects. Inside the cars, he notes the condition of roofs, walls, floors, and doors. He reads the "air date" to see if the air-brake apparatus has been cleaned within the year. Tests are made before each train leaves its home terminal and when cars are added to or taken out of the train to see that the air-brake system is functioning properly.

At almost any hour one or more car inspectors may be seen about the station and yards of important terminals, carrying their kits of tools, and their lanterns at night, testing brakes and hose connections, examining journal boxes, or listening for flaws as they tap their hammers against wheels, pipes, and couplings. Cars which do not meet the severest service requirements are ordered out of the train for repairs. Every effort is made, however, to keep loaded freight cars moving and to avoid delays which might damage the contents of the cars or cause inconvenience to the consignees. Of course, many cars travel empty on their way to pick up loads. Such cars can usually be sent to the repair tracks without undue inconvenience.

Car inspection is a part of the daily routine of railroad operations. It is one of many precautionary measures which the railroads employ to promote safety, prevent delays, and increase the efficiency of passenger and freight train operations. For many years "Safety First" has been the watchword of railroads and railroad employees. And today the railroads are providing the American people with their safest form of transportation.

Freight car repairs fall into three classes—(1) tinker repairs, (2) light repairs, and (3) heavy repairs. Tinker repairs are inconsequential repairs from the standpoint of expense and are usually made in the railroad yards without interfering with the service of the car. Light or running repairs consist of those repairs necessary to keep the car in service without delay. They are usually made in the car repair yard. Heavy repairs consist of rather extensive overhauling and may include the renewal of one or more of the following: wheels, truck bolsters, flooring, sidings, roof, springs, air-brake equipment, couplings, or draft beams.

Passenger car repairs are classed as (1) running repairs and (2) general repairs. Running repairs consist of minor work required to keep the car in service without material delay. General repairs call for more extensive work which may include renewal of wheels, air-brake equipment, seats or upholstery, springs, axles, or interior refurnishings.

Nearly every freight and passenger terminal has a repair yard for performing light or running repairs. Heavy or general repair work is performed at the larger car shops.

The railroads rely upon the expert eye and ear of the car inspector to locate defective equipment. When he finds anything wrong, he promptly notifies the foreman in charge of car repairs, and the latter takes immediate steps to have the repairs made. In this way, the railroads' great fleet of passenger, freight, express, and mail cars is kept in good condition.

Among the workmen who are employed in keeping railway cars in good condition are: car foremen, car repairers, machinists, machinists' helpers, welders, riveters, blacksmiths, blacksmiths' helpers, carpenters, carpenters' helpers, metal workers, machine operators, and painters. In addition to those mentioned above, electricians, upholsterers, and plumbers are employed in the rebuilding and repair of passenger train cars.

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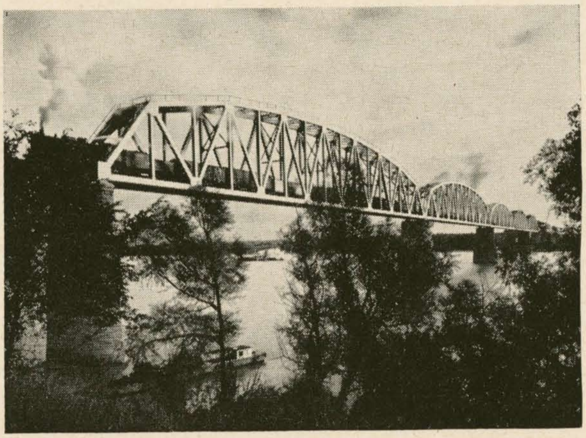
1. **What are the duties of the car inspector?**
2. **Why is he always "looking for trouble"?**
3. **What are some of the things he looks for?**
4. **What is he doing in the picture?**
5. **How does the car inspector discover defects?**
6. **What does he do if he finds a car that is not in good condition?**
7. **Must the inspector have special knowledge or experience to perform his work well?**
8. **How does the car inspector help to make travel safer?**
9. **Why do many railroad men work at night?**
10. **What workers are employed in repairing cars?**

# 28. SPANNING STREAM AND VALLEY



What is more interesting and imposing than a majestic railroad bridge! Whether viewed by daylight or moonlight, from afar or from the structure itself, the bridge is a thing of impressive beauty and wonder. It is a symbol of man's conquest and triumph over the obstacles of nature. Is it any wonder that passengers turn to the car windows when the rumble of the train tells them that a bridge is being crossed?

Bridges make it possible for trains to run from one city to another, or from one part of the country to another, by the most direct routes, without being stopped or impeded by the numerous watercourses and valleys encountered along the way.

The earliest railroad bridges were built of blocks of stone and wooden timbers, fastened into place by cast-iron or wrought-iron bars and bolts. Gradually iron replaced wood, and finally steel replaced iron.

A stone arch bridge, the Carrollton Viaduct, built near Baltimore in 1829, is the oldest railroad bridge in service anywhere. Its first loads were locomotives weighing but 3½ tons. Now, this same bridge carries locomotives weighing upwards of 500 tons.

Many years passed before railroad bridges were built across the larger rivers. The first railroad bridge across the Mississippi River, built of stone piers and wooden trusses fastened together with iron bolts, was completed at Davenport, Iowa, in 1856.

An historic milestone in railway bridge progress was the completion of the Eads Bridge across the Mississippi River at St. Louis, Mo., in 1874. This bridge was the first to span the river at St. Louis and was the first in the world to use steel in truss-bridge construction.

Today, there are about 190,000 railway bridges in the United States, ranging in length from short spans of 100 feet or less to huge steel and concrete structures several thousand feet in length.

A bridge's foundations, or "legs," standing in the river bed and supporting the main structure, are called *piers.* Each section between two piers is called a *span.* The structure at either end leading up to the bridge proper is called the *approach.* The "floor" of the bridge on which the railway tracks are laid is called the *deck.* The foundations and piers form the *substructure.* That part above the piers is called the *superstructure.*

The bridge in the picture is an eleven-span truss structure, almost 4,400 feet long. The spans at each end are of *deck truss* construction, and the other nine are *through truss* spans. All eleven spans rest on individual piers, each down many feet into the water and river bottom to reach a sound foundation.

There are several other types of railway bridges, including *suspension bridges, cantilever bridges,* and *arched concrete viaducts.* Bridges across shallow streams, bays, inlets, and lakes are sometimes built of piling and timber and are called *trestles.*

One or more of the bridges mentioned above are also used to carry the railroad over some highways, or one railroad track over another. These *overpasses,* or grade separations, as they are variously called, reduce accidents at railroad-highway intersections, relieve traffic and congestion at railroad crossings, and are a big factor in operating a railroad safely.

In addition, there are *lift span* draw-bridges, where the span is moved up like an elevator, between towers, to admit the passage of vessels which cannot pass under the bridge in its usual position; *swing drawbridges,* which open by swinging on a central pivot somewhat similar to a turntable, and *basculed drawbridges,* which open upward on huge hinges at one end, or which open similarly at both ends (known as single-leaf and double-leaf bascules) by the aid of counter-weights. Such spans are sometimes called "jack-knife" bridges.

The bridge in the picture is of single-track construction. The through truss spans vary from 400 to 518 feet in length and are set high enough on their piers to make the need for a drawbridge unnecessary. The piers rest on bedrock 150 to 200 feet below low water. The bridge contains 10,000 tons of steel.

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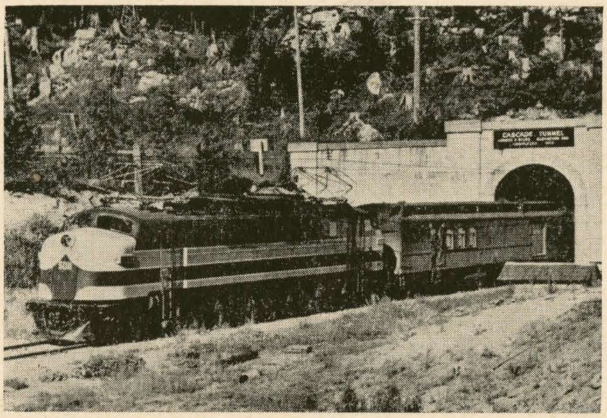
1. **Why are bridges necessary?**
2. **How did the pioneers cross rivers when there were no bridges?**
3. **Why must railroad bridges be strong?**
4. **Of what materials are modern railroad bridges usually built?**
5. **What do men who design and build bridges have to know?**
6. **What kinds of railroad bridges are there?**
7. **What is a drawbridge?**
8. **What kinds of drawbridges are in common use?**
9. **What is a bridge pier? A span? An approach? The substructure? The superstructure?**

# 29. A TRAIN LEAVING A TUNNEL



Imagine yourself seated in a luxurious air-conditioned dining car enjoying a delicious breakfast of bacon and eggs, toast and milk, while your train speeds merrily along hundreds of feet underground. This is happening every day in parts of our country where railway tunnels pierce great mountain ranges.

Many passengers entering and leaving New York City pass directly under huge ocean liners steaming to and from their piers on the Hudson or North River. In Washington, some passenger trains pass through a tunnel that carries them almost directly beneath the Senate Office Building, the Supreme Court Building, and the Library of Congress.

The tunnel ranks with the bridge among the most interesting features of the railroad. There are more than 1,500 railroad tunnels in the United States, ranging in length from a hundred feet or less to several miles—carrying railway traffic beneath city streets and skyscrapers, under busy rivers and harbors, through hills and beneath rugged snow-capped mountains.

The tunnel is the direct opposite of the bridge. The bridge carries the railroad above the earth's surface; the tunnel carries it beneath the earth's surface. Both are difficult and expensive to build; therefore, both are avoided whenever possible. There are many instances where tunnels are necessary to provide a more direct route between two points than would otherwise be possible, to enable the railroad to traverse mountains at fairly level grades, or to gain favorable entrances to large cities and obtain adequate terminal areas in those cities without seriously disturbing surface traffic.

The first railroad tunnel in America was built in 1833 to carry a railroad line through the Allegheny Mountains in Pennsylvania. In the years that followed many other tunnels were opened. All of them were eclipsed by the Hoosac Tunnel, more than 25,000 feet in length, completed in 1876, to carry a railroad line through Hoosac Mountain in western Massachusetts. This tunnel is still in use.

Since 1900, two longer railroad tunnels have been built in this country. One of these is the Moffat Tunnel, carrying a railway line for more than 32,000 feet through James Peak in Colorado. This tunnel was completed in 1928. At its highest point, Moffat Tunnel is 9,257 feet above sea level.

The other tunnel, the longest in the Western Hemisphere, is the Cascade Tunnel, 41,152 feet in length, piercing the Cascade Mountains in the State of Washington. It was completed in 1929.

The most stupendous tunnel project in the history of American railroading, from the standpoint of total cost, was the twin-tube tunnel under the Hudson River and the four-tube tunnel under the East River in New York, together with terminals and yards under the teeming city itself. This project, completed in 1910, employed many thousands of workmen and great quantities of equipment, tools, and machinery. It cost in the neighborhood of 113 million dollars.

The construction of a great railway tunnel calls for engineering skill of the highest order, for an error in reckoning might prove extremely costly. In the construction of the Cascade Tunnel, boring through solid rock was carried on from both the eastern and the western portals. When the construction forces met, each nearly four miles from its respective portal, the engineers found that they were only a few inches out of perfect alignment. This small difference was easily adjusted.

Many tunnels are bored through solid rock by the aid of pneumatic- and electric-drills and explosives. A temporary railway track is extended from the portal into the bore as fast as the drilling proceeds, and this is used to carry off loose rock and boring dust. It is also used to transport workmen, equipment, and materials. Electric fans or ventilator pipes keep fresh air circulating in the bore. Pumps draw off seepage water.

Some tunnels are straight; others are built on a curve. Some are built for one track only; others are built for two or more tracks, depending upon anticipated traffic and other operating conditions. Many tunnels are lined with concrete, brick, or timber, or a combination of these materials, and many are made waterproof to prevent seepage. Linings strengthen the walls and ceiling and increase the safety of train operations.

Many railroad tunnels are electrified, and trains are operated through them by electric locomotives.

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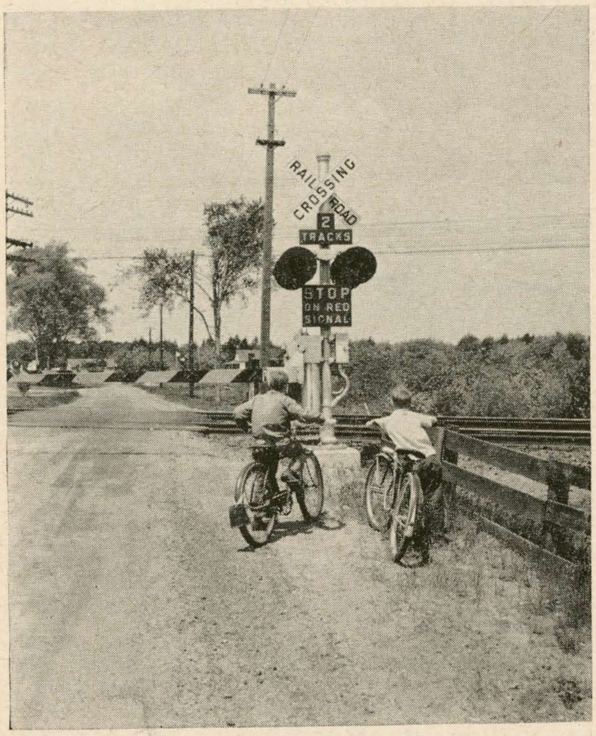
1. **Did you ever ride through a railroad tunnel?**
2. **What are some of the great railway tunnels?**
3. **What is the longest railway tunnel in America?**
4. **Why are tunnels necessary?**
5. **How are tunnels built?**
6. **Why is tunnel construction expensive?**
7. **What is the entrance to a tunnel called?**
8. **What must men who build tunnels know?**

# 30. WHERE WE "STOP, LOOK, AND LISTEN"




Every year the railroads spend millions of dollars and devote much time and effort to promoting safety at highway-railway grade crossings. As a result of the railroads' campaign and the co-operation of various safety organizations and the general public, the number of grade crossing fatalities was reduced 31 per cent from 1928 to 1953, notwithstanding a tremendous increase in the number of automobiles during that period.

Throughout the United States, there are some 227,000 grade crossings, or more than one for every mile of railroad. At virtually every railroad crossing a large sign marked "Railroad Crossing" warns motorists and pedestrians of the presence of the railroad and of the need to be careful.

At crossings where rail and motor traffic is heavy, various other warnings are also in use. Many crossings have gates which are lowered when a train is approaching and raised when it has passed. Some of these gates are operated by watchmen or towermen, others are operated automatically. Some also have electric bells. Others have flashing lights or wig-wag signals equipped with bells. The type of warning signs or signals used depends in a large measure upon the location of the crossing and the number of trains, highway vehicles, and pedestrians that use it.

As a still further precaution against accidents, the engineer of a train sounds the whistle or air horn of his locomotive—two long, one short, and one long blast—upon approaching a highway crossing.

The picture illustrates modern railroad safety devices at a level, fullview crossing. At the top of the pole on the right is the familiar sign, which can be read from either direction, warning drivers or pedestrians that they are approaching a "Railroad Crossing." Underneath, a sign with reflector buttons gives the added warning that the crossing has two tracks. Two red lights flash alternately when the train is near, warning those who are approaching the crossing to "Stop on Red Signal." Similar warning signs are located on the other side of the tracks.

In spite of warning devices and all the care exercised by the railroads and their employees, failure of motorists themselves to take proper precautions causes numerous accidents. In many cases, motorists or pedestrians deliberately try "to beat the train to the crossing." About one out of three highway-railway crossing accidents involving the collision of motor vehicles and trains is caused by the motor vehicle running into the sides of trains.

Some persons ask why trains do not stop at crossings to allow motor vehicles and pedestrians to pass. The answer is that railway trains, weighing in many instances thousands of tons and traveling at high speeds, could not stop at the numerous highway crossings without greatly interfering with and slowing down the movement of passengers, freight, express, and mails, which must move on exact time schedules.

Most grade crossing accidents could be avoided if proper care were exercised by motor vehicle drivers and pedestrians—first, by coming to a full stop before crossing the track; second, by looking in both directions to make sure that a train is not approaching; and, third, by listening for the sound of an approaching train. In other words, do what the railroad safety signs say—stop, look, and listen.

Great emphasis must also be placed on the importance of exercising due caution around *all* railroad property. About 78 American boys and girls under 14 are seriously or fatally injured each year while playing on railroad tracks, taking "short-cuts" across railroad property, "hopping" on moving trains or going under or between standing cars.

Children should be cautioned against playing or walking upon railroad tracks, crossing railroad bridges, climbing around cars, "hopping" trains in motion, or taking "short-cuts" across railroad property. To this end, railroads and railroad men, working together, have carried on a continuous program of safety education, with such slogans as:

"SAFETY FIRST."

"STOP, LOOK, LISTEN AND LIVE."

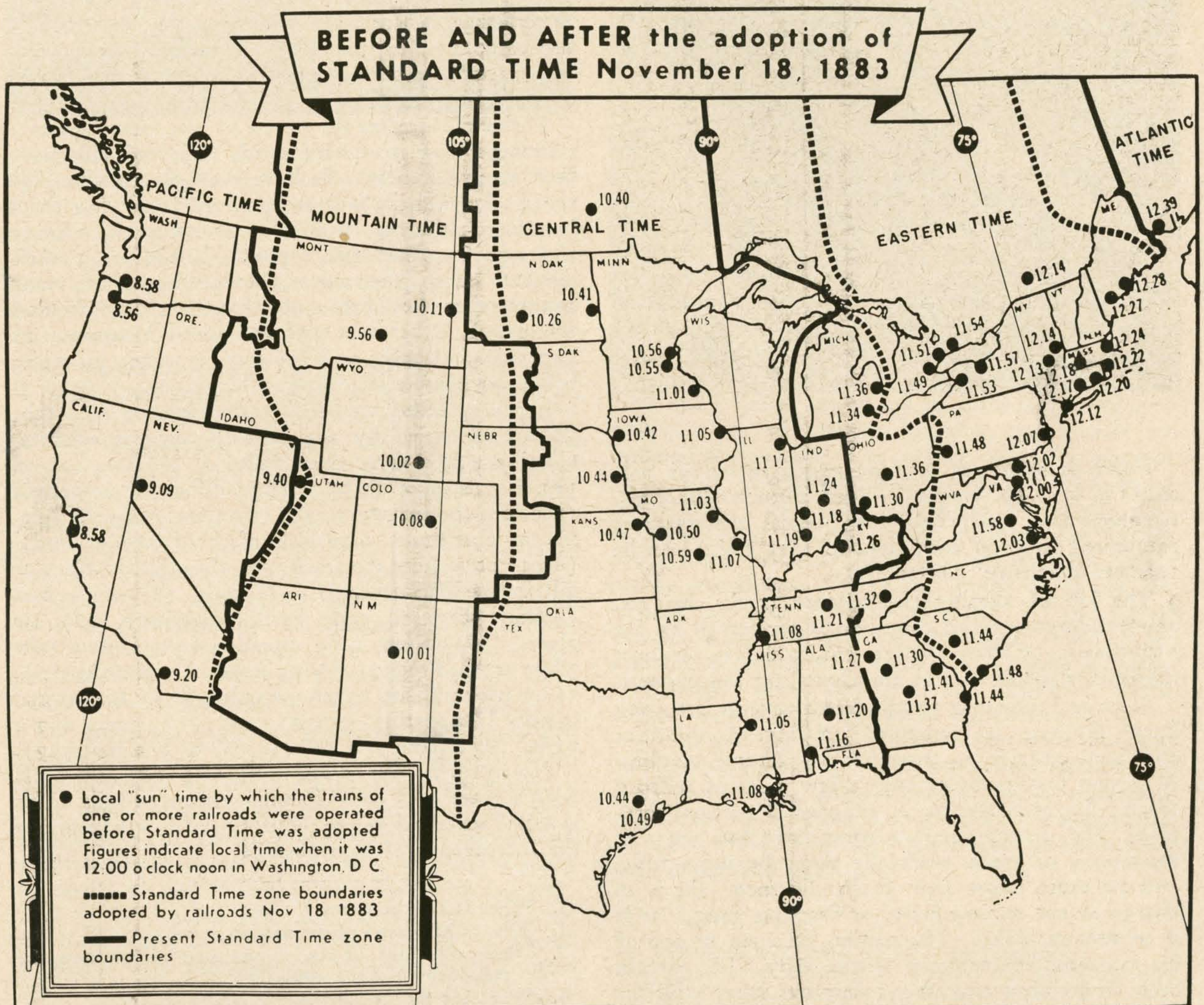
"BETTER TO BE SAFE THAN SORRY."

"CROSS CROSSINGS CAUTIOUSLY."

"LOSING A MINUTE MAY SAVE A LIFE."

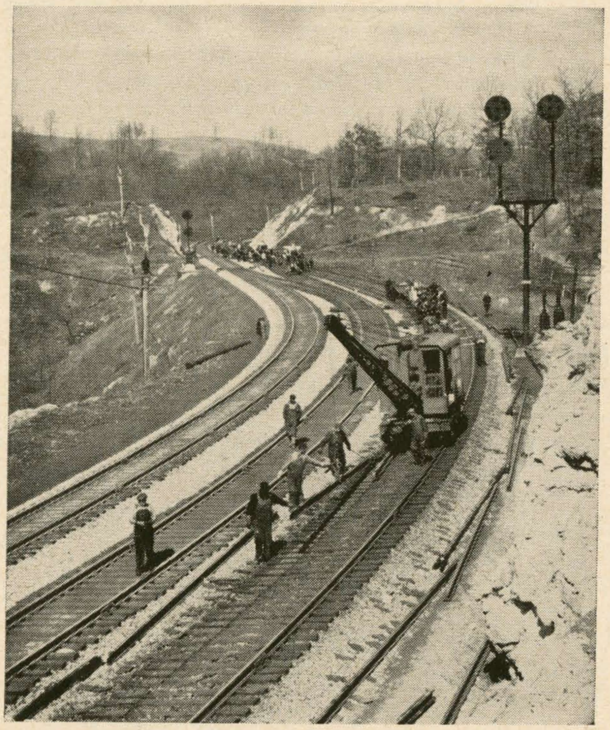
Children can help to promote safety (1) by observing these rules themselves, and (2) by discussing them with their parents and friends.

1. How can one tell when he is approaching a railway crossing?
2. What signs and devices do the railroads use to warn motorists and pedestrians to be careful when approaching a crossing?
3. What three rules should always be observed when approaching a crossing?
4. What is your favorite railway crossing safety motto?
5. How do many accidents occur at crossings?
6. How can such accidents be avoided?
7. Why can't trains stop at crossings to let motorists and pedestrians pass?
8. Why is it dangerous for children and others to cross railway tracks elsewhere than at railway crossings?
9. Why is it dangerous to play around railway bridges and railway cars?




Standard Time, sponsored and adopted by the railroads, became effective on November 18, 1883. Prior to that date, cities and towns throughout the United States went by local "sun" time and railway trains in this country were operated by many different times, as shown above.

# 31. THE TRACK REPAIRMEN AT WORK



Many thousands of men are employed by the railroads to keep the tracks, bridges, tunnels, buildings, telephone and telegraph lines, signal systems and equipment in good condition, so that trains can be operated efficiently and safely.

The job of keeping the railroad tracks, bridges, and buildings in good condition is performed by the Maintenance of Way Department, which is, on most railroads, a subdivision of the Operating Department.

A large railroad is composed of several divisions. Each division is composed of several districts, and each district is composed of several sections. A section may embrace only a few miles of railroad track. To each section is assigned a section foreman. The section foreman must have had years of experience in track work, he must be dependable, and he must know how to handle men. He is in charge of the section crew, or "section gang," as it is sometimes called. The section foreman or one of his assistants inspects the tracks daily. The section crew keeps busy replacing a few ties here, a rail or two there, a spike or bolt here, shifting the ballast there, and performing many other duties—all for the purpose of keeping the railroad tracks smooth, strong, and safe.

The section foreman reports to the road supervisor, who has charge of several sections, and the road supervisor reports to the roadmaster or to the division engineer, who has general charge of road maintenance on the division. The roadmaster or division engineer usually reports to the division superintendent and also to the chief engineer of maintenance of way for the entire railroad.

When important changes are to be made in the railroad, such as the re-laying of large quantities of rail, the straightening or strenghtening of track, the construction of new tracks, the renewal of bridges, or other work requiring the use of heavy machinery and large forces of men, a special crew of men, called an "extra gang," and the necessary equipment to perform the work, are assigned to the job. Much of the equipment in use today is highly mechanized. Work that was once done by hand is now performed by power-driven tools.

In this picture, we see a crew of men putting down rails on a long stretch of track. The old rails have been removed, new rails have been placed alongside the tracks, and the locomotive crane is putting them in place on the ties. Behind the crane, men are fixing the rails in their exact position, measuring their distance from the outer rail by means of track gauges (there are three gauge bars on the rail behind the crane). Other men with pneumatic hammers, nut fasteners, and other tools are driving spikes, fastening bolts, and completing the tracklaying job.

In this picture, we see (1) the right-of-way (the ground occupied by the railroad and its appurtenances), (2) a three-track railroad, (3) two curves, (4) a cross-over track with switches at either end (between the two curves), (5) an embankment (elevation above the natural surface of the ground), (6) a cut (where the track cuts through the ridge or hill in the background), (7) rails, (8) angle bars (holding the rail ends firmly together), (9) tie plates, (10) spikes, (11) crossties, (12) ballast (the white crushed rock surfacing material under the ties), (13) telegraph or telephone poles, (14) two signal towers (supporting signals), and (15) poles for a signal power line (on the far side of the roadway).

Nearly all railway track in North America is built with a space of 4 feet 8½ inches between rails. This is called standard gauge. Uniformity of gauge makes the interchange of cars possible.

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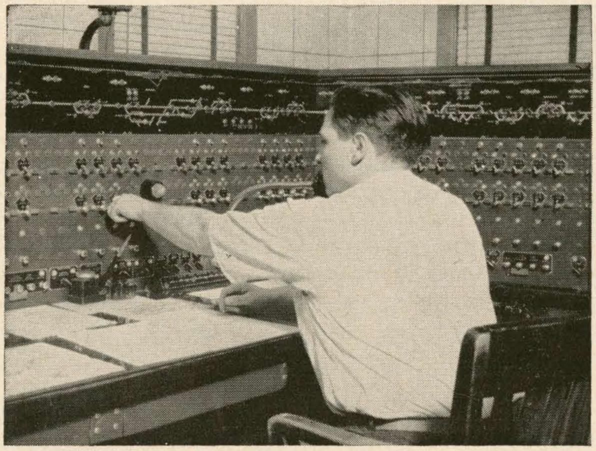
1. **What is a section crew?**
2. **Who is in charge of the section crew?**
3. **What are some of the things men do to keep the railroads in good condition?**
4. **What are the workers doing in the picture?**
5. **What objects can you identify in the picture?**
6. **Of what material is rail made?**
7. **In what kind of manufacturing plants is rail made?**
8. **If a rail 39 feet long weighs 120 pounds to the yard, what does the entire rail weigh?**
9. **How are the rails held firmly in the track?**
10. **Who has general charge of track repair work?**
11. **What is the advantage of standard gauge?**

# 32. THE TRAIN DISPATCHER



Silently, day and night, signals go up and down, lights flash, switches open and close, and trains roar down the track as if guided by an unseen hand. Search the labyrinth of railroad offices and somewhere you will find the train dispatcher—the guiding spirit of the rolling trains. Conductors and enginemen run the trains, but the dispatcher directs train movements.

The dispatcher knows the movements and location of every train on his division or district. He gives such instructions as will keep the trains moving according to schedule. If extra trains are being operated, he issues specific instructions governing their movements. Trains must proceed, meet, pass, and arrive according to his orders. The dispatcher also issues special train movement orders, if necessary, so that each train can make its run smoothly and safely.

Operators in towers and stations along the line report to the dispatcher so that he will know how every train is progressing. This information is entered on his train sheet. In the picture, a train sheet may be seen on the table in front of the dispatcher.

For operating purposes, railroads are divided into sections of varying lengths called "blocks." Entrances to these blocks by trains are generally governed by block signals which may be automatically or manually operated. In automatic block territory, signals are operated by the trains themselves as they move along the tracks through which there flows an electric current. As the trains move, they "shunt," or close, the electric circuits in the rails, thus causing the signals to change their positions and their colors. In manual block operation, signals in each block are worked by signalmen or "block operators" in control towers.

The first telegraphic train order was transmitted in 1851. Telephone dispatching, first introduced in 1879, has been in general use for many years. The dispatcher telephones his train order to one of the stations on the line; the agent-operator at that station makes as many copies as are required, reads it back to the dispatcher to make certain it is correct, and delivers one copy to the conductor and one to the engineman of the train to which it applies. Train orders are often delivered to crews of speeding trains. The agent-operator who receives the telegraphed or telephoned orders attaches copies of them to large hoops. As the train passes, he stands beside the track and "hands up" one hoop to the locomotive cab and another to the caboose. Crew members catch the hoops on their arms as the train goes by. Sometimes the hoops are placed one above the other on a metal frame called a "train order standard."

On some railroads, radio furnishes communication between dispatcher and crew members of trains operating over any part of a radio-equipped division. One type, the "inductive carrier" system, uses the rails and parallel wire lines for transmitting messages. For fixed point-to-train communication, wayside radio stations, sometimes remotely controlled, have been established at points of good reception. Each station is within range of its nearest neighbor. Radio does not replace communication by telephone, telegraph, or signals; it is in addition to them.

The complete, automatic centralized control of train movements under signal indication over a designated section of track or tracks is called Centralized Traffic Control. Under "CTC" written orders are unnecessary; train routes are set up on a control board in a tower or control room; switches and signals are operated electrically. The picture shows the operator of a CTC machine seated at the control board or "panel." By means of levers and push buttons, he routes trains, controls switches and signals, and is kept constantly informed about traffic movements, sometimes over many miles of tracks, by colored lights on the control panel. At the top of the panel may be seen the miniature "map" or reproduction of the track layout. CTC reduces delays, saves many stops, and gives the dispatcher better control of train movements in his territory.

The dispatcher also furnishes information to roadmasters, trainmasters, track supervisors, work train conductors, extra gang foremen, signal repairmen, and others whose work is affected by the movements of trains. Thus, he helps these men perform their tasks safely and efficiently.

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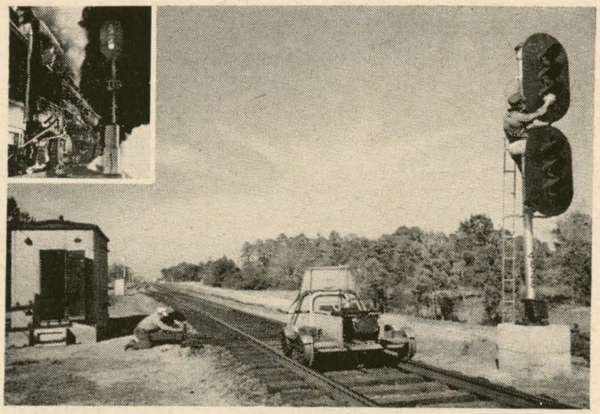
1. What are the duties of the train dispatcher?
2. What must he know to perform his job efficiently?
3. Why is alertness necessary on the dispatcher's job?
4. Does the safety of trains, passengers, and crews depend on his efficiency?
5. What devices does he use in his work?
6. How do the telephone and telegraph aid the dispatcher?
7. What remote control system is used to direct trains?
8. How does the dispatcher know where all the trains are at any time?
9. What does the dispatcher record on his train sheet?

# 33. SIGNALS FLASH THEIR MESSAGES



If the men who built and ran the first railroads could return to the scene of their trials and triumphs, doubtless they would be amazed and mystified by many things. They would be astonished by the revolutionary changes which have occurred in the art and science of railroading.

Perhaps they would be astonished most of all by the remarkable signal systems by which trains on railway tracks are protected, switches are thrown, trains are directed to stop, slow down, or proceed, and train movements through busy terminals are timed and regulated with split-second precision.

A railway signal is a means of conveying information to the locomotive engineer and other members of train crews. On railway lines where traffic is heavy, signals make it possible for trains to run faster and closer together than might otherwise be possible.

There are many kinds of railway signals, but those used for controlling the movement of trains, or "blocking" trains, as it is called, divide themselves into two principal groups—*wayside* signals and *cab* signals.

The first group comprises signals that are fixed in location relative to the track which they govern; the last group consists of signals located in the cab of a locomotive and consequently which give a continuous indication to the engine crew of conditions ahead.

The interlocking signal system which employs wayside signals is used largely in terminal areas, at points where two or more railroad lines cross at grade and at other places where tracks cross and routes conflict. The interlocking machine, operated by a signalman, is usually located in a tower or room commanding a view of the section of the railroad which it controls. On the other hand, the section of road controlled may extend for 30 miles. The machine is connected by electric wires or by mechanical means with the switches and signals in the zone of operation.

The interlocking system derives its name from the fact that the arrangements of signals and signal appliances are so interconnected that their movements must succeed each other in proper sequence, thus assuring precision and safety of operation. There are several kinds of interlocking devices. Some are mechanical, some electro-pneumatic, some electric, some a combination of two or more of these. Some are manually operated, some are operated automatically.

Automatic signals and interlocking signals are often combined in the operation known as Centralized Traffic Control which is described in Chapter 32. Centralized Traffic Control makes possible closer "meets" between opposing trains and faster "run-arounds" of slow trains by speedier ones.

The *block* signal system, which utilizes either wayside or cab signals or both, is a series of consecutive blocks or lengths of track of defined limits. Some blocks are less than a mile in length, others are several miles in length, depending upon traffic conditions and other factors. Some block signals are operated manually, some are operated automatically, and some semi-automatically.

Fixed signal aspects may be shown by the position of *semaphore* arms, color of lights, position of lights, flashing of lights, or a combination of color, position, and flashing of lights. The semaphore is a position signal by day, but gives its messages by colored lights at night. The *position light* signal gives its messages by the direction of a line of lights of the same color. Like the semaphore arm, they may be vertical, horizontal, or slanting. *Color position lights* give indications by both color and position. The *color light* signals, shown in both pictures, give their messages through colors—red, yellow, green—both day and night.

When a train approaches a wayside block signal, the signal indication conveys to the engine and train crews information concerning the use of the block ahead. Each railroad has rules that set forth what action, if any, must be taken by the engineman and train crew for each of the signal indications given.

A block signal tells the locomotive engineer whether he should stop, reduce speed, or proceed at authorized speed. If there is another train ahead and on the same track within the next block, the semaphore arm is in a *horizontal position,* or the light is *red.* This tells the locomotive engineer of the approaching train to stop and wait for the signal to change before entering the block, or to stop and then enter the block and operate cautiously. After the other train has left the block but while it is in the second block ahead, the semaphore arm swings to a *diagonal* position, or the light is *yellow.* This tells the engineer to proceed, preparing to stop at the next signal. When the other train has left the second block and the track is clear, the semaphore arm swings to a *vertical* position, or the light is *green.* This tells the engineer to proceed at authorized speed.

On railroads equipped with *cab* signals, the wayside signals are repeated in miniature inside the locomotive cab, right in front of the engineer. These cab signals are transmitted from track to engine by electrical impulses fed to the track rails and picked up inductively by receiver coils on the locomotive. Some railroads dispense with wayside signals except in certain instances, and utilize the cab signal for the purpose of displaying the block indication. On some lines, automatic train control stops the train if the engineer does not obey a stop signal.

Before a signal system is installed on any part of the railroad, the signal engineer and operating officers consider the problems from every angle in their effort to determine the type of signal system best suited for this particular part of the railroad.

The kinds of railroad signals and controls vary because different railroads have differing kinds of problems. Thus, one railroad may use many kinds of signals on different parts of its lines.

Signals play a very important part in railway operations. Men are constantly employed to keep them in good condition. The signal maintainer repairs and looks after the signals, making sure that the lights are in good condition, that the track circuit and other control circuits are intact and that the apparatus is in condition to function properly.

The smaller picture shows a locomotive stopped at a wayside color light signal, which is automatically operated. The larger picture shows signal maintainers at work. The man at the right is cleaning the roundels, circular pieces of colored glass, through which a light shines and gives the signal. The man at the left is checking, testing, or repairing the mechanism of a power-operated switch machine. The building at the left houses the signal control equipment.

Like the train dispatcher, the locomotive engineer, the conductor, and many other men who help to run the railroads, the signal maintainer helps to make railway operations dependable, efficient, and safe.

In the early days of railroading, before signal systems were introduced and before telegraph and telephone communication came into use, trains moved from station to station according to prearranged schedules. Nearly all railway lines were of single-track construction. If two trains were scheduled to meet at a certain station or siding and one of these trains was late, the other train would be compelled to remain there until the late train arrived, regardless of how great the delay might be. Thus, one late train might, and frequently did, throw trains traveling in the opposite direction off their schedules.

With the development of a coordinated system of signaling and communications, it became possible for railroads to synchronize their operations and maintain their schedules with far greater dependability and precision than ever before. It goes without saying that these developments have contributed greatly to the safety and efficiency of railway operations.

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1. **What are signals for?**
2. **How do signals help to improve train service?**
3. **How do signals help to make railroads safer for the traveler? For the worker?**
4. **What is a semaphore?**
5. **What is a position light signal?**
6. **What is an interlocking system?**
7. **What is a block?**
8. **What is a block signal system?**
9. **Are some signals operated automatically?**
10. **How is this done?**
11. **What does the semaphore arm say to the locomotive engineer when it is in a horizontal position? In a diagonal position? In an upright position?**
12. **What does the red light tell the locomotive engineer? The yellow light? The green light?**
13. **What uses do the railroads have for electricity?**
14. **What does the signal maintainer do?**
15. **Is he a safety worker?**

## WESTWARD, RAILS!

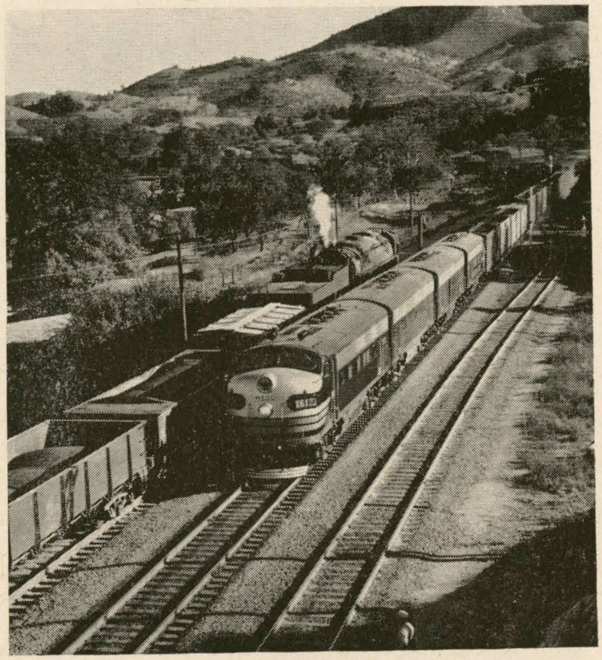
Turn back the time for a few years,
And gaze into the golden west,
To days when hardy pioneers
Put their courage to fearsome test.

Then westward turn our eyes today,
Toward the fulfillment of a dream;
No longer wolf and bison stray
Across the prairie, by the stream.

Instead, great cities meet our gaze,
Bound close by bands of glistening steel,
Brought forth—all men's minds to amaze—
By sweat, blood, steam and turning wheel!

—*William G. Brown*

# 34. FREIGHT TRAINS ON THE ROAD



For every man, woman, and child in the United States, the railroads of this country perform the equivalent of transporting one ton of freight a distance of about 10 miles each day!

The freight train is a symbol of American industrial efficiency. Every few seconds, in all kinds of weather, one of these trains starts its run somewhere within the United States to carry to our people the necessities, comforts, and luxuries of life.

The freight train is the vital link between farm, mine, forest, and factory, between producer and consumer, between thousands of cities and towns and the great seaports through which our trade extends to all parts of the world.

In this picture, we see two of the many thousands of freight trains that are operated over the railroads of the United States daily. The train on the left is powered by a steam locomotive, while the one on the right is powered by a Diesel-electric engine.

If anything should happen to cause these trains to stop running for even a few days, millions of people in the cities would be deprived of necessary food; thousands of manufacturing plants and other business enterprises would be faced with serious shortages or forced to shut down; our entire business and domestic life would be seriously disturbed, and nearly every individual would be affected in one way or another.

We can better realize how much we depend upon our railroads and how extensively railway transportation enters into our lives if we pause to consider the sources of our every-day requirements, comforts, and conveniences. We will find that much of the food we eat, the clothing we wear, the fuel we burn, the materials with which our homes are made, the furnishings of these homes, the books and magazines and newspapers we read, and the numerous tools and materials which we use each day are drawn from widely scattered places, sometimes hundreds or thousands of miles distant. Many of these things, perhaps most of them, come to us by rail. When we trace these articles back to their original sources, we will find that railway transportation also played an important part in assembling the raw or processed materials from which they were manufactured.

Railroads transport all commodities and articles of commerce. Nothing is too small or too large for them to handle. Nothing is too fragile or perishable. Whether the shipment be delicate potted plants or huge steel girders, whether perishable strawberries or heavy tractors, whether helium or coal, whether big timbers or turbines for ocean liners, the railroads are ready and equipped to handle whatever is offered.

Moreover, the railroads, working together, provide continent-wide through freight service without transferring the contents of a car on the way. The carload of paper from New England, the carload of lumber from the Northwest, the carload of citrus fruit from California, Texas, or Florida, and the carload of automobiles from Michigan, each can be shipped, on a single bill-of-lading, to any part of the country, or to any part of Canada or Mexico where there is a connecting railroad, without being rehandled en route.

There are many kinds and types of freight trains, each of which performs a particular service or handles a particular commodity. *Local Freights* stop at all stations and sidings between terminals, picking up loaded and empty cars, placing "empties" where wanted, switching cars for industries when desired, delivering and picking up L. C. L. (less-than carload) shipments. *Time Freights* run between important shipping centers, stopping only at the larger cities and towns. *Dispatch Freights,* frequently operated over long distances, include perishable shipments, livestock shipments, merchandise shipments, and other carload and less-than-carload shipments that require regular movements on fast schedules. *Merchandise Freights,* or package-car trains, handle small shipments in less-than-carloads, such as goods in boxes, crates, bundles, bags, barrels, cartons, containers, and packages of all kinds. Usually these small shipments are combined to form carloads for various cities.

In various parts of the country, there are freight trains each handling one commodity only, such as coal trains, oil trains, livestock trains, cotton trains, potato trains, wheat trains, iron ore trains, phosphate trains, pulpwood trains, lumber trains, and paper trains. There are strawberry trains, pineapple trains, orange trains, banana trains, and many other refrigerator trains carrying perishables.

In recent years, freight train movements have been speeded up so that average speeds today are more than half again faster than they were a generation ago. Schedules of many dispatch and merchandise freights are now comparable with passenger train schedules of a few years ago. The trains in the picture are composed of several types of cars, including refrigerator cars, box cars, automobile cars, and gondola cars. Of course, all cars that move in trains are not loaded. Usually coal cars return empty to the mines; refrigerator cars return empty to the fruit and vegetable producing areas; livestock cars return empty to the livestock producing areas, and so on.

The average load for freight cars varies according to the commodity—bananas averaging 10.9 tons to the car, and coal averaging about 59.8 tons to the car. The average for all commodities is about 43 tons.

One of the amazing things about railway freight service is its low cost. Astonishing as it may seem, in 1954 the average revenue for transporting one ton of freight one mile was 1.4 cents!

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1. What is freight?
2. How is freight transported?
3. How do freight trains differ from passenger trains?
4. What is a local freight train? A time freight train? A dispatch freight train? A merchandise freight train? A perishable freight train?
5. Name ten commodities that move by freight trains.
6. Explain how a carload or package of freight can be shipped from any station to any other station in the United States, Canada, or Mexico.
7. How many tons of freight make an average carload?
8. How much do the railroads receive for hauling an average ton of freight one mile?
9. What kinds of freight cars do you see in the picture?
10. How does railway freight service contribute to our comfort, convenience, and standard of living?
11. Why are adequate facilities, speed, dependability, regular service, and low-cost service important factors in transportation?

## SONG OF THE CABOOSE

I roll along upon the rails
Hooked to the lengthy freights,
No matter what the day avails,
With long delays and waits,
The crew that rides me o'er the line
Through sunshine, snow and rain,
Consists of willing men as fine
As ever ran a train.

I jog along o'er highest grades,
I take the sharpest curves;
And when the daylight softly fades
A tail light always serves.
Sometimes the long train hits a spot
That makes me roughly ride;
But when a journal box runs hot
It greatly stings my pride.

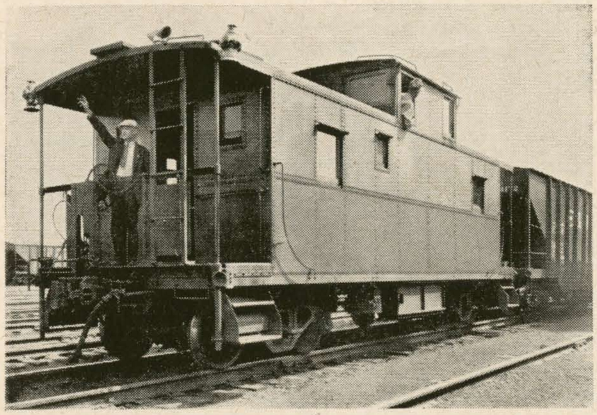
Upon my floor there rests a stove
That keeps my comrades warm;
No matter where my train may rove
These boys defy a storm.
They come to me with frozen ears
Through riding out on top;
And that's the time the warm stove cheers,
While tales the trainmen swap.

They sometimes hook me to a string
Of cars, box, coal and flat;
And as my wheels revolve and ring
The crew on guard stands pat.
And when the nights are dark and still
I hear the engine toot,
As 'round the curves and up a hill
It runs with loud salute.

I am a jolly fine caboose,
Smooth o'er the high grades pitch;
When freight runs light they turn me loose
And drive me in a switch.
But when the freight is running brisk
My wheels turn night and day.
The engine pulls me with a whisk,
And guides me on my way.

*—A. W. Munkittrick*

# 35. THE CABOOSE



Just as every store, factory, or other place of business must have an office, so must the freight train have an office to transact its business. The freight train really does a big business. It handles large quantities of merchandise every day. It is true, the train does not buy and sell merchandise like a store, but it produces and sells transportation—transportation of merchandise of every sort—and it must keep a complete record of all transportation produced and sold.

The conductor in charge of each freight train must keep a careful record of each carload or less-than-carload shipment handled by his train. The record must show the contents of each car and package and barrel and crate, by whom each was shipped, the station at which it was received, the station at which it is to be unloaded or left, and the person, firm, or company to which it is consigned. The record must also show the weight of each shipment, whether the shipper or the consignee is to pay the freight charges, and other necessary information. If there are empty cars in the train, the conductor must keep a careful record of them also.

In order to have a suitable place to work and keep his records, the conductor is provided with an office car. This office car is attached to the rear end of the train and is known by the odd name of "caboose." Just how it was christened "caboose" no one seems to know. Many years ago the conductor's car was called the "cabin," and it is possible that "caboose" was derived from that name.

The caboose is more than an office, however. It serves also as the "home" of the train crew while they are on the road. The trainmen or brakemen make their headquarters in the caboose when they are not attending to their duties outside. The caboose is also occupied occasionally by caretakers of livestock, perishable fruits and vegetables, and others whose duties require them to ride freight trains.

Lockers are provided for members of the crew and for the necessary flags, lanterns, light repair tools, oils, and other supplies. The caboose is equipped with a table, a drinking-water cooler, benches and chairs, a washstand, lights, and other conveniences. A stove provides heat in winter.

The odd-looking cupola atop the car is the "watch tower" of the train. When the train is running, the conductor or one of the brakemen usually sits in the cupola and watches in both directions to see that the train is running satisfactorily and that nothing is approaching from the rear. A fairly recent development in caboose design is the bay window, replacing the cupola. The bay window provides the trainmen with a side view of the train instead of the conventional rooftop view.

Doors open onto platforms at each end of the car. On one platform can be seen a wheel which operates the brakes when the car is not attached to a train. Brackets on the corners of the car hold signal lights when the caboose is attached to a train. On many railroads, cabooses are equipped with radio telephones providing instant communication between the conductor and the engineman. Such facilities are especially valuable when weather conditions, terrain, or length of train make it difficult to see hand or other visual signals.

The rubber hose on the rear of the car is a part of the air-hose system that controls the air brakes. The object with the two "eyes" just beyond the air hose is an automatic coupler. Cars are held together by couplers, which grip together like two cupped hands and hold firmly until released by a trainman.

The freight train conductor, who gets his training from years of experience as a freight brakeman, supervises the crew and has charge of all the cars in the train. He has a "ticket," or a waybill, for each car or shipment in his train. The waybills tell him the contents of each car in his train, and to what station, yard, or junction point each car or shipment in the train is to be delivered.

The conductor has to see that his train is thoroughly inspected before it leaves the terminal and that each member of his crew understands the orders governing the movement of the train.

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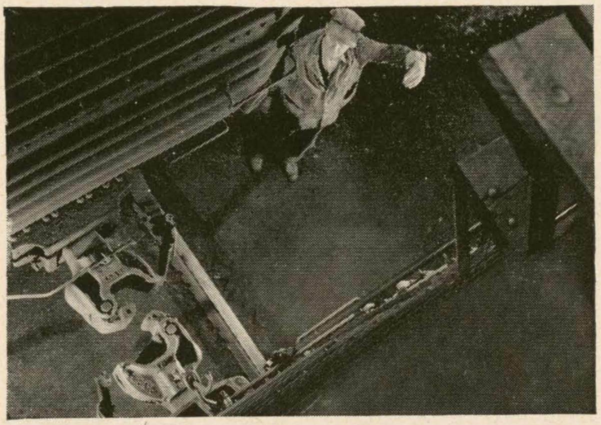
1. **What is a caboose?**
2. **How does it differ from other cars?**
3. **What is a caboose for?**
4. **Why is it always on the end of the train?**
5. **Who is allowed to ride in the caboose?**
6. **What is the cupola for?**
7. **What safety precautions do the trainmen take?**
8. **What are some of the conductor's duties?**
9. **What is the air hose for?**
10. **How are cars held together in the train?**

# 36. THE COUPLERS' "GRIP"



Trains are operated by train crews, usually consisting of four or more men—a conductor, one or more brakemen,* a locomotive engineer, and a fireman. The brakeman is the conductor's assistant, just as the fireman is the locomotive engineer's assistant. When a baggageman is employed on a passenger train, he also is considered a member of the train crew.

The brakeman must be thoroughly familiar with the rules of train operations. He must know the meaning of all hand, lantern, flag, and road signals. He must also know the meaning of road signs and other devices used to communicate train service information and to facilitate and safeguard train operations.

Before a train starts on its run, the brakeman sees that the required tools and equipment are in their designated places on the train and that the proper lights or flags are displayed on the rear of the train. He tests the air brakes to see that they are working properly.

If there are two brakemen on a freight train, one is assigned to the front end and the other is assigned to the rear end of the train. If the train stops where there is any danger of another train approaching from either direction on the same track, the rear brakeman, with a flag by day or a lantern at night, takes a position on the track some distance behind the train, while the brakeman at the front end takes a position ahead of the locomotive, to protect the train against a possible accident.

When switching is done at stations, sidings, or industry tracks, the brakeman helps to couple and uncouple cars, signaling the engineer when to go ahead, back up, slow down, or stop.

During the run of a freight train, many signals or "messages" are exchanged between the trainmen and the locomotive engineer in stopping and starting the train, in taking on and dropping off cars, in shifting cars, in coupling cars together, and in making other necessary moves en route.

In big freight yards, train crews are engaged exclusively in switching cars and in "breaking up" and "making up" trains. (See Chapter 40.) If signals are given on the left side of the train, the fireman, who sits in the left side of the engine cab, relays them to the engineer.

There is a signal for every movement of the train. For example, 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 train is standing, *apply air brakes;* held at arm's length above head, when standing, *release air brakes.*

In the picture, two freight cars are about to be joined. The two "hands" that seem about to clasp are the automatic couplers. The brakeman is signaling the engineer to back up so that the couplers will meet. As they meet, they will close in a firm grip, holding the cars together for their journey.

When his work or the safety of the train requires, the brakeman on a freight train may ride on top of the cars.

Brakemen employed on passenger trains look after the lighting, air conditioning, and heating (and ventilation if the cars are not air-conditioned). They open and close the car doors, assist the conductor in announcing stations, and, when necessary, they assist the conductor in collecting tickets and fares. Trainmen employed in passenger service wear regulation uniforms. They must be neat and clean in appearance, and they must be polite and attentive to passengers.

Every train service employee must be physically sound and must pass periodical tests for eyesight, color sense, and hearing.

Every conductor has served his apprenticeship as a brakeman. Thus, the competent brakeman with a record of faithful service who shows fitness to assume greater responsibilities may reasonably expect, in due time, to become a conductor in charge of a train.

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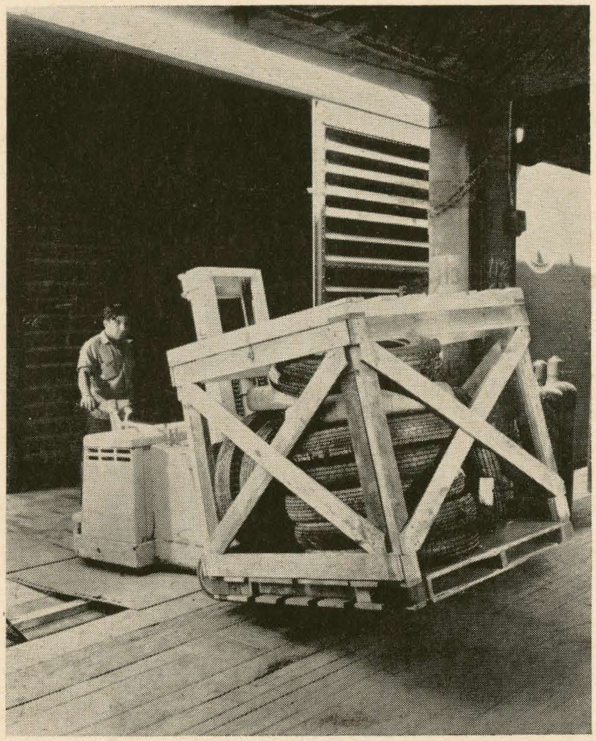
1. **What is a train crew?**
2. **What are the duties of the freight brakeman?**
3. **What are the duties of the passenger brakeman?**
4. **What must the brakeman know?**
5. **Is more than one brakeman sometimes employed on a train?**
6. **How does the conductor or brakeman communicate with the locomotive engineer?**
7. **What do members of the train crew do to promote safety?**
8. **How does the brakeman protect his train by day? By night?**
9. **What signaling equipment does the brakeman use?**
10. **What physical tests must the brakeman pass?**
11. **For what other position may his experience qualify him?**

* On some railroads, men who assist the conductor are called flagmen or trainmen, but the most common designation is brakemen.

# 37. UNLOADING A BOX CAR



If a box car could talk, what a fascinating story it could tell! It is a professional nomad, forever wandering, forever visiting strange places, never knowing what sort of adventure the immediate future has in store.

Like the weather-beaten stonecutter in the quarry, who, upon being asked what he was doing, beamingly replied that he was "helping to build a cathedral," the box car, if it could speak, might say with equal pride that it is helping to feed and clothe and house a nation, that it is helping to make people healthy and comfortable and happy.

Many years ago, each railroad kept its freight cars on its own rails, and each shipment of freight destined to off-line points was unloaded at the junction point and loaded into a car owned by the connecting railroad, and so on to destination. Sometimes several transfers were necessary, and freight shipments were exceedingly slow.

Then, soon after the railroads had adopted a uniform standard gauge, they worked out a plan whereby they interchanged cars. Since the adoption of interchange and per diem (See Chapter 24), freight cars are loaded and shipped to all parts of the United States, and even to Canada, Mexico, and Cuba, without transferring the contents en route.

That is why the freight car is such a wanderer today, and that is why it is a common sight to see a freight train made up of cars of many railroads—some located hundreds or thousands of miles away.

When a freight car has been unloaded off the line of the owning road, railroad employees and shippers, under a code known as "Car Service Rules," endeavor to find loading for the car which will take it back to or in the direction of the owning railroad, in order that the car may be returned economically to its home road.

There are approximately 2,105,000 freight cars of all kinds in operation on the railroads of the United States. Of these, about 281,000 are not owned by the railroads but by companies which have fleets of cars for special uses, such as refrigerator cars, tank cars, etc. Each week day, thousands of freight cars are loaded in the United States and started on their multitudinous errands, carrying the products of farms, mines, forests, and factories, and the cargoes that enter our seaports for distribution to consumers throughout America.

A journey for an active box car might be about as follows: *Packaged freight,* Atlanta, Georgia to New York; *printing machinery,* New York to Bangor, Maine; *empty,* Bangor to Millinocket, Maine; *newsprint paper,* Millinocket to Boston, Massachusetts; *empty,* Boston to Haverhill, Massachusetts; *shoes,* Haverhill to Dayton, Ohio; *electric refrigerators,* Dayton to St. Louis, Missouri.

But this would be only a start. Here's what its waybills might show us about the rest of its work: *Packaged freight,* St. Louis to Houston, Texas; *empty,* Houston to Galveston, Texas; *chemicals,* Galveston to Chicago, Illinois; *telephones and parts,* Chicago to Los Angeles, California; *ship machinery,* Los Angeles to Portland, Oregon; *canned salmon,* Portland to Minneapolis, Minnesota; *flour,* Minneapolis to Baltimore, Maryland; *empty,* Baltimore to Lancaster, Pennsylvania; *linoleum,* Lancaster to Green Bay, Wisconsin; *empty,* Green Bay to Appleton, Wisconsin; *paper,* Appleton to Hamilton, Ohio; *empty,* Hamilton to Cincinnati, Ohio; *soap,* Cincinnati to Detroit, Michigan; *automobile parts,* Detroit to New Orleans, Louisiana; *coffee,* New Orleans to Nashville, Tennessee. By this time the car might need some major repairs. If so, it would be sent home to Atlanta.

If the car requires repairs, the work is done by car repairmen at whatever place or on whatever railroad it happens to be, for methods and parts are standardized. In case of heavy repairs which can be performed more economically on the owning road, it is sent to that road empty or loaded. Responsibility for payment of repair costs is allocated among the railroads under an agreed code of rules which makes the handling roads responsible for certain types of repair work and permits billing the owning road for other types of repair work.

In the picture, a freight car is being unloaded by means of an electric fork-lift truck. The tires had been loaded in the car on "pallets." These are small stands on which cartons, packages, or other freight can be placed. The fork of the lift truck is inserted under the pallet and the entire unit is lifted from the floor to be transported from the car.

When the car in the picture has been emptied, it will be switched to another track to make way for another car, or it will be reloaded for another journey, after cleaning and inspection.

There are many kinds of freight cars—each designed for the handling of certain classes of commodities. In addition to box cars, which are suitable for the transportation of a great variety of articles and commodities, there are gondola cars, and open-top and closed-top hopper cars, used principally for carrying coal, coke, ores, phosphate, sand, gravel, sulphur, and other heavy bulk commodities; refrigerator cars, lumber cars, platform or flat cars, depressed floor flat cars, livestock cars, poultry cars, glass-lined milk tank cars, oil tank cars, vinegar tank cars, pickle tank cars, helium cars, rubber-lined tank cars for chemicals, and many "custom built" freight cars designed for special uses.

Box cars and other freight cars work for us in many ways. They bring to our city or community the materials which are used in building and repairing our factories, office buildings, churches, schools, hotels, markets, and homes. They bring fuel, machinery, and raw materials for our factories, merchandise for our stores, and fuel and food for our homes. And they carry to markets, far and near, the products of our mills and factories, or our mines and quarries. If we live in a rural community, freight cars carry to markets the products of our farms—things upon which we depend for our income. In short, they bring to our city or community many of the things which we need, and they carry away many of the things which we produce and have to sell. Truly, the freight cars are our friends!

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1. What is a box car?
2. What are some of the articles shipped in box cars?
3. Why is the box car better than other types of cars for carrying certain types of freight?
4. What other kinds of freight cars are operated on the railroads?
5. Can you name seven kinds of freight cars in addition to the box car?
6. Why do the railroads have so many different kinds of cars?
7. How is a freight car kept in repair when it is away from its home road?
8. How does the freight car work for us?
9. Why are many articles wrapped, crated, or boxed?
10. How would you wrap or package the following articles for shipment by freight or express? Books, oranges, glassware, eggs, typewriters, pencils, hats, shoes, baseballs, bicycles, radios, electric fans, television sets, washing machines, stoves, soap, preserves in jars, celery, sugar, flour, crayons, candy.
11. What articles are shipped by rail from your community? What are some of the things received by rail?

## THE RAILROADS

Railroads move the nation's freight,
Whatever size or weight or length,
Speeding shipments, small and great,
Performing mighty feats of strength.

From pencils, pins and paper clips,
To engines, tractors, garden hose,
And steel for bridges, mills and ships,
Transformers, tanks and dynamos.

From crayons, tablets, pens and books,
To granite blocks of many tons,
From hats and shoes and fishing hooks,
To great machines and giant guns.

Carloads of coal and iron ore,
And giant timbers, poles and sills,
And gravel, sand, cement galore,
Keels for liners, logs for mills.

From baby chicks and puppy dogs,
To bronchos for the rodeo,
From cattle, sheep and corn-fed hogs,
To elephants for Ringling's show.

What e'er the task, and come what may,
Thru blizzard, flood and pelting rains,
Week in, week out, by night and day,
The shipments roll in railroad trains.

# 38. LITTLE "TRAIN" TRANSFERRING FREIGHT

Every city and every important town in the United States—located on a railroad—has one or more freight stations. The size of each station and the amount of business which it handles depend largely upon the commercial importance of the community.

Freight is divided into two general classes—*carload* shipments and *less-than-carload* shipments. Most carload shipments, in bulk, are loaded and unloaded at manufacturing plants, mills, foundries, mines, quarries, storage warehouses, grain elevators, cotton compresses, team tracks, sidings, wharves, and docks situated on the railroad.

Most less-than-carload (L.C.L.) shipments (in boxes, cartons, crates, barrels, bundles, bales, bags, and packages) are loaded into cars and unloaded from cars at freight stations. In many cases, by combining several small shipments consigned to firms or persons in a particular city, a carload is made up at the freight station. Likewise, a carload of merchandise may be received at the local freight station, the contents of which are consigned to several firms or individuals. In such cases, the individual shipments are classed as L. C. L. freight.

In a small town, L.C.L. freight may be handled in a room of a combination freight and passenger station. In a somewhat larger town, a separate freight station may be used. In many large cities, there are several railroads and several freight stations.

In small towns, one railroad agent may take care of both passenger and freight business. In larger towns, the railroad has both a passenger agent and a freight agent. In important cities, the local freight agent has many assistants and helpers. The freight agent not only looks after the L.C.L. traffic that moves through his station, but he also looks after all other carload shipments of freight moving to or from his city over his railroad. The freight agent and his assistants must see that all shipments are properly packed, that each shipment is covered by a bill of lading and a waybill, that all necessary information concerning the shipment is shown thereon, that cars are ready to be placed to receive such shipments, that merchandise is properly packed and labeled, that deliveries are made promptly, that proper freight and switching charges are made, and that the freight charges covering the shipments are collected and accounted for.

A *bill of lading* is a receipt given by the railroad company to the shipper for goods accepted for shipment.

A *waybill* is the "ticket" for the shipment. It contains the necessary instructions to the conductor or conductors for handling the shipment to its destination. The waybill must accompany the shipment regardless of how it may be routed.

A freight station in a big city is one of the busiest places on the railroad. Freight cars are being loaded or unloaded most of the day and night, some by men with hand trucks, some by men with platform motor trucks. City delivery trucks back up to the platform and load or unload their freight. As they leave, others take their places. Everything is organized to move smoothly and get the freight out on time. In a large freight station, many workers are required—rate clerks, checkers, bill clerks, truckers, and others.

Many freight stations in big cities are long, low buildings. On one side of the station is a wide platform for the use of motor trucks. On the other side of the station is a platform the exact height of freight car floors. Since there is not enough space to have every car at a platform, cars are "spotted" parallel on sidings with doors open opposite each other. By using gangplanks between them, several cars can be loaded at the same time.

This is a picture of the interior of a large freight station showing freight being moved from cars to storage space in the station or to city delivery trucks. Little "trains" of warehouse trucks that move the freight to and from the platforms can be seen in the picture, being pulled by an electrically operated tractor, equipped with storage batteries.

A careful record is kept of each piece of freight received from shippers, loaded into freight cars, unloaded from freight cars, and delivered to consignees. Each package of freight received from shippers is weighed so that the freight agent will know what to charge the shipper or consignee for transporting it.

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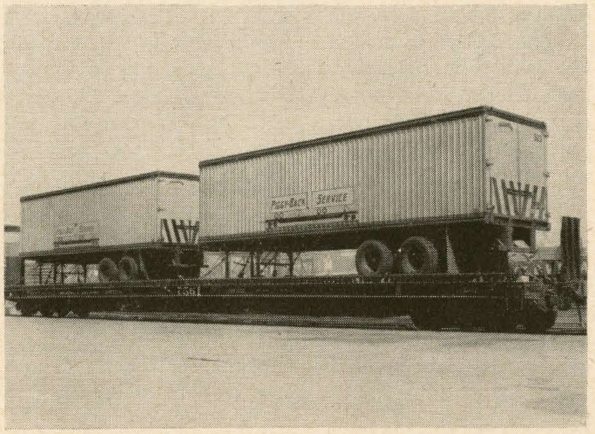
1. **Where are most carload shipments loaded and unloaded?**
2. **Name several commodities which are usually shipped in carloads.**
3. **What is a freight station?**
4. **What is L. C. L. freight? Give some illustrations.**
5. **Where are most L. C. L. shipments loaded and unloaded?**
6. **Who is in charge of the freight station?**
7. **What workers are employed in freight stations?**
8. **What are the duties of the freight agent?**
9. **How is freight transported to and from cars in a freight station?**

# 39. TRAILER-ON-FLAT-CAR SERVICE



In a preceding chapter (See No. 23), we learned that the Railway Express Agency calls at stores, warehouses, factories, and other places of business, as well as at homes, hotels, schools and colleges, and other institutions, for express shipments and delivers the shipments to places of business, institutions, hotels, and homes in cities and towns throughout the country. This is called "pick-up and delivery service."

In recent years, the railroads have broadened their pick-up and delivery service. Increasing use is being made of trailer-on-flat-car service, commonly referred to as "piggy-back." "Piggy-back" handles freight shipments in loaded truck trailers moved on railroad flat cars. The picture shows how the trailers are carried on the flat cars.

Trailer-on-flat-car service gives complete service from the consignor's place of business to the consignee's door or platform. The service begins with the loading of merchandise into a trailer at the shipper's place of business. The loaded trailer is hauled by truck tractor to the rail terminal where it is driven onto a flat car and detached from the truck tractor. Wheel blocks, springs, and chains are used to hold the trailers in position, and on some railroads jacks are used to lift the weight of the trailer off its wheels during its journey on the flat car.

There are many advantages to trailer-on-flat-car service for both the shipper and the receiver. It gives low-cost, high-speed, long-distance rail transportation. It saves the expense of loading and unloading from truck to freight car and back to truck, and, because there is less freight handling, there is less damage to the merchandise. Another advantage is that trailer-on-flat-car service operates in any kind of weather. And, of course, it eases truck congestion on highways.

Many variations of trailer-on-flat-car service are used by the railroads. Some railroads provide the complete transportation service from shipper to consignee, handling only their own or leased trailers or those of a subsidiary company, dealing directly with shippers. Others give the same service but they also carry trailers of commercial trucking firms, while still other railroads carry only the trailers of commercial highway carriers.

Some railroads handling their own or leased trailers charge freight rates for the service which are competitive with those rates charged by commercial trucking firms. These are based on both the weight of the load and the distance over which the load is moved. Others have regular less-than-carload shipments in trailers at regular L.C.L. rates, while specific commodities are carried by other railroads in trailers at applicable railroad rates. Those railroads which carry commercial highway carriers usually charge a flat rate based also on weight and distance of travel.

Although trailer-on-flat-car service operates now only between major cities, railroad people foresee the time it will serve smaller cities and towns as well.

In addition to trailer-on-flat-car service, many railroads began several years ago to provide pick-up and delivery service for less-than-carload (L.C.L.) freight shipments. This convenient method of shipping less-than-carload freight is now available to shippers and receivers of freight in most cities and towns of any size in nearly every State in the Union.

In order to perform this added service, some railroads own and operate large fleets of motor delivery trucks, somewhat similar to express trucks, while other railroads contract with local truckers to perform the work for them.

In cities and towns where pick-up and delivery service is available, the shipper simply telephones the local railway freight agent, and a truck calls for the shipment. Each shipment is weighed, and the freight charge is computed on the basis of weight. The charge is based upon a minimum of 100 pounds.

Freight charges may be paid by the shipper, or, if he desires, the freight charges will be collected from the consignee. As in the case of express shipments, the railroad will, at the request of the shipper, collect both the purchase price of the goods and the freight charges from the consignee and remit the former to the shipper.

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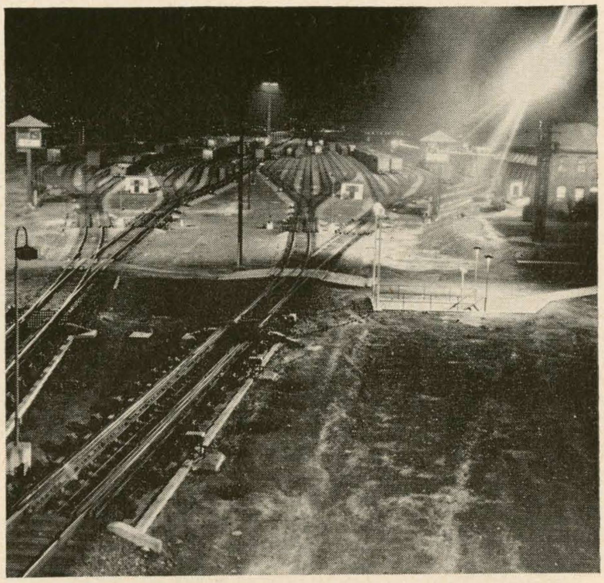
1. **What is trailer-on-flat-car service?**
2. **What are some of the advantages of trailer-on-flat-car service?**
3. **How do the trailers get on the flat cars?**
4. **What are some of the different ways in which the railroads use trailer-on-flat-car service?**
5. **What future do railroad people see for trailer-on-flat-car service? Do you agree?**
6. **What is pick-up and delivery service?**
7. **How does it differ from trailer-on-flat-car service?**

# 40. WHERE FREIGHT TRAINS ARE MADE UP



A maze of railway tracks, sometimes covering as many as 1,250 acres; signal towers; batteries of floodlights; busy switch engines; hundreds, sometimes thousands, of freight cars of many kinds, colors, and markings, singly and in strings, loaded and empty, moving and standing—this is the railroad freight yard. Here trains are "broken up" and "made up," locomotives and crews are changed, cars are inspected, and long freight trains are started on their runs.

Freight yards consist of groups or sets of tracks, connected by switches. There are several kinds of yards. There are receiving yards, classification yards, and departure yards. There are storage tracks to hold cars, and "rip tracks," where cars are repaired. There may be "house tracks" or "transfer tracks," where freight is loaded and unloaded at stations, and "team tracks," where freight is transferred between cars and motor trucks.

In the classification yards, cars are sorted and distributed. A train approaching Chicago, for instance, may contain cars destined to various parts of the city and cars destined to various cities beyond Chicago. Such a train is delivered to a receiving yard from which the cars are transferred to a classification yard, where they may be billed for delivery to different railroads for forwarding to destination or to different parts of the city on the same railroad. At intervals, cars regrouped by such a process move on to their destinations. Similarly, cars which are loaded in the city are brought to the classification yard and there combined into trains. The movements of cars between the classification yards and the city are commonly referred to as transfer movements.

This is a night picture showing an illuminated expanse of a part of one of the country's large freight classification yards. Floodlights at night make the yard almost as bright as day. Thousands of freight cars, loaded and empty, enter and leave the yard daily. Every kind of freight moves through the yard, including large quantities of coal, lumber, manufactured products, grain, livestock, fruits and vegetables.

Most yards are equipped with facilities for re-icing refrigerator cars in transit. In some yards, there are chutes, stock pens, and other facilities for unloading, resting, feeding, watering, and reloading livestock in transit. There may also be a storehouse containing replacement parts and other supplies for the repair and servicing of locomotives, cars, signals, switches, and yard buildings.

The freight yard is under the direct supervision of a yardmaster, who is responsible for its efficient operation. The yardmaster's office is the "nerve center" of the freight yard.

Upon the arrival of a freight train at the receiving yard, the train conductor turns his waybills (one for each car) over to the yardmaster's office. Thereupon, a switching list is made up, showing the number, weight and destination of each car in the train, and the number of the track in the classification yard to which the car is to be switched. Copies of the switching list are then given to the towerman in the control tower, who operates the machines which control switches and other devices. Copies are also given to the conductor of the yard switching crew, and to others who are to classify, inspect, and mark the cars.

In the meantime, the locomotive which brought the train in has been taken to the roundhouse, or locomotive shop, usually in or near the yard, to be put in condition for its next run. The caboose has been shunted to a caboose storage yard where it will also be serviced.

Many of the large yards are equipped with one or more *hump* tracks, as seen in the foreground of the picture. The "hump" is an elevation over which cars are pushed by a switch engine and released one by one to run by gravity into the classification tracks at the foot of the incline (in the background of the picture). As each car is released on the "hump," one of the workers announces its number to the operator in the tower and, with a copy of the switching list before him, the towerman sets the switches so that the car goes to the track where it is wanted. The cars in the background have been released in this manner and switched onto the proper tracks. If a car is moving too fast as it descends the incline, the operator presses a button or moves a lever which causes braking devices in the track, known as *car retarders,* to "squeeze" the sides of the moving car wheels. Two master retarders may be seen in the immediate foreground in the tracks leading from the "hump." Group retarders are in the tracks leading to each classification track area in the background. Retarders obviate the necessity of brakemen riding the released cars and increase the safety, efficiency, and speed of yard operations.

As soon as each train is made up, it is taken by a switch engine to the outbound or departure yard where a road locomotive is attached to the front of the train, and a caboose is attached to the rear, and the train starts on its run.

The yardmaster reports to the trainmaster, who is in charge of train operations over an entire division. Working in close co-operation with the road foreman of engines, the roundhouse foreman and others, they see that each train is made up and started on its run according to schedule. When the train is ready to leave the yard on its run, the conductor of the train crew receives his orders from the train dispatcher.

In the railroad freight yard, as well as out on the road, the movements of switching engines and all other operations are performed according to definite time schedules, so that each train will be ready to start on its run on the hour and minute designated in the time card.

In the picture, control towers for the operation of switches and retarders may be seen on each side of the tracks leading into the classification yard. Electricity and compressed air operate yard devices from these control towers. Air pipes and conduits connecting the retarders with power and control machines are visible in the foreground. The movable brake "shoes" of the retarders are located along each side of and parallel to each rail. The two-story brick structure at the right is a yard office.

In many freight yards, pneumatic tubes speed messages and waybills and yardmasters keep in constant contact with yard crews and clerks by means of various intercommunications systems. Portable two-way radio telephone similar, except for the frequencies on which operated, to the wartime walkie-talkies, are in use in some freight yards. Television car inspection and reporting, mechanical and electronic safety devices, including radar speed control for "humping" cars, air-conditioned yard offices, and many other modern features all contribute to the safe and rapid handling of inbound and outbound trains.

Many of the cars which move through freight yards in the large cities are passing from one railroad to another. Where two railroads meet and connect so that cars can be moved from one to the other, the point of transfer is called a junction, or an interchange point. When a car is delivered by one railroad to another, the car is said to be interchanged.

The interchange of freight cars between railroads at numerous junction points throughout the country must be recorded and reported. Agents located at interchange points forward daily reports showing the name of the owning railroad and the number of each car interchanged. A record is kept by each freight train conductor of all cars handled in his train, and the record is forwarded daily to a central Car Record Office. (See Chapter 24.)

There are many thousands of freight yards, large and small, in the United States. Most, but not all, of these yards are in or near important cities. Within the terminal district of Chicago, there are more than 200 freight yards of all kinds and sizes with a total capacity of about a quarter of a million cars.

Nearly every important seaport and lakeport is served by one or more large yards for the classification and handling of freight cars required for loading or unloading ship cargoes. At some of our ports there are immense yards to accommodate the trainloads of coal or ore arriving from the mines to be loaded into ships and to hold the long strings of empty cars before they are sent back to the mines. (See Chapter 49.)

In the mining regions, there are freight yards which are used for assembling carloads of coal or ore from the mines and organizing them into trains for forwarding to distributing and consuming centers as well as to seaports and lakeports. Some of these assembling freight yards are of large size and are equipped with all modern devices for the rapid and systematic classification of cars and assembling of trains. These yards are also used for assembling empty cars arriving from the cities and ports and distributing them to the mines for reloading.

In addition to the several kinds of freight yards, there are railway yards for storing, cleaning, repairing, and assembling passenger train equipment, including baggage, express, and mail cars. These yards are usually located in the vicinity of passenger stations in the large cities. Here each passenger train car is thoroughly cleaned and inspected after each run and is made ready for its next run.

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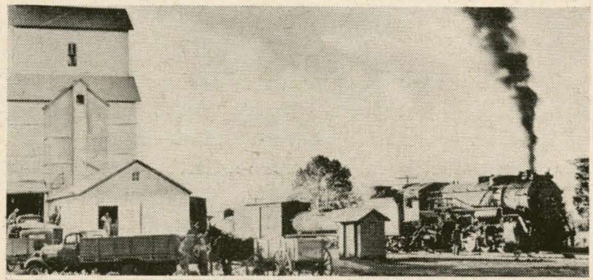
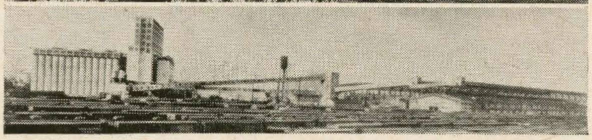
1. **What is the purpose of a freight yard?**
2. **Who is in charge of the freight yard?**
3. **What other men work in the freight yard?**
4. **What is a "hump" in a freight yard?**
5. **How does the "hump" help to speed up operations?**
6. **How does the man in the tower help to "make up" trains?**
7. **Why is it necessary to "break up" and "make up" trains?**
8. **What is an interchange point?**
9. **How does electricity help in the operation of the yard? Compressed air?**
10. **Where do trains go from the freight yard?**
11. **Why are so many tracks necessary?**
12. **Have you ever seen a busy freight yard? If so, tell about it.**
13. **What other kinds of railroad yards are there? Where are they usually located?**

# 41. GRAIN GOES TO MARKET





Behind every slice of bread, every biscuit, and every muffin that we eat is an interesting story of transportation. The bread may have started in the wheat fields of Kansas, Oklahoma, Nebraska, Montana, the Dakotas, or any one of a score of states in the grain belt. It may run through a dozen states, traveling, as grain or flour, from country elevators to terminal, from terminal to mill, from mill to grocery or bakery—all by rail—before it finally ends up at our table at home.

This is true whether the bread is made of wheat, corn, rye, or barley. In every part of the United States, every day, freight cars bearing grains or their products are rolling toward American homes.

In 1954, the railroads of the United States transported 1,280,000 carloads of wheat, corn, and other grains, chiefly from country storage elevators to terminal elevators, cleaning houses, mills, and seaports, and they carried an additional 574,000 carloads of flour, breakfast cereals, meal, malt, and other grain products to distributing and consuming centers throughout the country and to our seaports for shipment to foreign countries.

In pioneer days, before railroads and large grain elevators were introduced, many farmers carried their grain to the nearest grist mill. The miller received a part of the grain in payment for grinding the rest into flour for the farmer's use. The cost of hauling grain long distances by wagon was often prohibitive. Grain and flour from the Middle West to Eastern markets moved by lakes and canal and to New Orleans by the Ohio and Mississippi rivers.

With the coming of railroads, many millions of acres of land were settled and put under cultivation; country elevators sprang up along the rail routes; large terminal elevators and flour mills were established at transportation centers like Chicago, St. Louis, Minneapolis, Milwaukee, Omaha, Kansas City, Duluth, and Buffalo. And in time the United States became not only the world's greatest grain-producing country but also the world's greatest exporter of grain and grain products.

The farmer's immediate market for his wheat generally is the country grain elevator, as shown at the left in the top picture. Elevators are located at numerous railway stations throughout the wheat belt. Wheat is unloaded from the farmers' trucks and wagons and lifted into the elevator bins by means of a conveyor belt or a blower. Here it is held until the owner of the wheat decides it is time to sell. He then calls up the local railroad agent and orders the required number of empty box cars to be placed at the elevator for loading. The cars are delivered and the loading begins. This is done by means of grain spouts or chutes. An average carload of wheat is around 1,765 bushels, or 53 tons.

From the country elevator, the wheat may be shipped to one of the big terminal elevators, like the one in the lower picture. Sometimes a railroad picks up enough cars of wheat at the country elevators to form a solid trainload destined to one of the big wheat marketing centers. Terminal elevators are usually equipped for cleaning, clipping, drying, grading and mixing the grain, as well as storing and sacking it.

The long slender structures leading from the big elevator in the lower picture are equipped with conveyor machinery by which the grain is transferred to loading or unloading chutes.

At the terminal elevator, the wheat finally goes into a large bin containing wheat of a corresponding grade. From here it may be reloaded into cars and shipped to a mill where it is ground into flour. The flour is placed in barrels (or sacks) each bearing the name of the brand and the name of the milling company.

There are more than 3,000 flour mills and other mills producing grain products in the United States. Principal flour-milling states are Kansas, New York, Minnesota, Missouri, Illinois, Texas, and Ohio.

Since every individual is a consumer of bread and other grain products, the distribution of these commodities extends to every city and town and farming community in the United States. This country also ships large quantities of flour, meal, and breakfast cereals to foreign countries.

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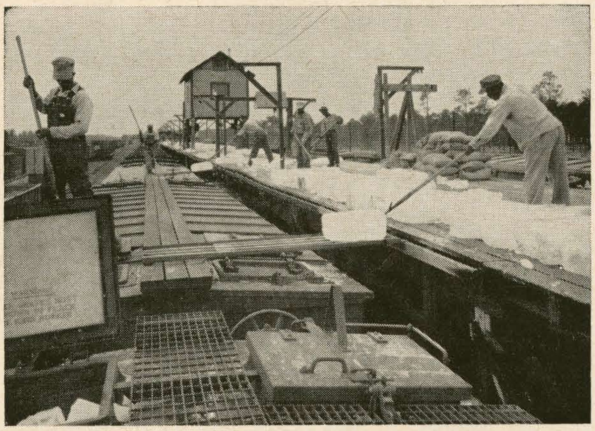
1. **Where are the principal grain-producing regions?**
2. **What states lead in the production of wheat?**
3. **What are the leading grain markets?**
4. **What states lead in the manufacture of flour?**
5. **What is a country elevator?**
6. **What is a terminal elevator?**
7. **How is wheat usually shipped from the country elevator to the terminal elevator?**
8. **What type of car is used for the shipment of wheat? Flour?**
9. **How does railroad transportation help the wheat farmer?**

# 42. ICING THE REFRIGERATOR CARS



One of the miracles of modern railway transportation is that fruits, berries, vegetables, meats, fish, eggs, and dairy products are delivered at hotels, restaurants, and homes throughout America as fresh and in as perfect condition as they were on the day they were shipped, even though they have crossed the continent in the meantime. Of course, this did not all "just happen." The science of refrigeration gradually advanced from crude beginnings. Many years of experimentation and experience in the handling of perishable commodities were necessary before the care of perishables in transit was reduced to a science.

From the outside, the refrigerator car does not look much different from an ordinary box car, but its construction differs in several particulars. For one thing, its floor, walls, and roof are thicker. It is insulated so as to keep the proper temperature within the car regardless of weather conditions outside.

Inside the car, at each end, are compartments known as bunkers, in which ice is carried to keep the interior of the car cold or in which heaters are placed to keep the interior warm. The ice is dropped into the bunkers through openings, called hatches, in the roof of the car, as shown in the picture. The hatches are equipped with adjustable ventilators to permit a continuous circulation of air through the car when it is not iced or heated but is carrying a shipment under what is called "ventilation." In this service, the ventilators are closed for most commodities when the temperature outside falls below freezing (32° Fahrenheit) and are opened when it rises above that point.

The temperature requirements depend upon the commodity with which the car is loaded. For instance, meats and fish require substantially lower temperatures than lettuce and peaches. Apples and potatoes do not usually require refrigeration, at least for short distances, but they must be protected against freezing in cold weather. This is done by the use of charcoal heaters placed in the car bunkers.

In this picture, we see refrigerator cars being iced at an icing station. The fully equipped icing station contains ice-making machinery and storage rooms for ice. A long icing platform, slightly higher than the tops of the cars, is connected with the icing station and extends along the railroad tracks. A chain belt conveyor moves blocks of ice along the icing platform. Men remove them at the cars to be iced, break them into smaller pieces and drop the pieces into the bunkers as shown in the picture. By this method, an entire train of refrigerator cars can be iced or re-iced in a very short time.

Railroads which handle considerable quantities of perishable products have a number of stations along their lines for icing and re-icing refrigerator cars which often journey 1,000 miles or more to market.

Caretakers or inspectors examine the cars at intervals en route to make sure that they are given the right kind of service to regulate the temperatures inside of the cars. On some shipments at certain seasons frequent temperature adjustments are necessary. For instance, a shipment from Florida, southern California, or southern Texas to northern cities during the winter season may start out under low temperature, require several temperature adjustments en route, and arrive at destination without refrigeration or even with charcoal heaters in operation.

Refrigerator cars are often used in cold weather to transport canned goods, potatoes, apples, pears, and other commodities which might freeze in ordinary freight cars. This is because the refrigerator cars have insulated walls, floors and ceilings, which, like a thermos bottle, have the effect of shutting out cold and retaining the desired temperatures. A new type of mechanical refrigerator car, now being widely used for the movement of frozen foods, has thermostatic controls for refrigeration, or heating, as required.

Small refrigerator containers, shipped in express cars and freight package cars, are extensively used for less-than-carload lots of oysters, fresh and frozen fish, fruits, vegetables, berries, fresh orange juice, cheese, meats, eggs, poultry, yeast, serums, vaccines, and films.

These specially constructed, hermetically sealed containers correspond in some ways to the ordinary kitchen icebox or refrigerator. They may be shipped for hundreds of miles without re-icing.

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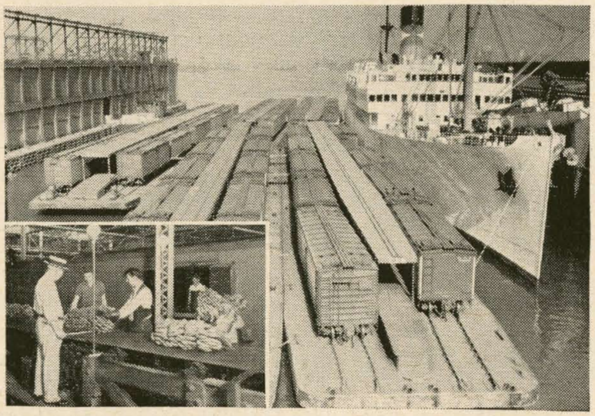
1. **What is a refrigerator car? For what is it used?**
2. **How does the refrigerator car help us?**
3. **How can you tell a refrigerator car when you see one?**
4. **What are the openings in the top of the car?**
5. **What foods are transported in refrigerator cars?**
6. **How are some shipments kept from freezing?**
7. **Do all fruits and vegetables require the same temperature in transit?**
8. **In what class of trains are loaded refrigerator cars shipped?**
9. **How are refrigerator containers like the refrigerators or iceboxes in our kitchens at home?**

# 43. BANANAS COME BY SHIP AND RAIL



In normal times, the people of the United States annually import from seven to ten billion bananas, and each year the railroads of the United States handle about 90,000 *carloads* of the fruit—nearly all in refrigerator cars—for distances ranging from a few miles to more than 2,000 miles per car.

Bananas are shipped first over little "banana railroads" from inland plantations in Central America, the West Indies, and other tropical countries to *their* seaports; then by steamship to *our* seaports; and then again by rail to marketing and consuming centers in all parts of the United States. Bananas from Mexico may travel the entire distance by rail.

Our imports of bananas are usually heaviest from April through August. During these months, "banana boats" from the tropics arrive almost daily at United States ports of entry. When a banana boat arrives, there must be a sufficient number of refrigerator cars on hand to handle the cargo. Railroad men know the number of cars that will be required. For example: If 10,000 bunches of bananas are on board the ship—to be moved from the port by rail—about 19 cars will be needed. If the cargo consists of 50,000 bunches, then as many as 95 cars will be necessary.

As soon as the ship is tied up at the wharf, its hatches are opened and mechanical conveyors are put in place. Several refrigerator cars are placed on nearby wharf tracks or on car floats or lighters in the harbor. In the hold of the vessel, banana handlers carry the bananas to the mechanical conveyor which delivers them to the wharf or car floats. Other banana handlers remove the bunches from the conveyor and put them into the cars.

Refrigerator cars on car floats or lighters, ready to be loaded with bananas from the steamship, are shown in the larger picture. This method of transferring bananas and other commodities from ship to rail is used when it is not practicable for a ship to dock at a pier which is served directly by rail.

The smaller picture shows bananas being removed from the conveyors and loaded directly into refrigerator cars on the steamship pier—a method commonly employed at most ports. Bunches of similar size and degree of ripeness (and only an expert can tell how ripe they are) are placed in one car, those of another size and degree of ripeness are placed in another car, and so on.

The bunches are put on racks within the car so that the air can circulate around and through them. Bananas keep best at a temperature of about 57° Fahrenheit, and the interiors of the cars are kept as near that temperature as possible. When the weather is warm, ice is stored in "bunkers," at the ends of each car, to keep the temperature cool. In cold weather, small stoves are used to warm the cars before loading and are removed as soon as the cars are loaded. If heat is required to maintain the proper temperature en route, charcoal heaters are placed in the bunkers.

As fast as the cars are loaded, switch engines haul them away to a freight yard. As soon as a sufficient number of cars are loaded and assembled in the yard, a banana train is made up and sent on its way, usually on a fast schedule.

While the train is speeding along, sales are consummated and orders are telegraphed to agents of the railroad at certain terminal points directing where each car is to be sent. Gradually the train is reduced in length as cars are diverted to other routes or dropped off at cities along the way.

On its way from seaport to destination, a carload of bananas may encounter drastic changes in the weather. For this reason, special "messengers" frequently ride the banana trains to check the temperatures of the cars at intervals. Otherwise, "messengers" are stationed at various junction points of the railroad and make inspections along the route. Car ventilators are opened or closed and ice is added or heat is supplied as required.

On reaching its destination, the banana car is unloaded at a fruit terminal or at a warehouse from which the fruit is distributed to retail dealers. Where storage facilities are not available, bananas may be kept in cars under refrigeration for several days.

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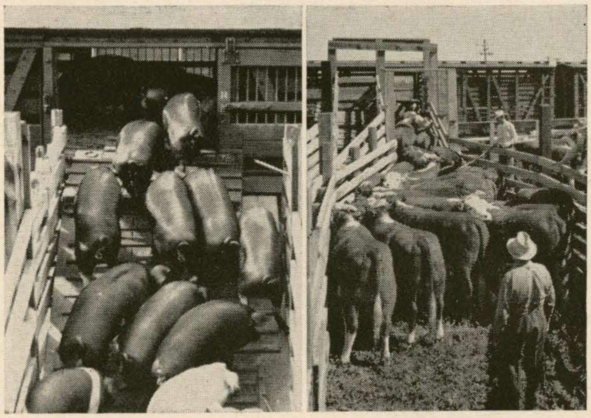
1. **Where are bananas grown?**
2. **What are some of the principal seaports through which bananas might enter this country ?**
3. **Why do many bananas make two railroad journeys?**
4. **How far do bananas travel to reach your community—by water? By rail?**
5. **In what kind of car are bananas usually shipped?**
6. **Are bananas green or ripe when shipped from the tropics?**
7. **How are bananas unloaded from ships and loaded into cars?**
8. **What are the men doing in the smaller picture?**
9. **Why is temperature control important in the transportation of bananas?**
10. **What care do bananas receive while being transported on the railroads?**

# 44. LIVESTOCK ON THE WAY TO MARKET



Millions of American farmers raise livestock for market. On many farms the sale of livestock is the main source of income; on many others it is an important secondary source of income. Altogether, the farmers of America derive upwards of nine billion dollars annually from the sale of livestock.

Without the means of getting to market, the farmer's cattle and calves and hogs and sheep would be practically worthless. Livestock producers depend upon the railroads to carry many of their animals to places where they can be sold. In a recent year, the railroads hauled around 432,000 carloads of livestock from producing areas to markets, as follows: cattle and calves, 283,000 carloads; hogs, 85,000 carloads; sheep and goats, 60,000 carloads; and horses and mules, 3,250 carloads.

Nearly every important city in the United States has its meat-packing plant; some cities have many packing plants. After the animals are converted into meats and other products, there is still another big transportation job to be done. The meats and other products must be shipped to distributing centers throughout the nation as well as to foreign countries, and then distributed to numerous meat markets and grocery stores. Other packing-house products must be shipped to plants which manufacture fertilizer, soap, glue, medical supplies, leather goods, and numerous other articles, and these plants, in turn, must ship their products to their distributing agencies all over the country and to foreign lands. In this job of distribution, the railroads play a major role.

At all of the large meat-packing centers, there are stockyards made up of acres and acres of stockpens, where livestock is kept and cared for until it is taken to the local packing plants or reshipped to other packing centers. In the morning hours, when many shipments are arriving and are being unloaded from the cars, the stockyards present a scene of great activity.

From the time the railroads helped to open up the great livestock region of the Mississippi and Missouri valleys and the Southwest they have been bringing cattle, hogs, and sheep in an endless stream to the livestock markets. They and car-leasing companies own about 43,000 freight cars especially designed for the transportation of livestock and poultry.

In general appearance, stock cars look something like box cars except that the side walls are made of slats, spaced two or three inches apart, so as to provide the animals with plenty of air and ventilation. Many cars which carry hogs and sheep are double decked with two floors so that more animals can be loaded per car than could otherwise be possible. The picture on the left illustrates the double-deck arrangement.

The railroads follow well-established rules in the handling and care of livestock to prevent injury or undue loss of weight in transit. Before loading, the cars are thoroughly cleaned, disinfected, and carefully inspected for loose nails or broken boards. The floors are covered with sand and straw. In cold weather, extra straw and heavy paper are also placed around the sides to break the wind. Unruly animals are separated from the others by partitions.

Several farmers sometimes pool their livestock to make a carload, as in the picture on the right. Frequently, several carloads are shipped from one station in a single train. Entire trainloads of livestock are shipped to market from some areas. Livestock trains travel on fast schedules, sometimes at passenger-train speeds.

If the journey to market requires more than 28 hours, the animals are unloaded at resting pens. They are fed and watered and kept in the pens for at least five hours before being reloaded. Caretakers sometimes travel with the stock cars, otherwise railroad employees are required to take care of the feeding and watering. In short, livestock receives the best of care and service when moving by rail.

Farmers sometimes ship live poultry—turkeys, chickens, and ducks—to market in specially built poultry cars containing several decks or floors so as to utilize the entire space in the car. Poultry cars resemble stock cars in appearance, but the openings between the slats are screened. Baby chicks in crates are shipped by railway express. Valuable horses frequently travel singly, or in groups, in "de luxe horse Pullman cars" in fast express trains.

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1. **Where are the principal livestock producing areas?**
2. **Where are some of the large livestock markets?**
3. **How are animals started on their way to market?**
4. **In what kind of cars are they shipped?**
5. **How are the animals cared for during their journey?**
6. **Do livestock trains travel on fast schedules?**
7. **How does railroad transportation help the livestock farmer?**
8. **How does railroad transportation help the city dweller?**

# 45. UNLOADING FRESH MEATS

We Americans are among the world's greatest consumers of meats and other animal products—about 150 pounds per person annually. Regardless of where we live, our groceries and meat markets are prepared to supply us at all seasons of the year with a wide variety of fresh meats—tenderloin steaks, spare ribs, lamb chops, pork chops, roasts, mutton, veal, liver, tongue, sausage meats, as well as fresh turkey, chicken, duck, fish, and many other items—not to mention all sorts of cured and canned meats, as well as butter, cheese, and eggs.

Ours is a land of abundance, where the products of every region are quickly made available to consumers in cities and towns and rural communities hundreds or thousands of miles away.

Railway transportation, plus processing at some 3,300 major meat-packing plants, transforms the Texas steer into the New Yorker's sirloin steak, the Iowa hog into the Bostonian's breakfast bacon, the Colorado lamb into the Pittsburgher's mutton, the Kansas calf into the Atlantan's veal chop.

To be sure, the American people were large consumers of animal products before there were railroads or packing plants. Nearly all of the animal products consumed then were of local origin, peddled by the farmer or by the village butcher. In many parts of the country, ice was not available and meats which were not consumed quickly were smoked or salted down in barrels for shipment and to prevent spoiling.

But it was not until the railroads came and railway refrigerator cars were introduced that the great livestock and meat-packing industries were developed on a big scale and the distribution of fresh packing-house products in great variety became widespread.

The railroads annually transport hundreds of thousands of carloads and numerous less-than-carload shipments to supply the tables of America with fresh, dried and cured meats, poultry, eggs, butter, cheese, and other commodities classed as animal products. In addition, the railroads transport many thousands of carloads of wool, hides, leather, and other non-edible animal products to be made into clothing, rugs, carpets, boots and shoes, traveling bags, and so on.

Refrigerator cars used for carrying fresh meats are similar to those which are used to carry fruits and vegetables, except that they are equipped with many steel bars upon which to hang the meats.

Every car is carefully inspected before it is loaded to see that it is clean and in good condition. The car is then pre-cooled and iced.

Meats are usually wrapped or boxed for sanitary reasons. Halves of beef and whole dressed lambs, calves, and pigs are hung from the ceiling of the car. This permits the cold air to circulate about them. Smaller cuts of meat are required to be wrapped and boxed. Boxed meats as well as boxes and cases of butter, eggs, dressed poultry, lard, bacon and hams are placed beneath the meats hung from the ceiling. When the car is filled, and the temperature within the car is properly regulated, the doors are sealed and the car is started on its journey. The temperature of the meat car is maintained at or below freezing during transit.

Many cars shipped from the packing plants are consigned to branch houses of the packing companies. Others are consigned to wholesale provision dealers, or to chain store companies, or to retail merchants. Still others are consigned to industrial firms which maintain camps for their workmen; or to steamship companies to provision their ships at the seaports, or to the various civilian construction projects of the federal government. In times of great military activity, thousands of carloads of meats and other packing-house products are consigned to the many training camps and supply depots of the United States Department of Defense. Still other carloads are shipped to the seaports for export to foreign countries.

The railroads also handle many "peddler cars" from the packing plants and their branch houses. Each of these cars is loaded with provisions consigned to merchants in cities and towns along a certain rail route. The provisions which are to be unloaded first are loaded last so as to facilitate unloading. "Peddler cars" make it possible for even the smallest communities to obtain fresh meats, butter, eggs, and other provisions direct from the packing plants daily.

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1. **What is a packing house? Can you name some of the large packing-house firms?**
2. **What are some of the things they produce?**
3. **Where do they obtain their livestock and other animal products?**
4. **Where do they sell their products?**
5. **What type of car is used? Could these products be shipped in ordinary box cars?**
6. **Why is refrigeration necessary?**
7. **How did people preserve meats and other animal products before railway transportation was available?**

# 46. BRINGING MILK TO THE CITY

More than a hundred years ago—in 1838 to be exact—the people of Boston were faced with a serious problem. They needed more milk than they could obtain from the farmers located within carting distance of the city. At the same time, many New England farmers located a long way from Boston were producing more milk than they could sell. Jason Chamberlain, an enterprising dairyman, solved both the problem of the Bostonians and the problem of the distant farmers by buying the latter's milk and shipping it to Boston by train. This was probably the first shipment of milk by railroad in America.

Today, Boston receives approximately 56 per cent of its milk and cream supply by rail. Boston is typical of numerous American cities.

Fast, dependable, low-cost railway service broke down the barriers of distance, and today every part of the country which is favorable to dairy farming finds a ready market for its milk, cream, butter, and cheese in consuming centers far and near. Boston, for example, receives milk from nearby states and cream by train from points as far away as Michigan and Wisconsin.

The picture shows milk in cans being loaded into a railroad car. This is the way many dairy farmers ship their milk. The cans are carried in baggage cars or in special milk cars to milk depots where the milk is transferred to larger containers.

Communities which produce large quantities of milk ship entire carloads daily, and some railroads bring carloads of milk into New York and other large cities.

Standard milk refrigerator cars are operated in fast passenger-train service. The cars are provided with ice bunkers at the ends, about 3½ pounds of ice being required for each gallon of milk. Salt is added to the ice if very low temperatures are desired. To reach market in the best condition, milk is shipped at temperatures ranging from 33° to 37° Fahrenheit.

Steel tank cars for the transportation of milk were introduced soon after 1900. The latest type of tank car used for the transportation of milk contains two glass-lined steel tanks, holding 3,000 to 4,000 gallons of milk each. The tanks are insulated with two inches of cork, and protected by a metal covering, like giant thermos bottles. The tanks are tilted toward the center of the car so the milk can be pumped out easily.

Fresh milk to be shipped in tank cars is first chilled on the farm and then brought in cans or a milk tank-truck to a receiving station at the railroad. Here it is inspected and cooled to the proper temperature for shipping. The cold milk is pumped from the storage or cooling tanks in the receiving station into the car tanks. Then the car is tightly closed. The car tanks must be completely filled in order to prevent splashing and churning in transit.

When the tank car reaches the city, it is unloaded at a special milk depot or at the dairy. Milk unloaded at the dairy can be pumped directly into the storage tanks. At the milk depot, the milk is pumped through long hoses from the tanks to the trucks. After the car tanks are empty, they are thoroughly cleansed and the car is returned for another load of milk.

Where smaller quantities of fresh milk are shipped, refrigerator containers may be used. Containers holding from 1,000 to 4,000 gallons of milk are loaded on special flat cars at the receiving station. On reaching the city, the containers are transferred to special trucks which take them to the dairies for unloading. Smaller containers are handled in railway express cars. At the city dairies, the milk is bottled by special machines for delivery to the consumers. Throughout the process of transporting and delivering milk and cream, three S's are stressed—sanitation, speed, and systematic delivery.

The transportation service provided by the railroads and the development of refrigerator and tank cars have widened the farmers' markets and increased production and consumption of milk. With refrigeration, milk from points hundreds of miles distant may be shipped to market with a change of only a degree or two in temperature during the entire journey. It is thus kept fresh, clean, and in perfect condition.

Milk is a highly perishable product. It must be handled in fast trains, on dependable schedules, at all seasons and under all weather conditions.

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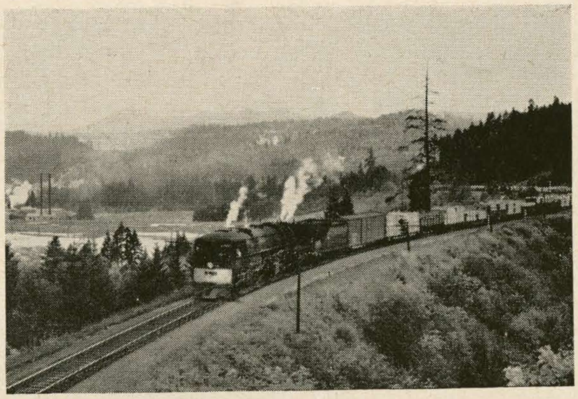
1. **Name various uses for milk.**
2. **Why is speedy, dependable transportation service important in the transportation of milk?**
3. **How is milk carried by railroad?**
4. **Is milk shipped under refrigeration?**
5. **Why are milk tanks glass-lined?**
6. **Why is it important that milk be kept clean?**
7. **What happens to milk if it is not kept fresh?**
8. **How does railway transportation help the dairy farmer?**
9. **Where does most of the milk consumed in your community come from?**

# 47. FOREST PRODUCTS MOVE BY RAIL



Before railroads came, lumbering operations were confined almost entirely to areas adjacent to navigable streams and rivers and the seacoast, because logs and lumber were too bulky and too heavy to be transported for any considerable distances by land.

Cars pulled by locomotives proved to be the ideal form of transportation for these products. From the time the railroads were first extended through the forest regions of our country, they have played an indispensable part in the transportation of logs, lumber, and numerous other forest products. Many railroad lines in the lumber-producing regions were built primarily to serve the transportation needs of the lumber industry.

Today, forest industries rely heavily upon the railroads for their transportation needs. Every 15 seconds, on the average, hour after hour, day and night, throughout the year, a carload of forest products starts on its journey somewhere in the United States. In 1954, about 2,130,000 carloads of forest products moved over our railroads for distances ranging from a few miles to thousands of miles.

Domestic forest products consist mostly of logs, poles, piling, posts, crossties, sawed lumber, shingles, lath, veneer, woodwork, box, crate and barrel materials, firewood, paper, paper bags, paperboard, pulpboard, paper wallboard, rosin, and turpentine.

From our seaports, the railroads carry many forest products from other lands—mahogany, cedar, briar, laurel, teak, cork, crude rubber, and various gums.

Railroads work for the lumber mills in two ways. They haul the logs from the forest to the mills, and they haul the lumber from the mills to markets. A trainload of such lumber products is shown in the picture. Sawed lumber, ties, and pulpwood are sometimes loaded on flat cars; sometimes in gondolas or box cars.

Railroads also haul large quantities of pulpwood and pulp from points of production to the paper mills. In some parts of the country, carloads, and even trainloads, of pulpwood are seen daily on their way to the mills. Then, trains haul paper and paper products from the mills to printing and publishing houses and other places where they are used or sold.

When the cars of lumber and lumber products reach their destinations, their loads are handled in various ways. Pulpwood, of course, is stacked in piles in the paper mill yards, or floated to the mills from a railroad siding, ultimately to be converted into paper and paper products. Other freight cars may be unloaded at yards where the lumber is stacked in neatly arranged piles. Men place the timbers or sawed lumber on a conveyor, equipped with rollers, and they are moved in either direction, as desired. For the heaviest pieces, sometimes a locomotive crane is used for unloading cars and for moving lumber from one point in the yard to another.

Shortly before Christmas each year, the railroads have a special transportation job. From the spruce- and fir-producing regions of our Northern states and Canada they bring carloads of Christmas trees for millions of American homes. The trees are cut and hauled to the railroads by farmers and others, who thus earn extra dollars for Christmas. At railway freight stations and sidings they are loaded onto flat cars or into box cars, usually about 450 trees to the car. Sometimes solid trainloads of Christmas trees are sent on their way to market.

Railroads are also large users of forest products. For the upkeep of their tracks, they install about 33,000,000 crossties a year, on the average. They buy and use large quantities of sawed lumber, ties, bridge timbers, piling, telegraph and telephone poles, and other wood products for the upkeep and improvement of their properties. In a recent year, the railroads spent more than 109 million dollars for crossties alone.

As a conservation measure, most of the crossties, piling, and bridge timbers used by the railroads are thoroughly saturated with creosote, chromated zinc chloride, or other chemical preservatives in special treating plants, before being used, thus increasing their service life two- or three-fold.

To help to preserve and extend forest lands, some railroads maintain comprehensive forestry programs, including reforestation, the building of fire breaks, and the supervised harvesting of timber.

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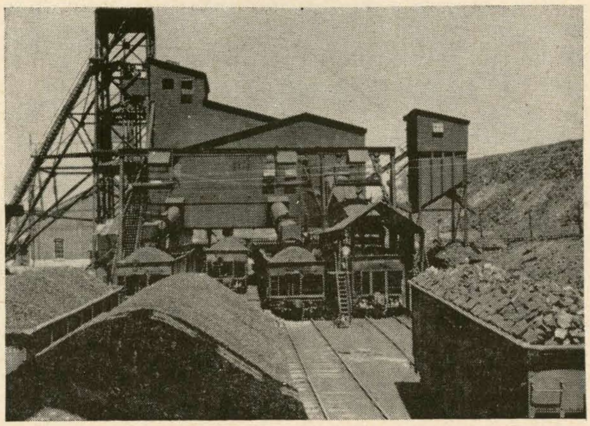
1. What parts of the United States produce most of our forest products?
2. What forest products do we buy from other countries?
3. How are logs and pulpwood transported to the mills?
4. What happens to them at the mills?
5. How are lumber and other mill products sent to market?
6. In what kind of railway cars would you ship poles? Sawed lumber? Paper? Veneer? Doors? Window frames? Turpentine in barrels? Christmas trees?
7. What uses do railroads have for forest products?
8. How do railroads help conserve forest lands?

# 48. LOADING COAL CARS AT THE MINE



Coal is a widely used fuel. It supplies heat for homes, schools, colleges, churches, offices, stores, and hospitals. It is used as fuel to drive ships and to operate mills, factories, foundries, and numerous other enterprises. Around 50 per cent of all electrical energy in this country is generated by the use of coal. Much of the power used to drive the wheels of industry is derived from coal. Railroads consume about 17,772,000 tons a year as locomotive fuel and for heating and power purposes.

Nearly every coal mine in the United States is served by a railroad. The importance of coal traffic in railway operations is clearly indicated by the fact that about one out of every five carloads of freight moved by the railroads of the United States consists of bituminous or anthracite coal.

Altogether, the railroads transport around 6,000,000 carloads of coal each year. The average carload of coal is about 60 tons. From its point of origin to its destination, the average carload of coal moves about 300 miles.

In order to transport the nation's coal from mines to points of distribution and consumption, the railroads own and operate a fleet of more than 890,000 coal-carrying cars—enough, if placed in train formation, to reach from the northern tip of Maine to Florida, thence across the continent to southern California and up the Pacific coast to the State of Washington, thence nearly halfway back across the continent—a distance of more than 7,000 miles. In addition, there is also a fleet of about 10,000 privately owned coal-carrying cars.

There are two types of coal-carrying cars—hopper cars and gondola cars. The *hopper car* is built of steel, with ends that slope toward the center and with drop doors underneath to dump the load. Cars of this type are built to carry loads of from 50 to 90 tons each. Railroads also have a special type of covered hopper car used for carrying grain, cement, phosphate, soda ash, and other bulk commodities which must be kept dry and clean.

A *gondola car* resembles a flat car with sides and ends or a box car with the upper part of the "box" removed. Many gondola cars have drop doors for unloading. Others unload from the side by tilting the body of the car. Loads must be lifted or shoveled out of some cars of this type. Coal, sand, gravel, stone, ores, sulphur, and other bulk commodities are carried in gondola cars. They are also sometimes used for carrying iron and steel, lumber, machinery, and other heavy commodities.

There are two major types of coal—*bituminous,* or soft coal, shown in the picture, and *anthracite,* or hard coal. There are four types of coal mines—*shaft mines,* reached from the surface by vertical shafts; *slope mines,* reached by sloping tunnels; *drift mines,* reached by horizontal tunnels; and *strip mines,* where coal seams are reached by removing the overlying earth with steam shovels. In the three first-mentioned types of mines, subterranean passageways extend from the entering shaft or tunnel through the coal seam.

Most coal is not ready for shipment when it comes from the mine. Larger lumps must go through a breaker, where they are crushed into smaller sizes to meet various uses. The coal is then dropped onto a series of shaking screens of varying mesh which separate it according to size—screenings, pea coal, nut coal, stove coal, egg coal, and lump coal.

From the sizing screens, the coal passes onto picking tables where trained workers remove stones, slate, and other foreign matter. The coal is then washed and dumped into railroad cars by adjustable loading chutes, as shown in the picture. As the coal flows from the chutes, sprayers coat it with oil or chemicals to reduce dust in handling from mine to market.

The loaded cars are weighed at the mine or at the nearest classification yard. Solid trainloads of coal are made up and sent on their way to towns and cities far and near. Other trainloads go to lake and ocean ports where the coal is put in ships for fuel or for shipment to domestic or foreign ports hundreds or thousands of miles away.

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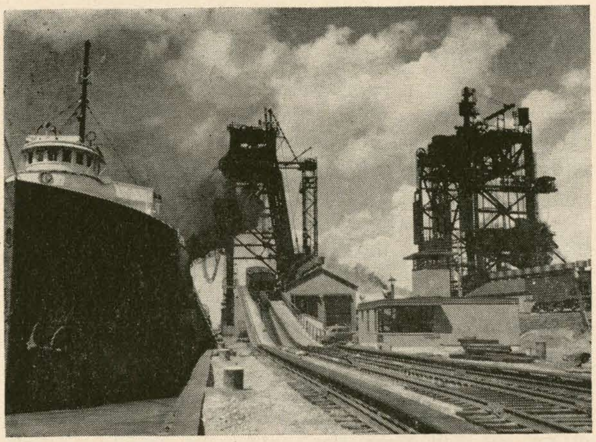
**1. What are some of the uses for coal?**
**2. What are the leading coal-producing states?**
**3. How is coal mined?**
**4. What is a strip mine? A shaft mine? A drift mine? A slope mine?**
**5. Are railroads useful to coal mines?**
**6. How is most coal transported to market?**
**7. How many coal-carrying cars do the railroads own?**
**8. Can you tell a hopper car from a gondola car?**
**9. How far does the average carload of coal travel?**
**10. How is coal classified as to the size of lumps?**
**11. At 60 tons to the car, how many tons of coal can be carried in a train of 100 cars?**

# 49. DUMPING COAL FROM CARS INTO SHIPS



A never-ending stream of coal flows by various rail routes from mines to seaports and lakeports. At these ports the coal is loaded into vessels—some for reshipment to American ports, some for export to foreign lands, some to fuel the coal-burning ships that help carry on our sea-borne commerce.

At many of these ports, the railroads own and operate great coal storage yards large enough to hold thousands of coal cars at one time. To stand on a bridge or other elevation and look out over one of these huge yards with its acres and acres of cars laden with coal is a sight one will never forget.

But the most impressive spectacle of all at one of these coal terminals is the towering mechanism by which the coal is unloaded from the cars into the holds of the ships. Some railway coal terminals are equipped with two or three coal dumping machines, each capable of unloading from 40 to 60 cars an hour.

Described by one writer as "an inspiring spectacle of engineering wizardry," the electrically operated mechanical unloader, similar to the one in the picture, grips the largest coal car, fully loaded, lifts it 50 to 75 feet or more above the track structure, dumps its contents into the coal "pan" leading to the ship's hold, and returns the car to its original position. Some unloading machines are capable of performing all of these functions in less than a minute. By this method, a ship of 10,000 tons capacity can be loaded in two and one-half hours.

Ocean-going ships engaged in coal trade have an average capacity of about 5,000 tons, although there are some which carry upwards of 10,000 tons. Some of the coal-carrying vessels on the Great Lakes range from 10,000 to 15,000 tons capacity.

A carload of coal comes from the mines, perhaps hundreds of miles away, on a regular waybill. When the car arrives at the port terminal, the waybill is checked by yard clerks and the car is switched to a track containing cars loaded with a similar grade or brand of coal. The number of the car is recorded on sheets held by the yardmaster and the coal pier offices.

Now, suppose a ship has just arrived at the port to be loaded with this particular grade of coal. The yardmaster issues instructions to a yard crew to deliver this and other cars containing the same grade of coal to the gravity load yard, or "barney yard." There a crew releases the cars as they are wanted for unloading. When released, the car "drifts" or rolls by gravity down the track to the scales where it is weighed automatically. The weight is checked by the scale clerk and transmitted by "telautograph" to the office on the pier, where the car number and weight are checked again before dumping. Then a narrow-gauge electric truck, known as a "barney," or "mule," moves the car up the incline track to the unloader. When it is in its proper position beneath the steel structure, it is gripped firmly by the giant unloading machine, lifted up to the "pan," turned over as easily as a boy would turn over a toy bucket of sand, dumped, and set back on the track, where it rolls off by gravity and comes to a halt in the "empty" yard. When dumped into the "pan," the coal slides down a huge adjustable telescopic chute into the hold of the ship.

At some coal piers, cars are lifted by elevators to tracks 50 to 75 feet or more above the pier floors and dumped into "pans" through hoppers in the bottoms of the cars. Piers equipped for handling cars in this manner sometimes have several chutes enabling several cars to be "spotted" and dumped at the same time and enabling two or more vessels to be loaded simultaneously.

While the work of transferring coal from cars to ships is in progress on the pier, a staff of checkers and office workers is busy keeping tally sheets and records of coal in the yard, coal moved to unloaders, coal dumped, coal on the way from the mines, coal stored, coal classified, coal weighed, empty cars returned, demurrage charges, and so on.

Controlling the movement of the coal from the gravity yard to the ship's hold are several operators who maintain constant communication with each other by telephone, loud-speakers, and push-button signals.

Car dumping machinery of this kind is also used for loading ores, sand and gravel, sulphur, and other heavy bulk commodities into vessels.

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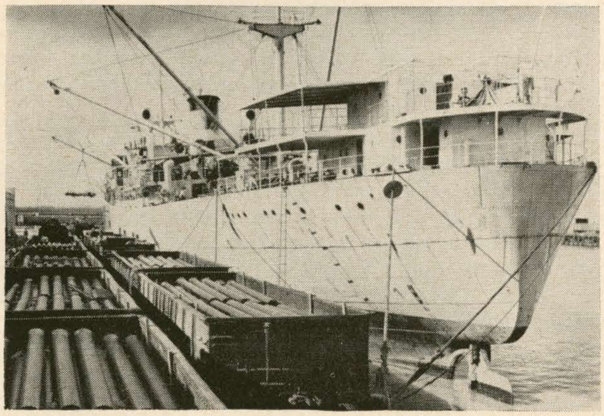
1. How is coal transported from mines to sea- and lakeports?
2. How is it unloaded into vessels at the ports?
3. How fast can cars of coal be unloaded into the ships?
4. What is the average carload of coal?
5. How many carloads of coal does it take to make an average cargo?
6. At 60 tons to the car, how many carloads of coal are necessary to fill a ship of 12,000 tons capacity? Dumped at the rate of a car a minute, how long would it take to complete the loading?
7. What becomes of the coal shipped through our ports?
8. Why are many tracks necessary at a coal port?

# 50. RAILROADS SERVE THE SEAPORTS



When the first railroads were opened in this country, in 1830, the total trade of the United States with other countries amounted to $134,000,000 a year. In 1953, our trade with other countries totaled $26,000,000,000, or 194 times as much as in 1830.

In this period of progress, we have outstripped one country after another in the volume of foreign trade, and our foreign commerce is now more extensive than that of any other country on the globe. In 1952, United States exports represented 20.7 per cent of total world exports and United States imports represented 13.7 per cent of total world imports.

Our vast trade with other lands originates to a great extent in the interior of the country, and our imports are distributed and consumed in all parts of the United States. In this commerce, our railroads play a major role. From farmlands, from timberlands, from mines and quarries of the North, the East, the South, and the West, and from tens of thousands of factories scattered throughout the United States—the railroads bring to the busy seaport cities a never-ending stream of farm, forest, mineral, and manufactured products of every sort to fill the ships of the Seven Seas that come to our ports for cargoes. And from these seaports the railroads carry back to the manufacturing plants and to the distributing and consuming centers of America the wide variety of raw and manufactured products which thousands of ships bring to our shores.

Without the service provided by the railroads, many of our manufacturing plants, and many of our farms and mines and forest industries, far removed from the seacoasts, would be unable economically to obtain their raw materials and supplies from distant lands or to command a world-wide market for their products.

Among the principal groups of commodities exported by the United States are: machinery and electrical apparatus; automobiles, trucks, buses, and parts; grain and grain products; chemicals and related products; petroleum and its products; ferrous metals and manufactures; cotton and cotton textiles; tobacco; coal; farm and dairy products.

Among the principal groups of commodities imported from other countries are: nonferrous metals (copper, tin, aluminum, nickel, lead, zinc); paper and newsprint; coffee; nonferrous ores; petroleum and its products; cotton, wool, and other textile manufactures; wood pulp and sawmill products; cane sugar; and rubber.

The typical dock scene in the picture shows a railroad-owned pier with tracks extending its full length. Cast iron pipes are being loaded for export directly from the railroad cars to the ship. This is done by means of the ship's booms which can swing backwards and forwards between the ship and the gondola cars. By this method, or sometimes by the use of traveling cranes on the pier, an entire train can be loaded or unloaded in a few hours.

As a study of railroad maps will show, every seaport of any importance is linked by rail with cities and towns throughout the United States. At each seaport, the railroads own large terminal yards; piers, often longer than 1,000 feet, to accommodate several ships at once; warehouses; and, other facilities. At many seaports, the railroads own extensive dock and lighterage facilities for the direct loading and unloading of freight cars from and to the ships (See Picture 43). Lighterage, a method by which freight cars are transferred to barges or floats, is frequently used when a ship does not dock directly on a railroad line or when cars have ferried across a river or bay to reach the rails. The railroads of the United States own nearly 1,800 barges, lighters, tugboats, ferryboats, and other units of floating equipment.

In order to help merchants and manufacturers with their import and export problems, some railroads maintain special staffs in their main offices, with managers or agents located in the larger cities. These staffs must be familiar with conditions at ports along their railroads or connecting lines, including the scope of ocean service, frequency of sailings, rates, government regulations, and other related matters. They must also know related conditions in foreign countries, as well.

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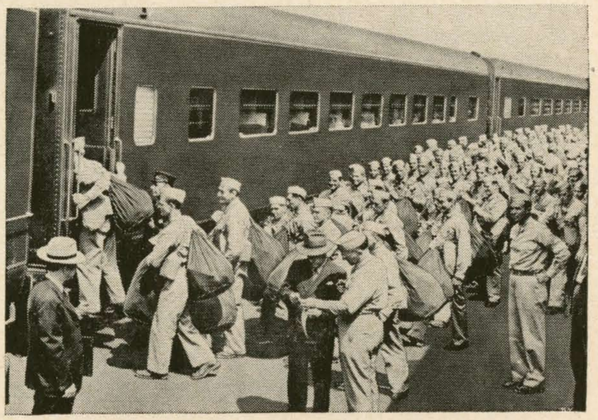
1. **Does our country trade extensively with other countries?**
2. **What do we sell them? What do we buy from them?**
3. **What part does rail transportation play in this commerce?**
4. **Where are the things we sell to other countries produced?**
5. **Where are the things we buy from other countries consumed?**
6. **Could railroads perform this job without the aid of ships?**
7. **Could ships perform this job without the aid of railroads?**
8. **List five important ports on the Atlantic Coast; on the Gulf Coast; on the Pacific Coast; on the Great Lakes.**

# 51. SOLDIERS ON THE MOVE



**Importance of Railroads in War**

The history of World War I, World War II, and the Korean war has demonstrated that the dependency of the military departments upon common carriers is not misplaced. There is heavy reliance placed upon them during such periods and they have unfailingly responded. The capacity for immediate expansion in time of war which is possessed by common carriers has proved to be a reservoir which is essential in the defense effort.—*Charles E. Wilson, Secretary of Defense, 1955.*

As the backbone of the nation's freight transportation system and an essential part of its passenger-carrying network, the railroads of the United States are an integral and vital part of defense preparedness. In the unfortunate event of new hostilities, the need for railroad transportation will be great for the movement of troops and supplies, critical production, civil defense, and basic consumer necessities.—*Sinclair Weeks, Secretary of Commerce, 1954.*

Transportation is of vital importance in time of peace. It is indispensable in time of war. The best-organized, best-trained, and best-equipped military force in the world would be hopelessly handicapped without adequate and efficient means of transportation to move it from place to place and to keep it constantly supplied with food, clothing, guns, tanks, ammunition, fuel, and other materials. The railroads, more than any other form of transportation, are able to move vast numbers of men and huge quantities of equipment.

Upon the railroads in World War II fell a large part of the gigantic task of transporting millions of men from their homes to reception centers and from reception centers to army camps and naval stations. In the process of mobilizing and training military and naval forces on a large scale, and in the prosecution of the war itself, the railroads were called upon to move large numbers of soldiers, sailors, and marines from one training area to another and to and from the seaports. When the war ended they were called upon to move returning servicemen in special trains to and from staging areas, personnel centers, and separation centers. In addition, the railroads transported large numbers of sick and wounded servicemen, many in special hospital trains; also large numbers of prisoners of war between seaports and prison camps.

During the forty-five months of World War II, the railroads performed the equivalent of moving about 44,000,000 members of the armed forces in organized groups more than 1,100 miles each in special trains and in special cars attached to regular trains—not including millions of others traveling on furlough. More than 97 per cent of all troops were transported by rail.

To move an infantry division of about 15,000 men and their equipment required 65 trains with a total of approximately 1,350 cars. To move the men and the vehicles in an armored division required about 75 trains of from 28 to 45 cars each, depending on the length of the cars and the size of the equipment of the various units carried on each train.

The successful transportation of large military forces by rail required careful planning and preparation on the part of both the government and the railroads. In each instance where the railroads were called upon to operate special troop trains, schedules were carefully worked out in advance by railway officers in co-operation with the military authorities.

When the time arrived for the dispatch of troops, all arrangements had been completed; each train was ready and waiting at its appointed location and each train crew was on hand to start at the appointed time to carry the troops through to destination on the assigned schedule. Frequently many troop trains were in operation at the same time.

The railroads, through the Military Transportation Section of the Association of American Railroads, kept the War and Navy departments constantly informed by wire concerning train movements. In this section, an expert staff of railroad operating men was on a three-shift, 24-hour schedule, planning and directing the unprecedented movement of troop trains and military supply trains. At any moment, any one of the trains could be stopped or diverted over another route or sent to another destination should the need arise.

Many troop trains were made up of troop cars or tourist sleeping cars. Three soldiers were assigned to each tier or section. On many troop trains, meals were served in dining cars or from special troop kitchen cars; on others, food was prepared and served from field kitchens set up in baggage cars.

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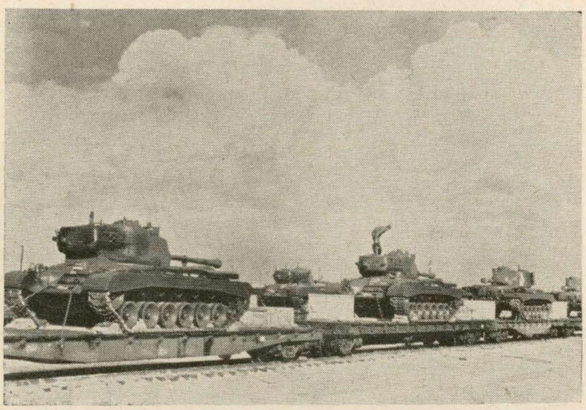
1. **What services do railroads perform in wartime?**
2. **What is a troop train?**
3. **Why do troops travel in special trains?**
4. **Why is careful planning necessary in the transfer of troops?**
5. **How are meals prepared and served in troop trains?**
6. **What other special trains are operated by the railroads in time of war?**

# 52. SPEEDING MILITARY EQUIPMENT BY RAIL



The United States of America likes to live at peace with its neighbors and with all the world. But when warlike nations stir up strife and threaten our tranquillity, security, and independence, we must be prepared and ready to defend our liberties. In times of national peril, every resource of the nation must be drawn upon if necessary to put our country in readiness to meet and repel attack from any quarter.

As was pointed out in Chapter 51, rail transportation is a vital necessity in wartime. Upon the normal transportation demands of our 165-odd million people are superimposed the urgent and exacting transportation demands of the military establishment.

Construction materials of all sorts must be transported for the rapid expansion of training camps, airdromes, coastal fortifications, military and naval bases, and for the construction or expansion of manufacturing plants and shipyards. Ores, fuels, lumber, and other mineral and forest products must flow in increasing volume from points of production to points of consumption.

To the normal transportation requirements of the manufacturing industry is added the job of transporting large quantities of military equipment and supplies—airplanes, engines and parts, military tanks, huge guns for battleships and coastal defenses, small arms, bombs, mines, ammunition, food and clothing, and countless other things essential to equipping, supplying, and feeding our armed forces.

In order to perform their great transportation task, the railroads must constantly watch their supply of locomotives and cars. They must keep enough equipment on order to meet the needs of the immediate future. They must keep a sufficient supply of equipment and a sufficient number of skilled workers in readiness to serve the needs of every industry that has goods to ship. They must also be organized and prepared to keep every mill and factory and consuming center supplied with prompt, dependable transportation service so that there will be no delay in carrying out the military program.

Our great network of railroads is an asset of immeasurable value in time of national emergency. With their vast fleet of locomotives and cars and their trained organization of more than 1,221,000 employees, the American railroads are able to rush a huge and fully equipped army into any part of the country in an amazingly short time. Should one or more railway lines be temporarily put out of commission by the enemy, troop trains, supply trains, and ammunition trains could be routed over other lines while the crippled lines were being restored to serviceable condition.

The picture shows a number of military tanks, each weighing several tons, loaded on flat cars, awaiting shipment to the fighting fronts. Other war freight, in boxes, may also be seen on the flat cars.

Flat cars are also used for the transportation of gun mounts, anti-aircraft guns, engines, boilers, turbines, steel for battleships and other naval craft, airplanes packed in cases for export, and other heavy military equipment which cannot be loaded into box cars. Box cars are used for the transportation of airplane engines and numerous airplane parts, small arms, ammunition in cases, tank parts, instruments for airplanes, battleships, and testing laboratories, and of numerous other materials and supplies. Army horses and mules are shipped in livestock cars or specially designed horse cars. Nearly every kind of railroad freight and express car is used for the transportation of equipment, materials, and supplies for the Army, Navy, Marine Corps, and Air Force.

In addition to standard railroad equipment, the the United States Army and Navy own several hundred freight cars of various kinds for the transportation of oil, gasoline, acids, helium, and other supplies.

During World War II, the railroads moved about 90 per cent of all Army and Navy equipment and supplies. From December, 1941, through August, 1945, they transported approximately 369,358,000 tons of freight and express for the armed forces, of which 293,758,000 tons were for the Army and 75,600,000 were for the Navy. Seaport deliveries exceeded 150,000 carloads a month, on the average.

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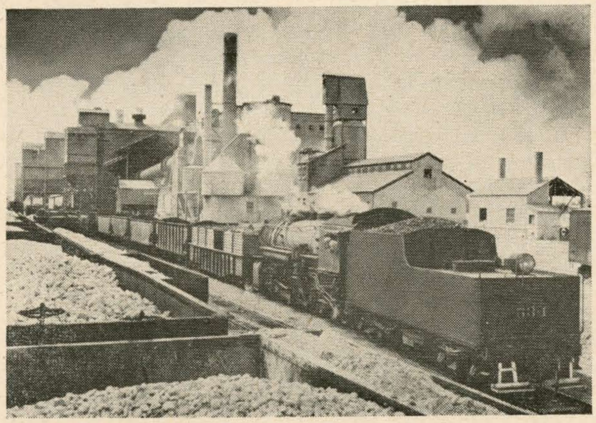
1. **Why is transportation important in time of war?**
2. **What are some of the materials used in the construction of army training camps, coastal fortifications, naval bases, air bases, and shipyards?**
3. **What materials are used in building battleships, airplanes, tanks, big guns?**
4. **How do the railroads help in the production of ships and war equipment?**
5. **What are some of the supplies needed by armed forces—on land and sea, at home and abroad?**
6. **How do the railroads help the fighting forces—on land and sea?**
7. **What do you see in the picture?**
8. **Why are heavy tanks shipped by railroad?**

# 53. FACTORIES ARE FED RAW MATERIALS BY TRAINS



The railroads have aptly been called "the world's longest assembly line" and "the manufacturer's delivery system." Manufacturing and transportation go hand in hand. Each works with and for the other. Neither could get along without the other.

Before railway transportation was introduced, there were few factories in this country, and most of them were small in size, employing only a few people and producing goods largely for the communities in which they were located.

Railway transportation opened up new regions and tapped many new sources of raw materials. It contributed greatly to the development of farming, mining, and forest industries. It enables the manufacturer to draw his fuel and raw materials from many distant places which could not previously be reached because of the high cost of land transportation.

Many manufacturing plants market their products in all parts of the country. Some export their products to all parts of the world. Obviously, they could not do these things without good transportation. Railway transportation greatly widens, extends, and multiplies the manufacturer's marketing opportunities.

In the location of a factory or mill, several factors must always be considered: (1) labor supply; (2) raw materials; (3) fuel or power supply; (4) markets; and (5) the character, adequacy, dependability, and cost of transportation service from the sources of raw materials to the manufacturing plant and from the plant to points of distribution and marketing.

After all of these factors have been given careful study, the plant is located in the town or city which offers the most favorable combination of advantages. In many instances, transportation is the determining factor.

Nearly every large factory or mill is located on a railroad, as shown in the picture. Many of them are served by railway tracks running directly from the railroad into their plant or plant grounds, where cars can be loaded and unloaded advantageously.

Each year the railroads handle millions of carloads of fuel, materials, and supplies for the use of manufacturing plants and other millions of carloads of manufactured products from such plants to points of distribution, consumption, and export.

Railroads provide the manufacturer with complete transportation service, from any shipping point in the United States direct to his factory and from his factory direct to any part of the country, without the necessity of transferring his goods from one car to another en route.

A single article of commerce may be the product of many factories and mills. Take a book, for instance: The inside paper is made from wood pulp and several chemicals, each of which may be produced in a different mill in a different part of the country. The book is printed with ink which is also composed of several ingredients, each of which may have been processed in a different plant before reaching the ink manufacturer. The binding of the book is made of heavy cardboard, which was probably made in a different paper mill than the inside paper from wood pulp and chemicals produced in several other mills.

The cardboard which gives stiffness to the binding is covered with book-cloth produced in a textile mill from cotton, linen or other cloth which was produced in still another factory. The dyes which were used to color the cloth were made of several ingredients produced in still another set of factories. The book is stitched with binder's thread from still another textile mill, and the binding is held firmly together with glue made in another factory from ingredients which were produced in still another set of factories.

All of the raw materials from which the various elements of the book were made were assembled at the various manufacturing plants, and the paper, cardboard, cloth, thread, ink, and glue were transported to the publisher. Then the finished book was shipped from the publisher to the book dealer or to the purchaser. Thus is transportation woven into the complex fabric of our modern civilization.

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1. **What is a manufacturing plant?**
2. **By what other names are manufacturing plants known?**
3. **What kinds of manufacturing plants are located in your community?**
4. **Could these factories get along without transportation?**
5. **Do railroads help the manufacturer? How?**
6. **What kinds of transportation service help the manufacturer—passenger, freight, express, mail?**
7. **What things would you consider in selecting a location for a factory?**
8. **Are many factories served directly by railroad tracks?**
9. **What kinds of railroad cars are in the picture?**
10. **What raw materials go into a house? An automobile? A suit of clothes?**

# 54. A RAILROAD MATERIAL YARD AND STOREHOUSE

There are big merchandise concerns, known throughout the globe, which count their customers by the million. Yet, the total year's sales of none of these great merchandising firms come within hundreds of millions of dollars of the amount which the railroads of the United States spend each year for things which they need.

Railroads are among the country's biggest buyers. Their purchases of equipment, fuels, materials, and supplies normally average about $10,000,000 for every day. Their "shopping list" includes more than 100,000 different items—ranging from typewriters to telephone poles, from lanterns to locomotives, from bolts to box cars, from strawberries to streamlined trains.

There is scarcely a city or a large town in the country in which the railroads do not buy materials or supplies of one sort or another, and their purchases represent an important contribution to the prosperity of many communities. A survey showed that before World War II the railroads made purchases in 12,174 cities and towns in 2,637 of the 3,072 counties in the United States.

Railroads are among the biggest buyers and users of coal mined in the United States, of the products of iron and steel mills, and of the output of our lumber industries. They also buy and use vast quantities of fuel and lubricating oils, paints, cement, electric materials, machinery, stationery and printing, commissary supplies, and other products. Thousands of industrial enterprises and millions of industrial workers are engaged to some extent in supplying the needs of the railroads.

All railway purchases are made through the Purchases and Stores Department of the railroad. So that materials and supplies will be on hand when needed, each railroad has storehouses and material yards, located at important shops and terminals. Stock items are classified for both storage and record under a standard materials classification scheme, with modifications to meet supply requirements peculiar to a particular railroad.

Locomotive and car parts and track materials are arranged under large sheds while bulky items such as lumber, wheels, rails, castings, switches, and ties are carefully placed and stored out of doors. A giant crane mounted on a flat car lifts and places the heavy materials in a gondola car. A switching engine then takes the loaded gondola to the erecting shops and car repair tracks, where workmen make repairs to railway equipment.

Smaller items and parts which require protection from the weather or from theft are kept in storehouses. The picture at the right shows how various supplies are kept in stock. There is a place for everything and everything is in its place arranged in accordance with a standard plan. In the bins and shelves, each plainly labeled, are various sizes and kinds of valves, pipe fittings, bolts, nuts, washers, rivets, nails, spikes, chisels, files, drills, locks, gaskets, hammers, brass and bronze castings, lamps, lanterns, brakeman's flags, fusees, paints, varnishes and hundreds upon hundreds of other articles which are necessary to keep the railroad running and its equipment in repair.

The storekeeper keeps a record of materials received and placed in stock and materials delivered to the various officers of the railroad. From his record, he can tell exactly what quantity of any of the many articles or types of material he has in stock.

For instance, his records show that he has 100 2-pound blacksmiths' hammers in stock. When the stock is reduced to, say, 50 hammers, the clerk notifies the storekeeper, and the storekeeper requests the Purchasing Agent to order a further supply. When these are received and placed in stock, they are entered in the storekeeper's record. In this way, an adequate supply is always kept on hand, and the storekeeper can tell in a jiffy just how many 2-pound blacksmiths' hammers are in stock.

By means of a vast delivery system all these various items of supply are sent to the places where they are needed, so that there is no delay in the smooth and efficient operation of the railroad. The importance of conservation and reclamation of materials is also recognized and practical methods are in effect to reclaim all materials possible.

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1. **What department of the railroad does the buying?**
2. **Why do the railroads keep materials and supplies on hand?**
3. **Where are these materials and supplies kept?**
4. **What are some of the things a railroad buys?**
5. **What industries benefit from railroad buying?**
6. **Who looks after materials and supplies?**
7. **Do some railroads have more than one storehouse?**
8. **What is a requisition?**
9. **How does the storekeeper know when his stock is getting low?**
10. **What objects can you identify in the pictures?**

# 55. IN A RAILROAD OFFICE

Every railroad, large or small, has its main offices, or general offices, in some city or town in its territory. Here are located the offices of the president and other general officers of the company.

Each large railroad also has division offices, traffic offices, shop offices, storekeeper's offices, and yard offices in that and other cities and towns on its lines. And, of course, each passenger and freight station has an office for the transaction of its business. Many railroads also have city freight and passenger offices both on and off their lines.

The general offices of a large railroad are usually divided into several major departments, as follows:

*The Executive Department,* headed by the President of the Company;

*The Operating Department,* usually headed by a Vice President or a General Manager. The functions of an Operating Department are subdivided into three principal categories: (1) *Transportation,* usually directed by a Chief Transportation Officer or a General Superintendent; (2) *Maintenance of Equipment,* usually headed by a Chief Mechanical Officer or a Superintendent of Motive Power; (3) *Maintenance of Way,* usually headed by a Chief Engineer;

*The Traffic Department,* usually headed by a Vice President or a Chief Traffic Officer;

*The Law Department,* usually headed by a Vice President and General Counsel or a General Counsel;

*The Accounting Department,* usually headed by a Vice President, Comptroller, or a General Auditor;

*The Treasury Department,* usually headed by the Treasurer of the Company;

*The Purchases and Stores Department,* usually headed by a Vice President or General Purchasing Agent.

In addition to the departments mentioned, some railroads have a Personnel Department and many include a Public Relations Department. Many large railroads also have special departments for Real Estate, Taxes, Insurance, Claims, Agricultural and Industrial Development, Medical Aid, and Police.

Every operation, transaction, and activity of the railroad falls within the scope of one or the other of these departments. In each department are assistant officers who, because of their education, experience and abilities, are entrusted with executive duties and responsibilities.

The number of office workers employed by a railroad depends upon the size and importance of the railroad and the amount of business done. In the United States there are hundreds of railway companies, ranging from a few miles in length to thousands of miles in length. Some railroads employ only a few hundred workers, while others employ thousands of workers. The small railroad has a comparatively simple departmental organization and a small office force, while a large railway system must have a much larger office organization.

The larger railroads maintain not only the major departments mentioned above but many minor departments and bureaus each charged with the responsibility of performing certain duties essential to the efficient operation of the railroad or the successful management of the property.

On a large railroad, for instance, the Traffic Department may include a Passenger Traffic Department and a Freight Traffic Department, and the latter may also include Foreign Freight, Perishable Freight, Coal Traffic, Industrial Development, and Agricultural departments.

Similarly, the Engineering Department may include Maintenance of Way, Construction, and Bridge and Building departments.

Few persons not directly employed by the railroads realize what a vast amount of office work is involved in the railroad business. Railway office work includes: the issuance and sale of tickets; the collection of freight charges; the issuance of vouchers; the purchase of locomotives, cars, fuel, and great quantities of materials and supplies; keeping records in connection with the operation of dining cars and restaurants; keeping constant track of all freight cars; the collection and payment of rentals for equipment and joint facilities; settlement of claims; preparation and auditing of station accounts, vouchers, payrolls, waybills, tickets, train receipts, bills receivable and bills payable; keeping the time of all employees; the making and quoting of freight rates and passenger fares; preparation and revision of timetables and maps; preparation and distribution of advertising literature; payment of taxes; keeping a record of stockholders and bondholders; analysis of operating costs; design of bridges, structures, and equipment; preparation of deeds, contracts, law briefs and other legal documents; banking transactions; preparation of numerous daily, weekly, monthly, and annual reports; carrying on a vast correspondence with government agencies, other departments, other railroads, and the general public; and performing numerous other duties incidental to railway operations.

Aside from executives, general officers, division officers, and the professional occupations already mentioned, the railroads employ architects, law clerks, rate experts, advertising men, auditors, paymasters, accountants, statisticians, cashiers, estimators, draftsmen, claim agents, bookkeepers, chief clerks, correspondents, voucher clerks, bill clerks, secretaries, stenographers, typists, accounting machine operators, multigraph operators, telephone operators, file clerks, office boys, and many workers in specialized fields of railway office work.

The electronic machines in the picture, now widely used in railroad offices, represent some of the latest techniques in accounting procedures. At the left, employees are operating accounting machines, punch card machines, a collator, which merges card groups into a single group, and an electronic calculator used in payroll and disbursement accounting. Also shown are a reproducing punch machine, an interpreter which translates punched holes into printed information on the same card, card sorting machines, card counters, and punch card files. Together, these particular machines take care of many accounting functions: freight billing, inventory control for supplies, payroll earnings (with an attachment which simultaneously writes the paycheck), withholding tax and other payroll deductions, and computing daily rental charges on approximately 16,000 freight cars 365 days a year.

Railway offices, like all other branches of railroading, have undergone revolutionary changes in practices and methods. In the early days of railroading, all letters were written in long hand, and, with neither telegraph nor telephone communication, the correspondence for even a small railroad was heavy and burdensome. All accounts were kept and all records and reports were made with pen and ink. Today, numerous office devices—such as typewriters, dictaphones, billing machines, posting machines, rapid calculating machines, card punching machines, and inter-office communication systems—contribute to the efficiency of every branch of railway office work.

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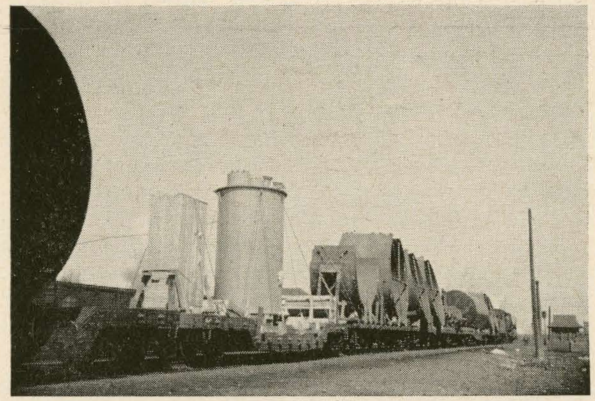
1. **Where are railroad offices located?**
2. **What are some of the different kinds of railroad offices?**
3. **What kinds of workers are employed in railroad offices?**
4. **Do the railroads employ women in offices?**
5. **What are some of the things done in railroad offices?**
6. **Have you ever visited a railroad office? If so, tell what you learned.**
7. **What objects do you see in the picture?**
8. **Why is a knowledge of mathematics necessary in an accounting office?**
9. **Why do railroads have to keep records?**
10. **What are an accountant's duties?**
11. **What are the duties of a paymaster?**
12. **What is an executive officer?**
13. **What is the title of the chief officer of a railroad?**
14. **What are some of the different departments of a railroad?**

## ADVANCEMENT IN RAILROAD CAREERS

Not long ago, an analysis was made of the careers of the presidents of 76 leading railroads in the United States—men who had risen from the ranks and reached the pinnacle of success in the railway world. It was found that 43 of them were graduates of colleges or universities, 9 had received some college training, and 19 had attended high school. Most of the 76 presidents began their railroad careers in minor capacities and advanced step by step up the ladder. While the college-trained man doubtless stands a better chance of getting to the top, the record reveals that the door of opportunity in the railroad field is not closed to the man without college training, if he has the necessary qualifications. Teachers with vocational guidance responsibilities should advise students interested in railroad careers to apply direct to individual railroads of their choice, because all matters relating to the recruitment, selection, and training of railroad personnel are handled by the individual railroads rather than by the Association of American Railroads.

# 56. RAILROADS CARRY "ANYTHING, ANY TIME"



Railroads are unique among transportation agencies in that they are equipped to handle shipments of almost any kind. In their role as mass movers for the world's greatest industrial nation, they are frequently called upon to perform transportation tasks of truly herculean proportions—tasks indeed which could not be well performed by any other mode of transportation.

Great generating units and transformers for power plants; huge tubings for subterranean structures; immense steam engines for manufacturing plants; great turbines for steamships; huge machines for paper mills; immense printing presses; steel girders for bridges and other structures; long flag poles and spars; forgings for industrial plants and dams; boilers; tanks; heavy machinery for automobile plants, for coal mines, and for refineries, foundries, machine shops, and rolling mills—these are some of the many oversize or unusually heavy shipments that move over the American railroads.

Some of the freight cars upon which the pictured shipments were loaded were of extra heavy steel construction capable of bearing great loads. Most freight cars are equipped with eight wheels—a four-wheeled truck at either end—but some special freight cars are equipped with 32 wheels, consisting of two eight-wheeled trucks at both ends.

A shipment of abnormal size often calls for special attention on the part of railroad operating men. Typical main line tracks range from 12 to 15 feet from center to center. Yard tracks are usually closer together. The overhead clearance of many bridges is 22 feet. On each side of the track, signals, roadway structures, bridge supports, tunnels, and other obstructions often limit clearances for wide or tall loads. Therefore, before a shipment of this kind is sent on its journey, often even before it is manufactured, the railroad or railroads which handle it must make certain that it will clear all overhead structures, wires, or other track-side objects along the route. If the most direct route does not have sufficient clearances to accommodate the shipment, it is given another routing. Over-size shipments are often handled separately and in daylight hours only.

The tallest big-unit shipment on record was part of an electrical rotor, standing approximately 28 feet above the top of the rails, shipped from a manufacturing plant near Chicago to another plant two miles away.

The heaviest single freight shipment on record was an almost 800,000-pound, 7½-miles long, high-voltage, submarine cable, carried from Passaic, New Jersey, to Renton, Washington, for use in Puget Sound. The cable was shipped, in the spring of 1951, on nine specially prepared gondola cars.

In many instances, the enormous weight of loads such as this must be distributed on two cars by means of pivoted bolsters and held firmly in place by steel cables. The pivoted bolsters are necessary to allow sufficient flexibility for the cars to negotiate curves encountered along the route. However, the weight of these extra-heavy shipments seldom creates a serious problem for the railroads. Railroad track and roadbed, accustomed to absorbing the pounding of big locomotives and freight cars, can take the weight of a huge boiler, tank, a big steel bridge girder, or even a tugboat, without any difficulty.

The longest big-unit single shipment on record was a 203-foot cylindrical refinery tower—two-thirds the length of a football gridiron—shipped from a manufacturing plant in Houston to Chaison, Texas, in November, 1955. This shipment, resting on two cars, required two idler cars between the burden cars and one idler car at each end—six cars in all. Other recent large-size shipments have been 180 feet or more in length.

Among the many unusual shipments which the railroads have been called upon to handle was the almost priceless 200-inch telescope lens shipped from Corning, New York, to California, for the world's largest telescope at Palomar Observatory. The slightest fracture, cracking or chipping of the lens would have ruined it and set the completion of the telescope back for years. Therefore, the lens was packed for shipment with the utmost care and was attended and guarded constantly on its 2,960-mile trip across the continent. It was delivered to the observatory in perfect condition.

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1. **Why are railroads especially well adapted to handling big and heavy shipments?**
2. **What are other large and heavy units which must be transported?**
3. **Have you ever seen large machines or objects on railroad cars? What were they?**
4. **What kinds of freight cars are in the picture?**
5. **The heaviest shipment weighed 673,000 pounds. What is its weight expressed in tons?**
6. **What purpose does a pivoted bolster serve?**

# TOPICS OF THE TIMES

*(Reprinted from The New York Times)*

## RIDE ON A TRAIN

In a town within commuter flight of Times Square a show of hands lately revealed a pathetic situation. No member of the entire class, adult to the extent of five dreary years, ever had been on a railroad train. In classes up to the sixth, where at 11 a man might be expected to have seen everything and discounted most of it, certain members never had been on a railroad train. At 5 and 11 they knew almost every tree along the Merritt Parkway, as well as the location of each Howard Johnson on the Post Road, yet they knew no trains. Clearly they were the lost generation, the unheeded by-product of the internal combustion engine, a sad parody of happy childhood.

The situation was rectified, of course, and now they smile again. The correction was put in charge of a man whose usual occupation is the production of plays, and his script called merely for a trip from one station to the next. When the train puffed into the next, however, no one cared to leave, and after a delay of such length as would entitle the conductor to set down Act of God in his report, the group rode on. Translating the event into his own specialized terms, the producer said he would give something for a play which would so hold its audience, and in a flash of insight, rare among managers, he said he guessed he never would find it. Nor will he. For a play is just a play, while a railroad train is basic.

## SAD SHORT CUTS

This indeed is the lost generation, this tired old man of 11, this weary woman of 5. Childhood should be happy, as all the authorities agree. Childhood should move contentedly from given point to given point—from Christmas to Christmas, for example, and from train to train. It perhaps is knowledge of a sort to be able to state the number of cylinders in the new Buick or the new Ford, assuming, of course, they are not already jet propelled. It may even be knowledge to know the short cut through Providence which, on the way to Cape Cod, avoids the traffic around the railroad station. But there is the rub, for the short cut also avoids the station. A pleasant childhood consists no more in circling a station at a distance than in circling a candy cane. Both should be sampled as often as possible in order that an agreeable child become an honorable man. A train is basic, while an automobile is turned in each year; a train is a friend, while a car is only a temporary possession.

## POINT IN TIME

This lost generation of 5 and 11 has missed much. It has missed the preparations for a journey. A car can leave the garage at any hour or no hour, but the train goes on schedule, and it is the schedule that decides preparations. In an automobile, the child goes away sometime tomorrow, but in a train he goes tomorrow at 9:15. That is a definite point in time and space, that is a point which exists. That is the point at which all the baggage must be assembled, the tickets must be at hand, and the point from which there is no turning back to see whether all the lights are off. That is the point which means going away, and not just talk of going away somewhat later. It is possible almost to reach out and touch 9:15, to place carefully 9:15 in the pocket with the jackknife and fishhooks. Expectations and preparation form nine-tenths of any journey of consequence, and 9:15 is the symbol. That is really it.

## THE GREAT MOMENT

This lost generation has missed more. It has missed the sight of an awaited train coming around a bend and slowing for the station. It has missed the grinding sound of the brakes and the hiss of escaping steam as the engine passes, and the casual, friendly glance of the engineer. It has missed the quick look into the open door of the baggage car, and the half-opened door of the car carrying mail, no doubt with armed guards. It has missed also the diner, slowing as if in invitation, and that moment when the conductor swings down and beckons important passengers aboard. It has missed the one true and great moment of any trip: the "All Aboard," the brisk notes of the bell as the train starts slowly off again. With no experience of that, it is a lost generation indeed.

## MANY THINGS MISSED

To one who never has heard the special sound made by the whistle of this particular train there may be some minor satisfaction in tuning in the radio of the car. To one who never has had luncheon in a diner, Mr. Johnson may be able to provide just as many flavors of ice cream as he says he can. One who never has set out to explore a train, from the baggage car on back, may feel that US Route 86 may lead ultimately to the rainbow—but rainbows definitely are train borne. Driving into its motel early in the evening, the lost generation does not know the supreme pleasure of climbing into its berth and watching the lights of the country pass by. The lost generation thinks in its ignorance that the movies are pretty fair, that television is pretty fair, but it does not know true art. The true art is not 10,000 extras, jumping screaming from technicolor cliffs, but is one small light in a lonely farmhouse, seen at night—from a train. Not even Raphael could improve on that.

# THE AMERICAN RAILROAD SYSTEM

I am the Burden Bearer of the Nation. I am the Nation's Number One Delivery Boy.

I carry the products of millions of American farms to thousands of American factories and to millions of American homes.

I take the coal from the mines, the ore from the hills, the stone from the quarries, and carry them to the market places.

I keep the factories of the Nation supplied with raw materials. I distribute the products of these factories to cities and towns and hamlets from Maine to California, from Washington State to Florida.

I meet the ships of the Seven Seas at our seaports. I receive the coffee, the sugar, the spices, the rubber, the copra, and the countless other things which these ships bring to our shores, and I deliver them to the factories and stores and homes where they are wanted. I gather up the surplus products of farms, forests, mines, and mills and carry them in endless streams to fill the ships that come for cargo.

I bring the circus to your city, the entertainers to your theaters, the films to your movies.

I speed across America, from city to city, from town to town, with your express shipments—parcels and crates and boxes—picking them up or delivering them at your doors.

I am the chief mail carrier for the Nation. I carry eighty-five out of every one hundred pieces of non-local mail in this country. I bring you letters from distant relatives and friends—letters that mean so much in your life. I also bring you packages and your favorite magazines.

I am the Nation's safest carrier of passengers. I am the swiftest carrier of passengers by land.

At this very moment, tens of thousands of people are speeding across America in my comfortable traveling hotels—businessmen on important missions, students going to and from schools and colleges, newlyweds on their honeymoons, vacationists en route to distant resorts, parents going to visit their children, children going to visit their parents.

Not only do I carry the American people on their myriad errands—I provide them with comfortable beds in which to sleep; I serve them food and refreshments; I look after their every want while they are my guests.

I am an employer as well as a transporter. One and one-quarter million men and women work for me and with me in performing my great transportation tasks.

I am one of the chief shoppers of the Nation. I am constantly buying; yet my wants are never satisfied. Yesterday I spent millions; today I am spending millions more; tomorrow I shall spend other millions with mines and mills and factories and wholesalers for the many things I must have to keep my millions of wheels rolling.

I am one of the chief supporters of government. The taxes I pay—amounting to millions of dollars a day—help pay the salaries of our public officials, meet the expenses of our public schools, protect the health of communities, provide police and fire protection, build roads, airports, and waterways all over America.

I am an empire builder and a promoter of unity. I have knit this far-flung Nation together, linking North with South, East with West, in one great community of common interest and common understanding.

I never sleep. Night and day, month in and month out, year after year, summer and winter, rain or snow, in storm or flood—I carry on!

I am a vital part of the Nation's economic life.

I am the American Railroad System!



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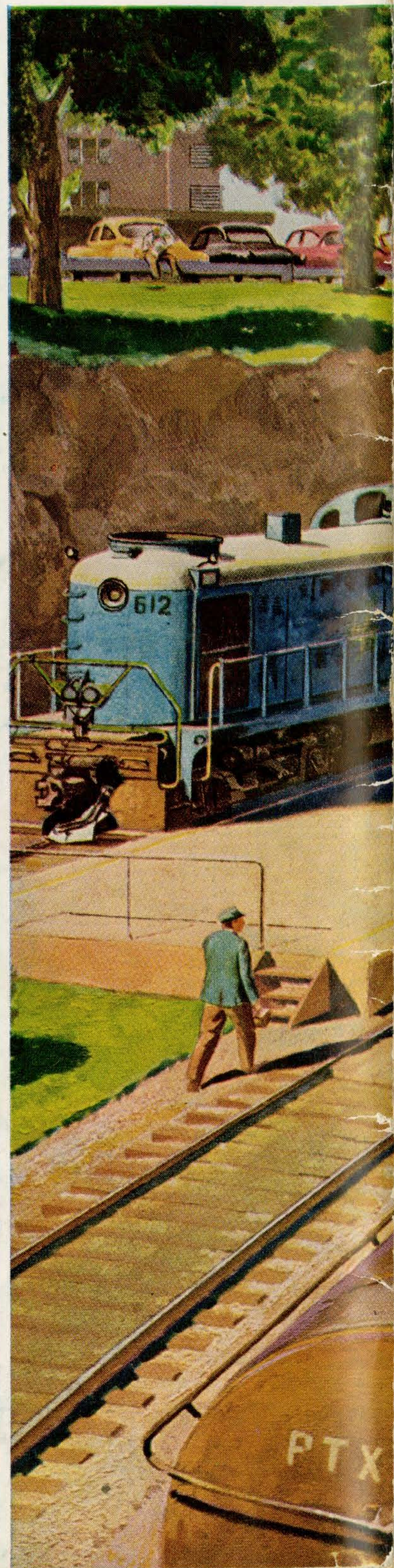
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