THE RAILROAD

FURNISHED THROUGH COURTESY OF

SANTA FE SYSTEM LINES

Although the great steam locomotives of yesterday have largely been replaced by Diesels, their glamour remains.

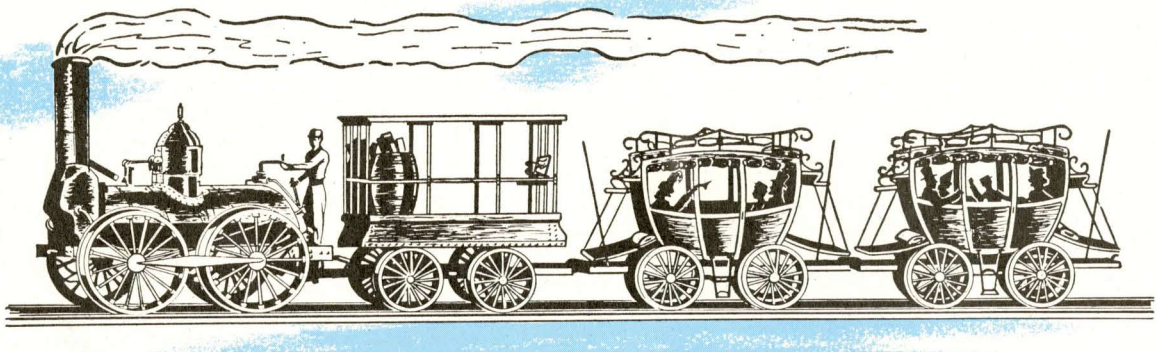
THIS BOOKLET tells of American railroads. It has been prepared in response to many requests that come in, year after year, from teachers and students. It sketches a little of the romance, the daring and resourcefulness and fierce competition that have marked the development of American railroads into the greatest rapid transportation network the human race has ever known, an essential part of the mighty industrial civilization that has rocketed the United States into world leadership. Produced by the Santa Fe, it uses the Santa Fe story to illustrate all American railroading, and American enterprise.

We cordially invite further correspondence, and on request will be glad to furnish additional material on this vital subject.

Bill Burk

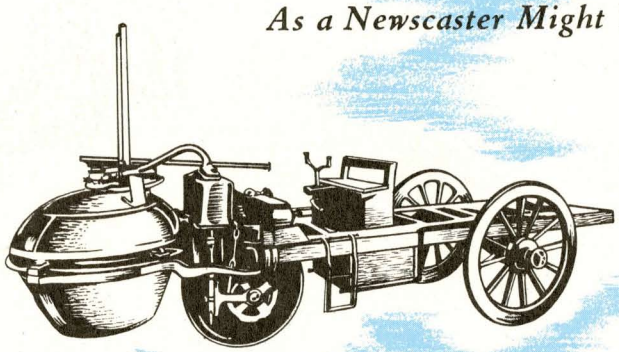
MANAGER, PUBLIC RELATIONS
SANTA FE SYSTEM LINES

Printed in U. S. A.



How Railroads Began

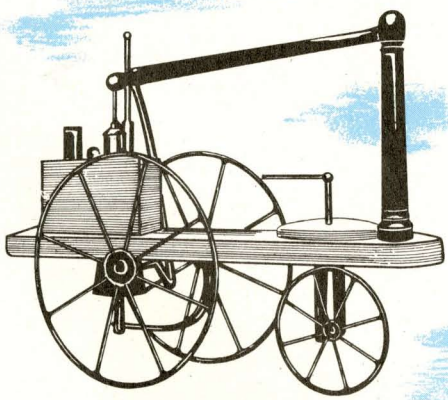
As a Newscaster Might Tell of It, If It Happened Today



Cugnot's Steam Engine.

France, 1769

Flash! Captain Nicholas Cugnot of the French Army has built a great steam machine that will pull a cannon! It goes almost as fast as a man can walk. But it won't steer and has run into a ditch and smashed. The Army will not accept it.



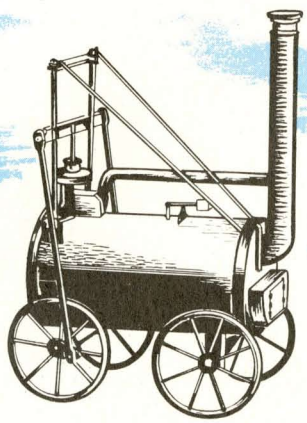
William Murdock's Oscillating Engine.

England, 1786

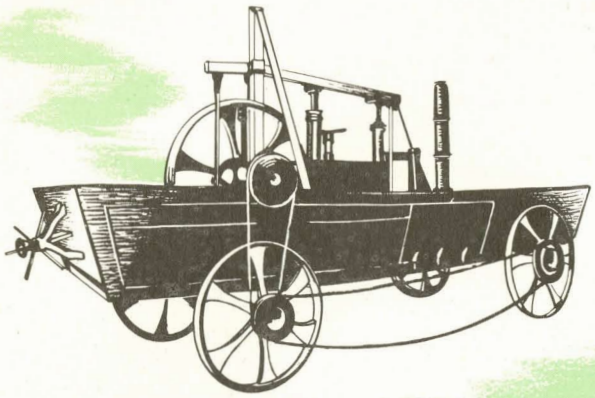
William Murdock has made a noisy little 3-wheel steam-machine that goes by itself. He tried it out after dark in a lane near the church, and nearly scared the life out of his pastor who happened to be walking there. He may be arrested.

England, 1802

Richard Trevithick has made another of those steam machines we heard such tales about 20 years ago. He has mounted it on a wagon, and claims it can pull ten tons of coal, on rails, at 5 miles an hour! But it isn't practical; it ruins the roadbed.



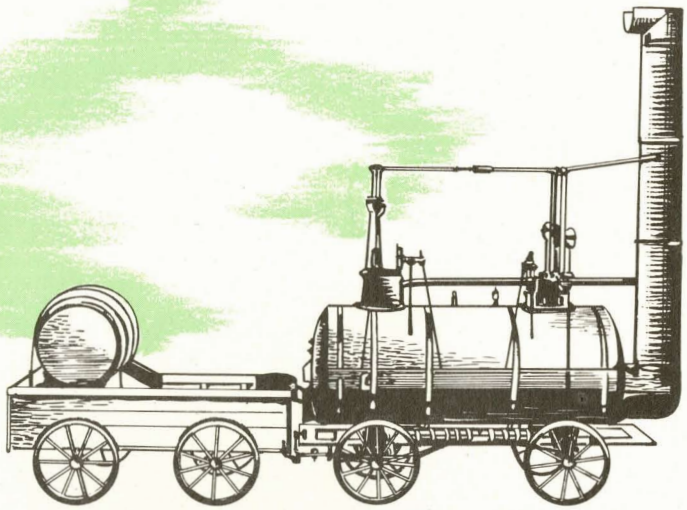
Dick Trevithick's locomotive.



The Evans Scow.

America, 1804

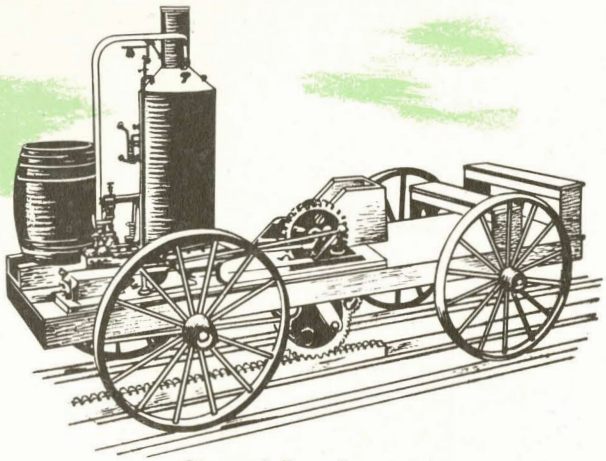
Oliver Evans of Philadelphia has built a machine on wheels that is also a boat. When he drove it into the Delaware River it left its wagon wheels and paddled off. In these days when there is so much talk of canals, it may be a great thing.



Stephenson's Killingworth Locomotive.

England, 1815

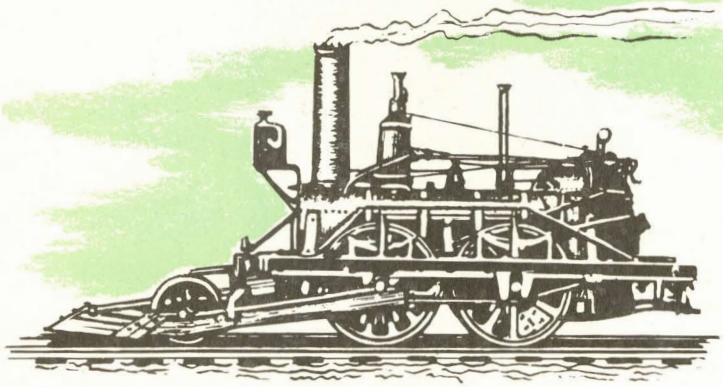
George Stephenson has made an engine that can pull coal cars, and is really getting somewhere. He has cut down its deafening roaring and hissing noises by turning the steam into the chimney, which he calls a smoke-stack. He claims that this makes it more powerful.



Stevens' Experimental Locomotive

America, 1825

John Stevens, Hoboken, N. J., resident, has completed the building of a tiny locomotive with a multitubular boiler and is operating it on a circular track in his garden. The small car attached to it will carry six passengers. Stevens has been experimenting with steam engines for 30-odd years.



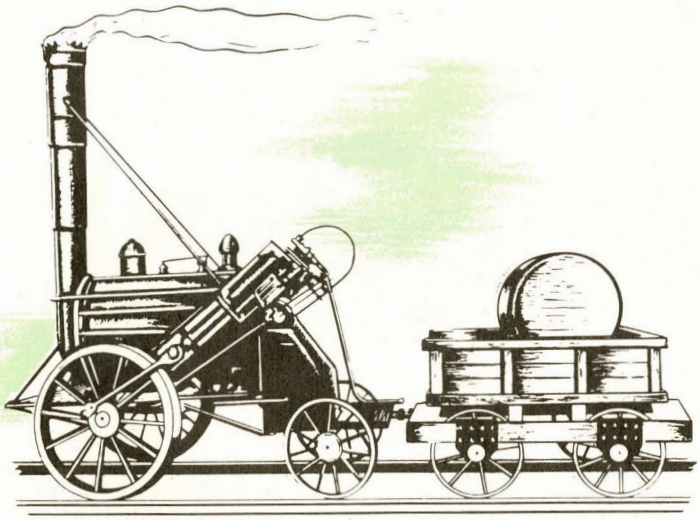
The strong "John Bull."

America, 1828

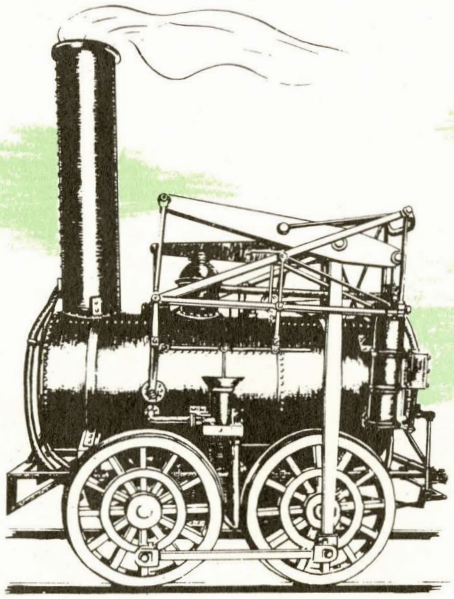
A young engineer named Horatio Allen is leaving for Stockbridge in England, to find out more about these newfangled machines that are being called "locomotives." If they are very good, he has orders to buy four of them to bring to this country.

England, 1829

Flash! George Stephenson has done it again! He has won the $2500 prize offered by the recently formed Liverpool and Manchester railway! His winning locomotive, The Rocket, is a wonder! It has taken everyone's breath away by going *thirty miles an hour!*



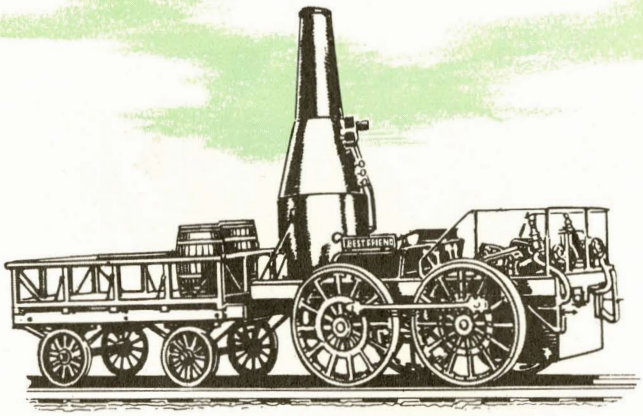
Stephenson's famous "Rocket."



The great Stourbridge Lion.

America, 1829

Horatio Allen has brought an English locomotive to this country. It has a lion's face painted on the front end of its boiler, and is called "The Stourbridge Lion." Allen is trying it out on a railroad for coal cars that has been built in Pennsylvania.



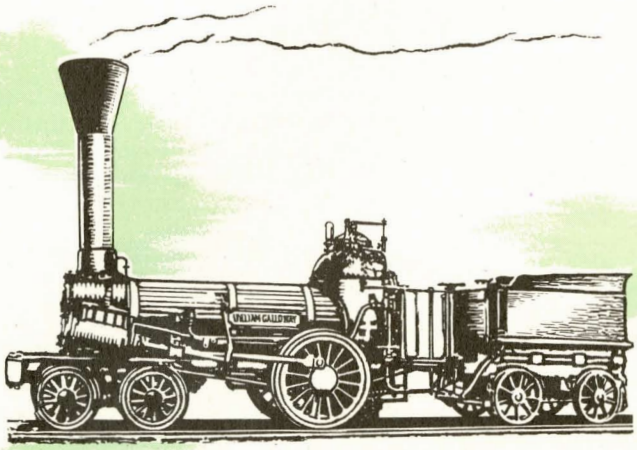
"Best Friend of Charleston."

America, 1830

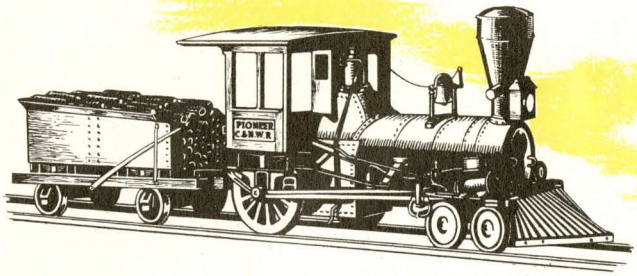
The first steam locomotive to be operated over an American railroad on a regular schedule left Charleston this morning, Christmas Day, 1830. Viewers kept their distance fearing the noisy, smoking monster might explode or jump the tracks.

America, 1837

Richard Norris of Philadelphia has delivered to the Baltimore and Ohio Railroad the first horizontal boiler locomotive to be purchased by that company. The new engine, named "William Galloway," is to be used in freight service.



"William Galloway."



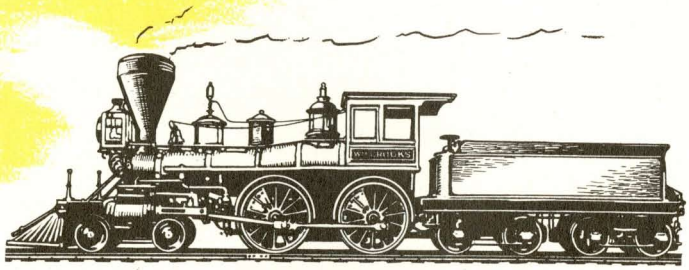
"Pioneer."

America, 1848

After a brief career on an Eastern railroad, a sturdy locomotive, "The Pioneer" has arrived in Chicago via the Great Lakes and a barge. It will soon be clattering along newly-laid rails on the prairies startling livestock and fascinating citizens.

America, 1861

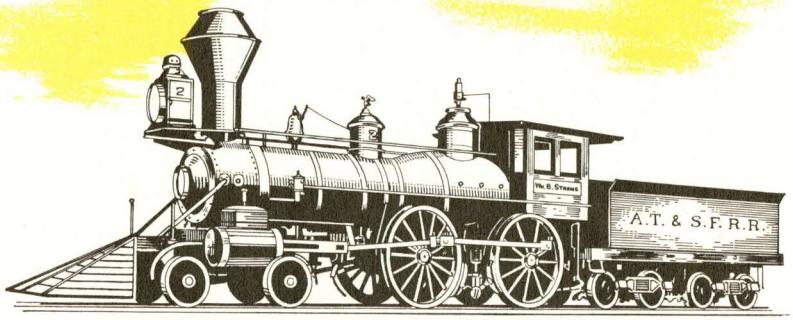
President-elect Abraham Lincoln left Springfield, Ill., today, February 11, en route to his inauguration in Washington, D. C. One of the locomotives hauling the special train will be the "William Crooks."



"William Crooks."

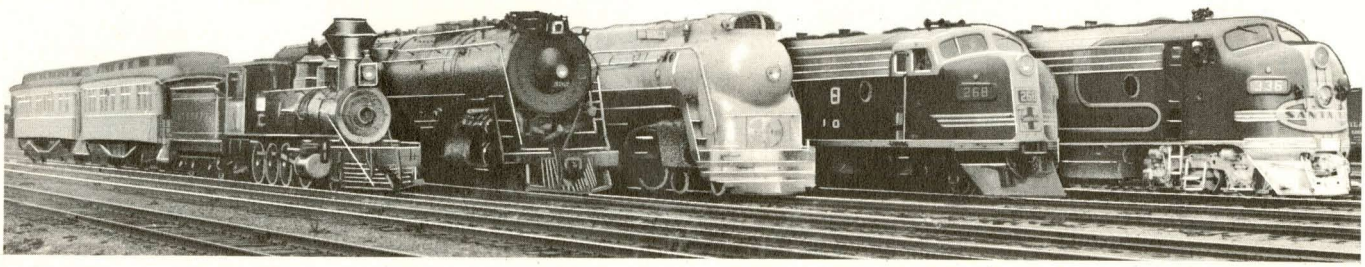
America, 1881

Railroads continue to push westward. On March 1, 1881, Santa Fe will open the first direct transcontinental route to Southern California. Locomotives like the new Baldwin-built "Wm. B. Strong" will be in service.



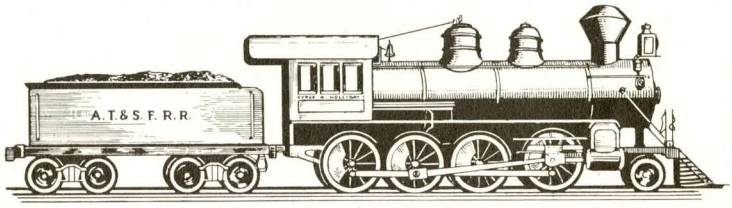
"Wm. B. Strong."

"Parade of Power." Portraying the tremendous progress made in railroad motive power, the locomotives pictured here range from the tiny coal-burning diamond stack steamer to today's thundering Diesels. As a result of the continuing search for means of providing better service to the shipping and traveling public, locomotives are refined or new types developed almost every year.



Railroads Opened The West

A TELEVISION SCRIPT FOR CLASSROOM USE



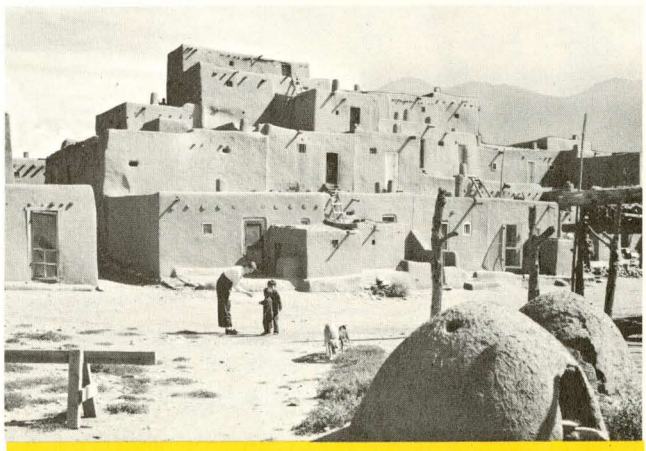
Fade in round living-room table in a pleasant Kansas home. Draped curtains on the windows. Framed pictures of an old man and an old lady on the wall. Beneath the pictures there is a television set. One or two books and a magazine in foreground on the table. Sitting around the table are Uncle Bob, facing towards the camera, with Freddie, about 15 and Sue 11, at his right and left. Behind them, sitting in easy chairs a little to each side, are Pop and Mom Baldwin, parents of the children. Uncle Bob is about 35, and quite a bit younger than Mom, his sister. He is tanned and muscular, but rather heavy, with a round, pleasant face. Sue is rather slender, reddish-haired, and eager. She has a number of freckles. Both Freddie and Sue, as well as Mom and Uncle Bob, show a resemblance to the strong, elderly face of the man in the picture, who is the children's grandfather.

DIALOGUE

SUE *(demandingly):* Tell us about the beginning of the railroad, Uncle Bob.

UNCLE BOB: Shucks! You know as much about it as I do! Or at least your Mom does.

MOM *(Spiritedly):* I do not, Bob, and you know it! The idea of my knowing as much about it as a Santa Fe agent! The children want you to tell it!



Indians of the Southwest lived in pueblos, like this 5-tier village at Taos, New Mexico.

UNCLE BOB *(Resignedly):* All right, all right! (To Sue) Where shall I begin?

SUE: With Great-Grandpa and Colonel Holliday.

UNCLE BOB: O.K. Only first you have to remember that this is only the way my Gram'pa told it to me, when I was just a little shaver.

FREDDIE *(Impatiently):* We know.

UNCLE BOB: Well, it really begins before that, when Gram'pa came out from the East, when *he* was so little he can't remember much about it. There were railroads in the East, but not any West of Chicago.

FREDDIE: Chicago?

UNCLE BOB: Well, say the Mississippi River. Chicago hardly knew it was a city then.

SUE: When was that, Uncle Bob?

UNCLE BOB: About 1859, I guess. Gram'pa's parents, your great *great* Gram'pa and Grandma, came the last part of the way, right here to Topeka, in a wagon.

FREDDIE: Topeka was here then?

UNCLE BOB: Just was. Colonel Holliday and two-three others had just started it. Only he wasn't a colonel then, just a young fellow named Cyrus.

SUE: Then how could he start a railroad?

Great rocks rise from the Southwestern deserts, like these in Monument Valley.

UNCLE BOB: Anybody could, in those days, if he had the brains and the get-ahead and the money.

FREDDIE: How did he get the money?

UNCLE BOB: Made some by writing a charter for an Eastern road, called the Pittsburgh and Erie, and taking stock for his work. To start The Santa Fe he sold more stock.

SUE: Get to the Colonel Holliday part.

UNCLE BOB: That was in 1868. Gram'pa was about 14 years old. Cyrus Holliday had been trying to get his railroad started for nearly ten years.

FREDDIE: Why did he want to build a railroad?

UNCLE BOB: It was needed, he thought.

FREDDIE: But there weren't hardly any people out here then, were there?

UNCLE BOB: Not many. Mostly just Indians, and buffalo. Great herds of buffalo.

FREDDIE: How big were the buffalo herds?

UNCLE BOB: Nobody knows. But the *bones,* just the skeletons for fertilizer, of more than 30 million buffalo were shipped east, later.

SUE: That's an awful lot.

UNCLE BOB: You bet. There must have been herds with thousands and thousands of buffalo in them.

FREDDIE: Right here in Topeka?

UNCLE BOB: All over the prairies, but mostly further west than this. That's what made Colonel Holliday so sure there ought to be a railroad.

FREDDIE: Why?

UNCLE BOB: It showed the land would make wonderful farms—just the way it has.

SUE: How did the buffalo show that?

UNCLE BOB: If the land would support millions and millions of buffalo, it would support millions of cattle, and millions of people.

SUE: But there *weren't* any people here then, except Indians.

UNCLE BOB: Exactly. It took men with a lot of vision, and a lot of courage, like Colonel Holliday, to see that if you wanted farms and towns and factories instead of just Indians and buffalo, you'd need railroads, and start getting 'em.

FREDDIE: Why did it take *railroads?*

UNCLE BOB: Because when you raise cattle, or corn, or make something to sell, you've got to be able to ship it to a market. Where there are railroads, a country can develop.

FREDDIE: Wouldn't ordinary roads do?

UNCLE BOB: In the first place, they were too slow. There weren't any automobiles then, you know. And in the second place there weren't any real roads, except the rough trails, like the Santa Fe Trail.

SUE: I know. In school yesterday they told us about places where they have only ox-carts, and people stay ignorant for hundreds of years.

UNCLE BOB: Something like that. Cities and railroads grow up together. Nearly all the nice things you like—clothes and carpets and curtains and pipes for plumbing and glass for windows—are brought in by railroads.

MOM: Don't forget books and magazines, and mail.

POP: And tobacco. (Lights his pipe)

UNCLE BOB: So Colonel Holliday started his railroad into the West, when it was only wonderful, empty land waiting to be devloped.

FREDDIE: Weren't there any other railroads?

UNCLE BOB: Not many. One line reached to California. It was opened after work was started on Colonel Holliday's road.

SUE: Tell about really *starting* it, Uncle Bob.

As the roads were pushed into the west, track-laying crews spiked big steel rails that weighed 56 pounds to a yard into solid oak ties.

This great California lettuce field shows how the grassy plains were changed into fertile farmland.

Great cities like this have sprung up where once there were only a few Indians.

UNCLE BOB: Well, they had quite a little ceremony. Senator Edmund Ross took a new shovel and turned the first shovelful of dirt. Then Colonel Holliday told where the road was going to go: to Santa Fe!

SUE: Tell about Great Gram'pa.

UNCLE BOB: Your great grandfather, my grandfather, was about 14 years old. He was standing on the edge of the crowd. When Colonel Holliday said the road would go all the way to Santa Fe, some of the people laughed. It seemed absurd to think a new railroad could go through undeveloped Indian country to a small city way out there in the desert. But Gram'pa didn't think so, and when they laughed he shouted: "It will too!"

SUE: And he was right!

FREDDIE: So was Colonel Holliday!

UNCLE BOB: You bet they were! But of course it didn't all happen at once.

FREDDIE: How long before they reached Santa Fe?

UNCLE BOB: About 11 years. The main road didn't go right to Santa Fe even then, because by that time they were on their way clear to the Pacific Coast.

FREDDIE: Across the desert. But there weren't any farms to develop *there* then, were there?

UNCLE BOB: Indeed there were, although not so many. But just because some part of the country is slower to develop doesn't mean it won't eventually. You should see the way some of those New Mexico cities are developing! Why, Albuquerque has more than two hundred thousand people, right now.

FREDDIE: And it wouldn't have, except for the railroad?

UNCLE BOB: That's right. At least it wouldn't have grown like that for years and years. The whole Western part of the country has grown up with the railroads. The Santa Fe has played a big part in it.

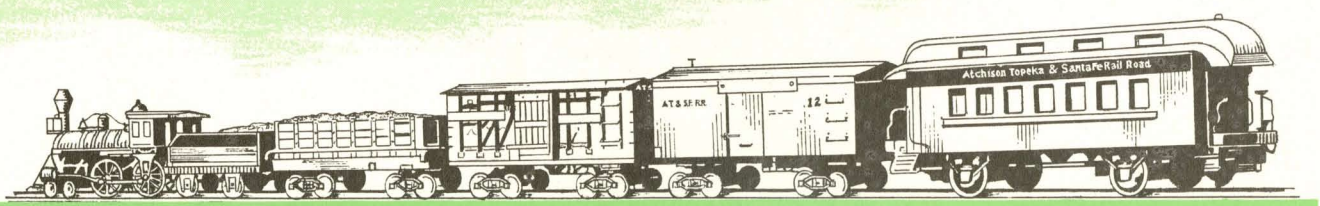
FREDDIE: Good-bye buffalo.

UNCLE BOB: Good-bye buffalo. They weren't as useful as cattle and sheep, and crops. Even Dodge City had to change its name from Buffalo City to Dodge City.

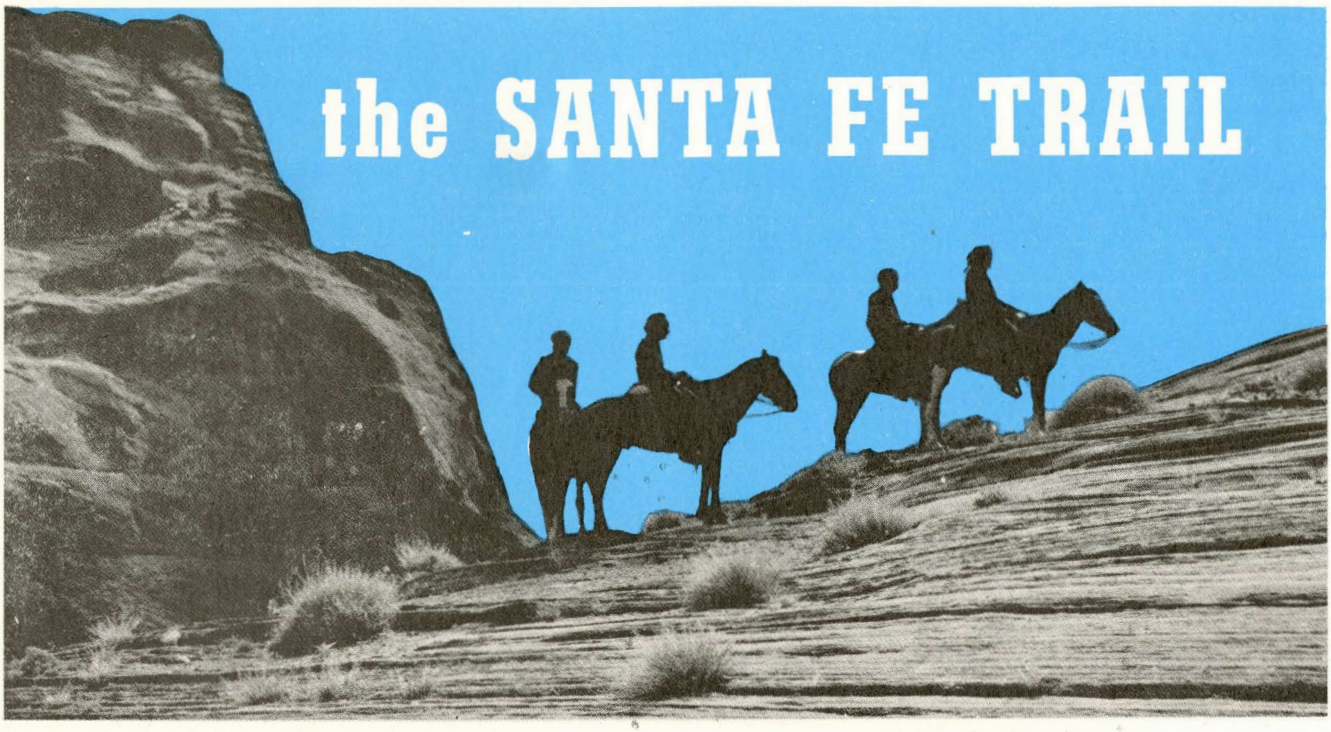
FREDDIE: I guess Colonel Holliday did quite a job.

UNCLE BOB: All the big railroad builders did. Their roads became part of the country—and the country developed with their roads. It's all part of one great picture.

SUE: Railroads and America, growing up together!



Early Santa Fe train. Built in 1868, it had one small passenger coach and three freight cars. On its first trip it ran 17 miles, from Topeka to Carbondale, Kansas.



Long before the railroads came, Navajo Indians rode their horses through the mountains and deserts of the Southwest.

How much do you know about the Santa Fe Trail? In the last 140 years it has become one of the most famous routes in the world. Because a great railroad has followed what was once only a footpath for Indians, then a bridle-path for pack mules, and then a wagon track, as many as 11 million railroad travellers on the Santa Fe Railway in a single year have come in contact with its romantic history.

There are not many great overland routes, like the Santa Fe Trail in America, or the Burma Road from India to China. Before the days of railroads, boats as a rule were used for long journeys, and in new countries cities grew up along rivers.

For more than 200 years the city of Santa Fe de San Francisco, the Holy Faith of Saint Francis, on the deserts of New Mexico, was almost unknown and unheard of in the East.

Founded by Spanish conquistadores in 1606 at the location of an old Indian town or pueblo, it is, except for St. Augustine in Florida, the oldest city of the white man in the United States. It became the capital city of the province of New Mexico.

For many, many years Santa Fe was almost unreachable. A few pack-trains and early wagon-trains come up to it from the South: Nine months for the journey from Mexico City, then a few months rest, and then nine months more to get back.

As the sleepy little capital of the Spanish desert-province grew slowly more and more important through two hundred long years, Indians traded with the white men. They brought their baskets and beadwork and beautiful little silver ornaments and bright, semi-precious stones to exchange for sharp hunting-knives and pots and pans and iron tools and all the hundreds of useful things that have come to be common in what we call civilization. Some came from the North, and some from as far away as California in the West, and still more from the East. Gradually the trails they travelled over became quite clearly marked; the trail from the East, the early track to Santa Fe from the great prairies and valleys of the Mississippi and Missouri valleys, became the most-travelled of them all. By 1820 the first white traders, from the towns that were springing up west of the Alleghanies, were also using the Santa Fe trail of the Indians.

The Spaniards had brought with them horses. At first horses were rare and very valuable; long before 1800 they were so numerous that all the Indian tribes had plenty of them. With the hoof-prints of horses and mules the Santa Fe Trail became still more distinct.

In 1822 Capt. William Becknell led the first wagon-train from the Missouri River, with loads of cloth and shoes and knives and other things that could be sold or traded for turquoise or Indian blankets. That was better than a pack train, with 250 pounds to a mule.

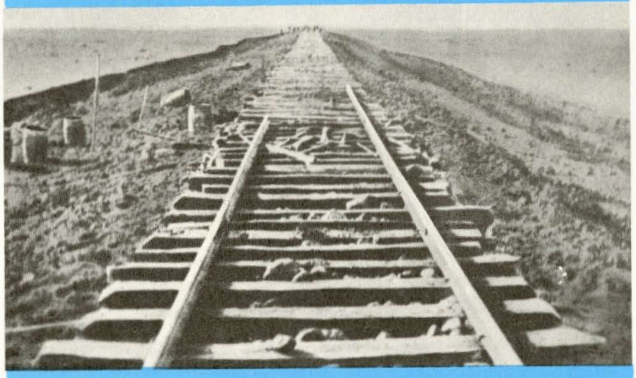
Other wagon-trains followed. Sometimes they were attacked by Indians. By the time gold was discovered in California in 1849 the Santa Fe Trail was one of the main routes to the West. There were stage-coaches; for a short time there was the famous Pony Express, with riders flinging themselves off a sweating horse to climb at once onto a fresh one.

Then, in the great railroad-building days at the middle of the century, Cyrus Holliday, a young lawyer of Kansas, planned a road that would join Topeka, a new city that he had himself helped start, with another young Kansas city called Atchison. Both towns lay only a little to the north of the Santa Fe Trail. West of Topeka there were then only the vast buffalo herds, with the Rocky Mountains beyond them. But more than 800 miles away in New Mexico was the fabulous city of Santa Fe! The railroad could follow the old trail! So the name of the new road, before a single shovelful of dirt had been turned, was changed from "Atchison and Topeka" to "Atchison, Topeka and Santa Fe." And eleven years after work was actually started the Santa Fe Railroad had accomplished the seemingly impossible and reached its far-away goal, the city of Santa Fe. Then it continued to build on westward, towards the Pacific Coast.

That is how it happens that today you can sit in luxurious comfort on a great train like the Chief or the Super-Chief or El Capitan and see the landmarks of the Santa Fe Trail slip past like magic. Where slow-moving oxen once pulled the covered wagons of west-bound pioneers you now roll smoothly along at 80 or 90 miles an hour. From a comfortable seat in a lounge or dome car you can see, where once there were only endless herds of buffalo, rich farmlands flashing by. Across a snowy-white tablecloth in a dining car you can look through a wide window at the hills and rocks where Indians once darted out in warpaint and feathers, terrifying weary travellers.

And long freight-trains gliding along behind powerful Diesel engines at 55 or 65 miles an hour follow the route pioneered by traders with plodding pack-mules.

In 1849 and 1850 covered wagons pushed slowly west along the Santa Fe Trail.

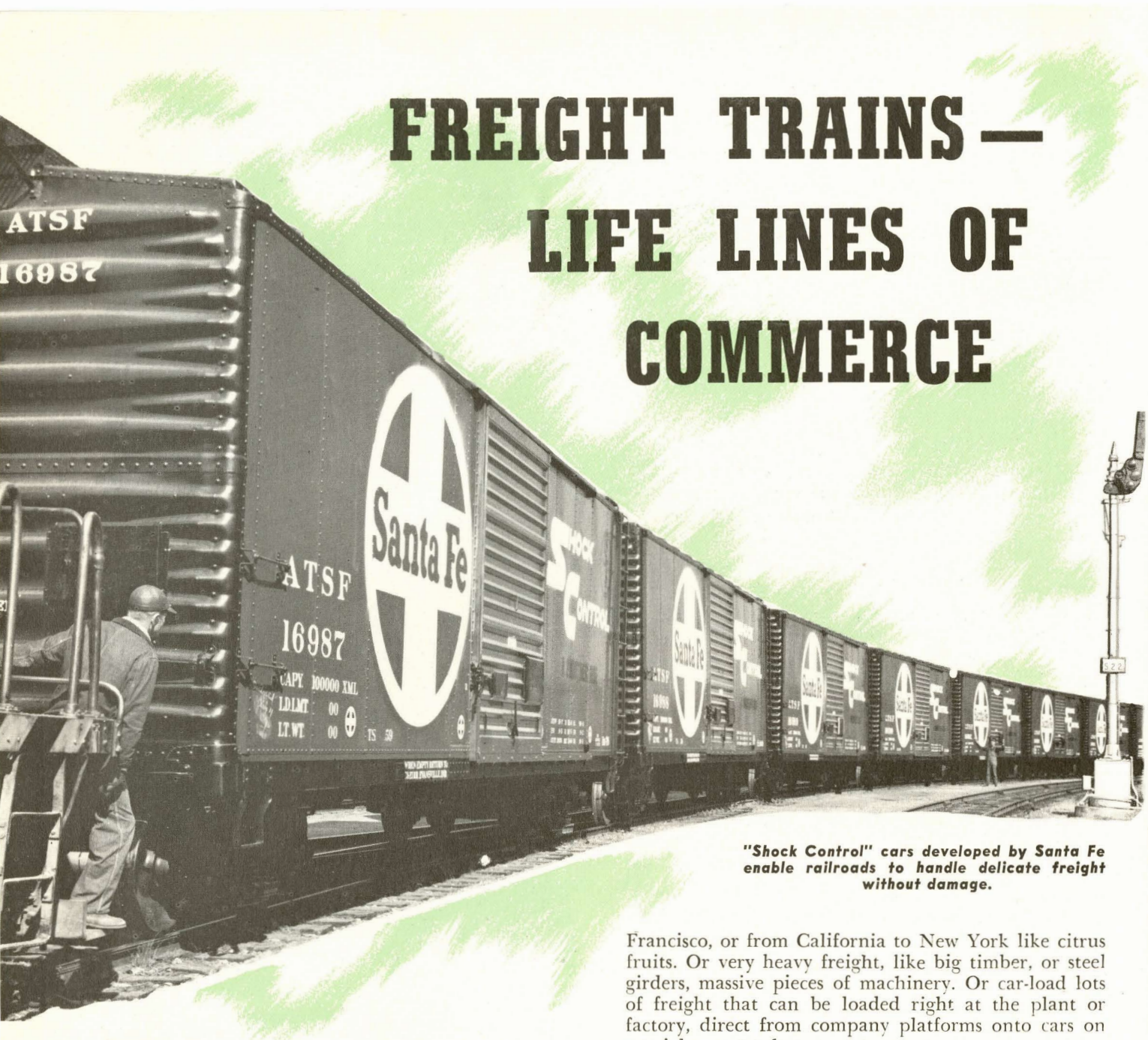


Through the Seventies railroads were built. Here is "the end of rail" in 1872.

Stage coaches were still running when the first Santa Fe trains went through.

Today great Diesel locomotives haul passengers and freight along the Santa Fe Trail.

FREIGHT TRAINS— LIFE LINES OF COMMERCE



"Shock Control" cars developed by Santa Fe enable railroads to handle delicate freight without damage.

When you think of railroads, you very likely think first of passenger trains, because you become a passenger yourself whenever you get on a train. But the most important work that railroads do is transporting quantities of freight so big that you can hardly imagine them.

Suppose there were 100 loaded freight trains each 3500 miles long. They would reach from Maine to California. American railroads transport that much freight in a year.

Or put it another way: American railroads own and operate about *two million* freight cars. Each year they travel nearly *30 billion* miles. They have carried more than *three billion* tons of freight in a single year.

The reason for this is that railroads can haul many kinds of freight more easily and safely and cheaply than it can be done in any other way. Long-distance freight, for instance, that goes from Chicago to San Francisco, or from California to New York like citrus fruits. Or very heavy freight, like big timber, or steel girders, massive pieces of machinery. Or car-load lots of freight that can be loaded right at the plant or factory, direct from company platforms onto cars on special spur tracks.

All the vast amount of freight-hauling is done in competition. Each railroad tries to do better than anyone else, like college runners on a cinder-path. It keeps everybody on his toes, trying to show more courtesy, trying to help shippers, trying to hurry freight along faster and more safely than their competitors. If the railroad is well run, all its employees catch the spirit, like members of a winning football squad. In American industry the prize for success is profitable operation. The penalty for failure is bankruptcy.

Because of this system many freight cars on American railroads have been upgraded since World War II. Hundreds and hundreds of improved new box cars, flat cars, tank cars, hopper and gondola cars have been built. There has been continual improvement in the hauling of goods.

Playing a big part in this improvement was the development of multi-level auto cars, Piggy Back flat cars and cushion underframe cars. The auto cars have

Yardmaster in tower checks cars passing over hill into Retarder Yard.

Electronically controlled icing machine can ice a car in one minute

either two or three decks and are used in hauling automobiles. "Piggy back" is the name given movement of trailers on flat cars. In other words, loaded highway trailers are moved on flat cars for long hauls and a truck-tractor pulls the trailer to local destinations from the terminal.

The cushion underframe or Shock Control car developed by the Santa Fe has been very successful. It is specially built to cushion the freight and enables railroads to handle delicate freight without damage.

For greater power and speed and economy more powerful locomotives have been built: the Santa Fe has led the way in using great Diesel-electric locomotives for freight trains. All Santa Fe freight trains are equipped with modern two-way radios, so that at any time the engineer in the cab can talk to the conductor in the caboose, nearly a mile behind him, in spite of the noise of the train. The speed of American freight trains has been increased more than 70 percent since the early 1920's.

Let's step for a moment into a high office perched in a great Santa Fe classification yard at Argentine, just outside Kansas City. In order to handle freight cars more rapidly and efficiently, this yard was enlarged and improved on an enormous scale: a whole town – stores, houses and all – were moved to make room for new tracks. Two miles of a state highway were moved and rebuilt. Pipe lines and telegraph and electric light and telephone lines have been rerouted Miles and miles of new track were laid.

In order to shorten the time and cut down the expense of switching, a long hill of earth was built, nearly 30 feet high, and sloping away in all directions. Tracks were laid over it. From the Yardmaster's office close to the top of this hill we can see a long freight train pushed slowly over it, about as fast as a man can walk. A man at the side of the train uncouples each car, just before it reaches the crest. In a pit beneath the track an observer sits, looking up at the wheels and bottoms of the cars as they pass over him to make sure everything is all right. If he sees anything that needs to be repaired he squirts a gob of whitewash on the wheels of that car to indicate it needs some repair work; he also telephones the repair crews if it is important enough.

As each car, already uncoupled, comes over the top of the hill and hits the downgrade it starts to coast rapidly away from the rest of the train. Switchmen in towers flip little levers that guide it onto any one of nearly 56 different tracks; in all there are 169 miles of track in this single freightyard! The towermen also operate big electropneumatic brakes, known as retarders, that grip the wheels of each car in a sort of two-rail vise to keep it at the proper speed.

From the high offices we can see the long train moving across the hill on one side of us, and in the other direction as many as eight or more freight cars, singly or in twos or threes, all coasting away at once onto the spider-web of many tracks where particular trains are being added up, car by car. It is a miracle!

How do the tower-men know which track to switch each car onto? We'll get to that in a moment; but first let's take a trip to the icing-platforms and grain-elevators. They will tell us still more of this great competitive race that all the railroads are in to serve their customers more and more adequately.

The "icing dock" is long enough to accommodate

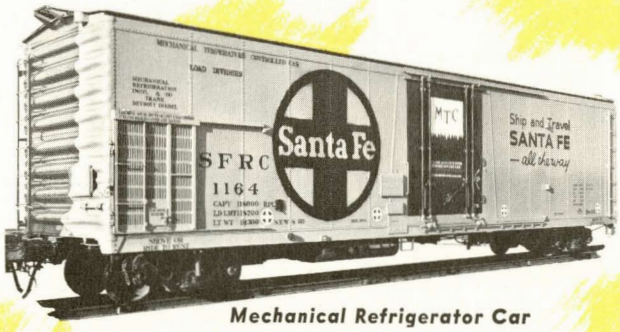
100 big refrigerator cars at one time. Here they come —a long string of yellow Santa Fe cars direct from California, full of perishable fruit. A great steel "icing machine," as high as a two-story house, runs along tracks beside the freight-train. We can climb up steel ladders to the very top deck of this, where there is a little office fitted up with levers and two-way radio for the operator. Big 300-pound cakes of ice trundle along beside the track on an endless chain, coming from a large building, where they are frozen and stored, half a mile away. The machine tips them over onto a conveyor-belt that hoists them up to the crushing machinery, where they are broken up and pushed onto a chute that drops them into the ice-compartments at the ends of each yellow car. One minute for icing each car, 60 cars iced every hour!

Besides the big crusher there is a smaller one that makes "snow ice," that is sprayed like snow through a hose directly onto cargoes that need this sort of treatment. More modern magic!

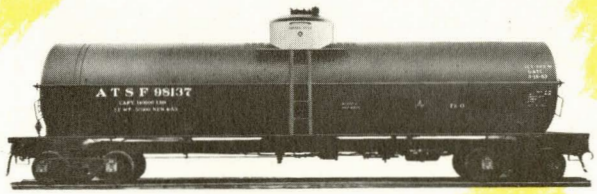
As time marches on, so railroad progress continues its steady pace toward improved service.

Ice and salt refrigerator cars so important in early days of transportation of perishables, continue, with their many improvements in insulation, air circulating devices, etc., to be the backbone of perishable transport. With the advent of frozen foods, citrus juice concentrates and other commodities requiring low temperature refrigeration, the limits of ice and salt have been exceeded as a refrigerant.

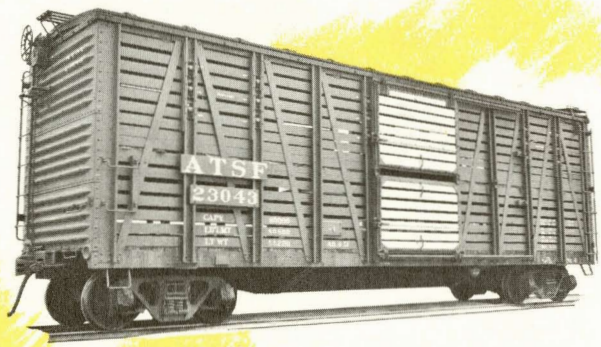
The Santa Fe immediately following World War II began its planning to meet this need. Its new mechanical refrigerated cars maintaining temperature levels below freezing are now in service.



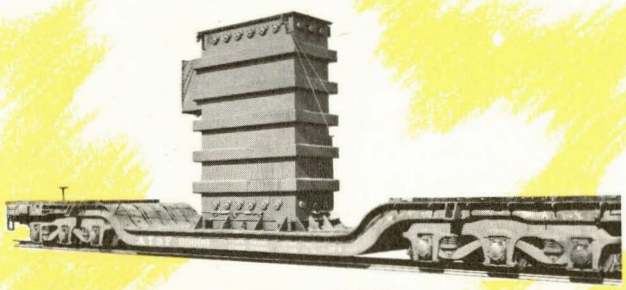
Mechanical Refrigerator Car



16,000 Gallon Tank Car



Double-Deck Stock Car



Well-type Flat Car

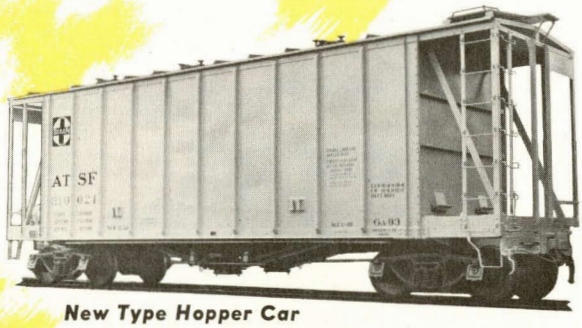
"Shock-Control" Box Car

At the mammoth grain elevators, where hundreds of thousands of bushels of wheat can be stored, we see a box-car full of wheat picked up bodily by machinery as if it were a toy, tipped first one way and then another to let the wheat pour out by gravity, to be hustled by conveyor-belt to the great storage bins.

Now let's see where some of the different kinds of railroad freight that comes to the Argentine retarder yard start, and how they are handled.

At Los Angeles, we'll say, we can watch cars being loaded and assembled at the First Street freight yard. The freight warehouse there is 60 feet wide and 840 feet long. "LCL" freight, which means freight in "Less than Carload Lots," comes to the platforms in 20 or 30 good-looking Santa Fe trucks, that whisk it up from the cargo-ships at tide-water, and from other nearby points. Each shipment, big or little, is listed, with details telling just where it is to go, and the number of the car in which it is to be loaded and shipped. Fast little self-propelled motor trucks and "fork-lifts" lift the boxes up bodily and trundle them rapidly to the long platforms where strings of empty cars are waiting to receive them; one car is perhaps bound for Galveston and another for Chicago, or for some connection point where it will be turned over to another railroad to complete its journey.

All through the freight house orders can be given



New Type Hopper Car

Santa Fe Gondola Car

Radio Equipped Caboose for The Crew

or questions asked through public-address loud-speakers, that keep everyone in touch with the offices at all times. Two-way radios in all the switch-engines tell the engineers when cars are loaded and ready to be pulled out and assembled in this train or that. Train crews are called and locomotives of the proper size and power roll out as soon as the whole train is ready, whether she's a long transcontinental or merely a local, and off she goes!

Each car has a "waybill" that tells exactly what is being shipped in it, and the whole train has also a "consist" giving the number of all the cars, the order in which they are arranged on the train, their type, weight, loads and destinations.

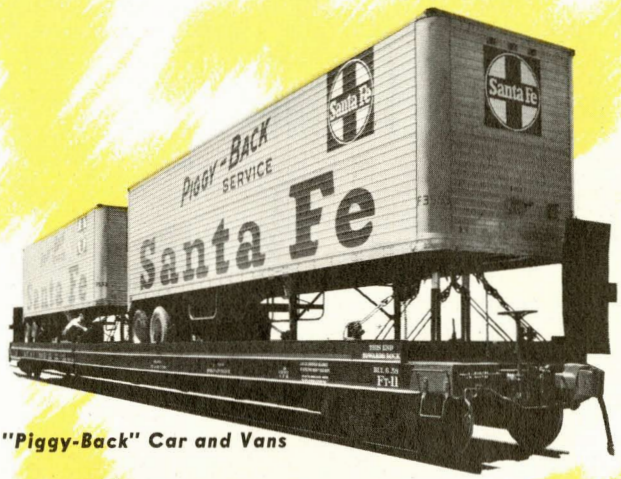
Through the waybills and consists the railroad knows exactly where each shipment and each car is at all times, and can keep shippers informed as to where their carload shipments are, when they will arrive. The consists, also, telegraphed ahead to great freight-yards like the one at Argentine, let the Yardmasters know ahead of time exactly how each freight train is made up, and the order in which the cars are placed. That is how, as each car of a long train is shoved over the hill, the Yardmaster and the towermen know onto which one of the many tracks to let it roll.

There are more than nine hundred switches in that one tremendous yard at Argentine. A mile-long train of a hundred or more cars can be handled and resorted in less than half an hour, with only a single engine, aided by the force of gravity, turning the trick. (Of course there are plenty of other engines on hand, too, for a lot of other work.) As many as three thousand incoming cars have been handled in this yard in a single day.

To do such a job an amazing amount of complicated equipment is necessary. The Argentine yard has nearly four miles of 5½ inch pneumatic tubing in which waybills can be sent from the incoming trains to the proper offices, and so on. There is an additional 3000 feet of 3-inch pneumatic tubing. There is a constant clacking of teletype machines in the offices, as consists come in from trains five or six hundred miles away, hours before they are due at the yard.

All of this, remember, is to make Santa Fe freight-handling, in cooperation with other roads, more efficient. The tremendous outlays of money involved all have to be carefully and scientifically planned so that in the long run they will mean lower cost of operation as well as improvement in service.

Six different radio channels are used at the Argentine yard for communications, in addition to the loud-speakers that are located wherever they may be needed; one of these radio channels is used by the Yardmaster in talking with switch engines, one by the operator to talk to trains, a third radio channel is used for walkie-talkies carried by car checkers in the receiving yards, the fourth channel is used to control humping operations, and the remaining two channels are used to provide a car inspectors' system for communication between car inspectors, car inspectors and car foremen and the Yardmaster.



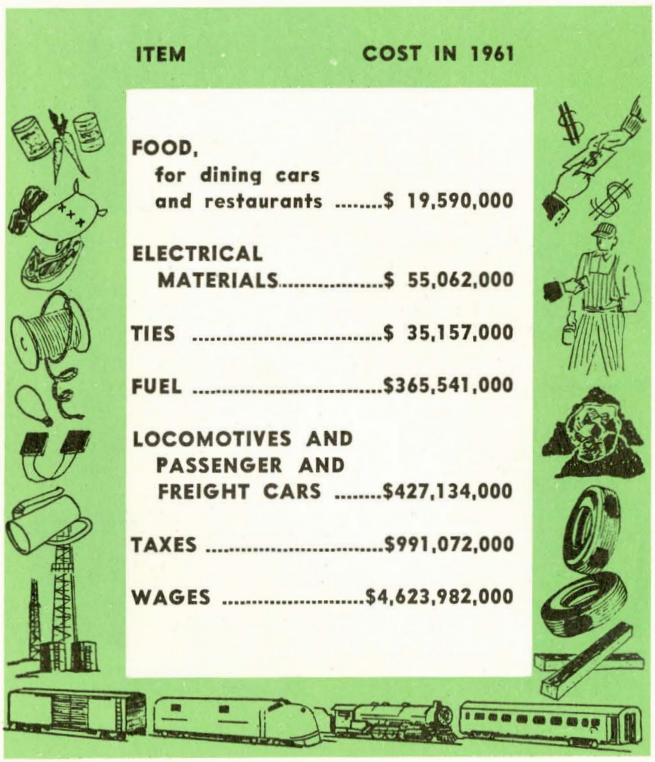
"Piggy-Back" Car and Vans

Tri-level "Autoveyor"

RAILROADS— YOUR PARTNERS IN PROSPERITY

Whenever you buy a pair of shoes, or anything else, you help along "Economic prosperity." The price you pay for the shoes adds that much to what the storekeeper takes in for the year. Part of his total may go to clerks; part may be paid in rent, and for light and heat; the biggest part of all is passed along to shoe manufacturers, who in turn buy leather, hire workmen, and pass the money along still further. Taken together, all the purchases that are made in the whole country, like the purchase of your shoes, add up to the great volume of business that makes us the most advanced and prosperous and powerful country in the world.

So you can see how tremendously important the really enormous purchasers of materials, and employers of labor, are. And railroads are among the biggest customers of all. They have to buy furniture for hundreds of offices, food for millions of meals in dining cars, big machines for their shops that cost many thousands of dollars, tractors and tea-cups and typewriters. They spend nearly $67,000,000 a year for spikes and bolts and other track-fastenings alone!



The Santa Fe has a building in Topeka, Kansas, that covers a large section of a block; about 1500 bookkeepers and clerks and accountants and other workers are employed there. At several points along the Santa Fe lines, the company occupies large buildings like this one at Topeka. Many contain huge rooms full of big storage batteries and other electrical equipment, to provide reserve power for a "Traffic Control System" that can operate track switches—each one of which has to have its own electric motor—on more than 300 miles of railroad.

Each year railroads distribute many millions of timetables to passengers. Stationery, printing costs for timetables and items of this type add up to over $30,000,000 a year. Railroads spend over $50,000,000 each year for electrical materials alone.

There are thousands upon thousands of offices occupied by railroads: think of the desks and waste-baskets and brooms and tables and chairs! Think of the mattresses for cabooses, and water-buckets, and oil-cans! Think of the glass and paint and stains and grease! Items like that add up to $200,000,000 a year.

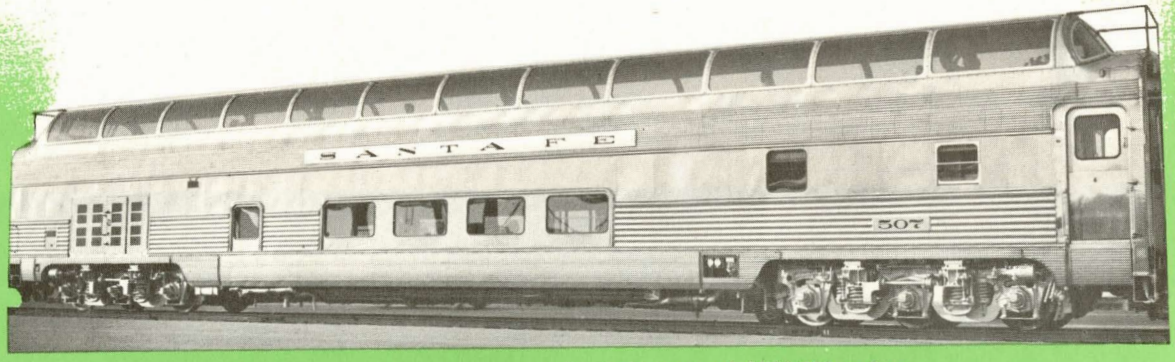
Then there are the freight cars costing an average of $10,000 apiece, and passenger cars which may cost as much as an average of $150,000 apiece, that have to be bought. A single Diesel unit may cost approximately $250,000, and a locomotive may consist of from four to six units. The Santa Fe owns its own big tugboats and lighters, at San Francisco. Anybody who has bought supplies for even a row-boat knows how much that means!

Railroad ties and other lumber take up almost *one tenth of all the timber that is cut, or shipped into the country*. More than fifteen million dollars a year is spent for ballast.

A five year average shows the railroads pay more than $390,000,000 per year for fuel. All in all, railroad purchases for the year 1961 totaled $1,262,220,000. Nearly a billion is paid in taxes. Think how many schools and school children that can take care of! For labor railroads have spent more than five billion dollars in a single year.

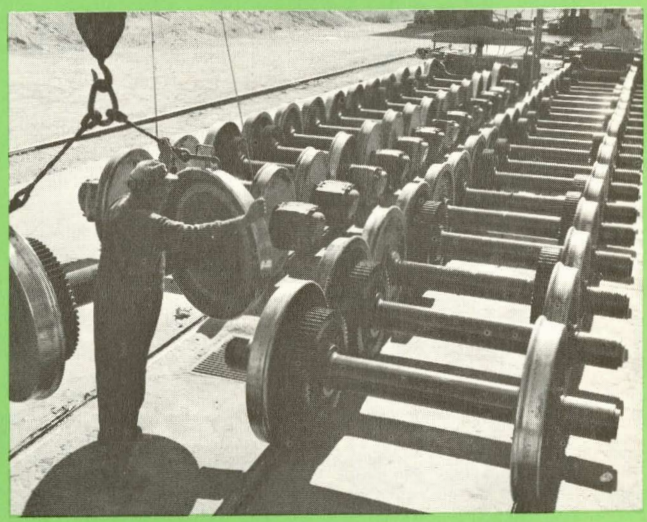
Now look at your own shoes again. It all adds up. Railroads are your big partners in prosperity.

Here at the left is a list of some of the things that railroads have to buy each year.



Railroad passenger cars may cost an average of $150,000 apiece, but a car like this "Hi-Level" dome lounge would cost more.

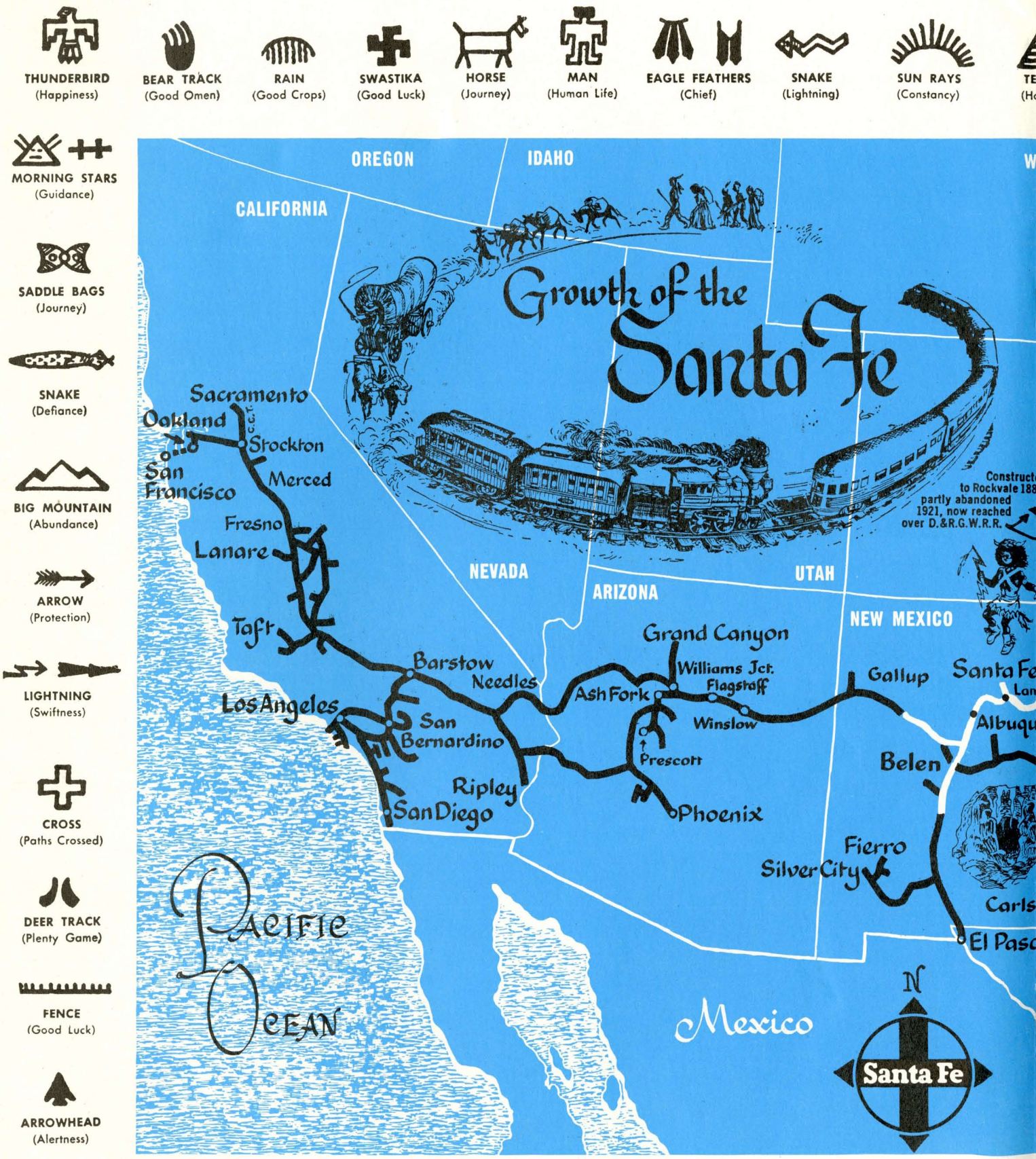
"Towveyor" system in a new Santa Fe freight house.



Every year railroads need thousands of new car wheels and axles. Here are just a few for Diesel locomotives.

Rooms full of big storage batteries provide reserve power for "Traffic Control System."

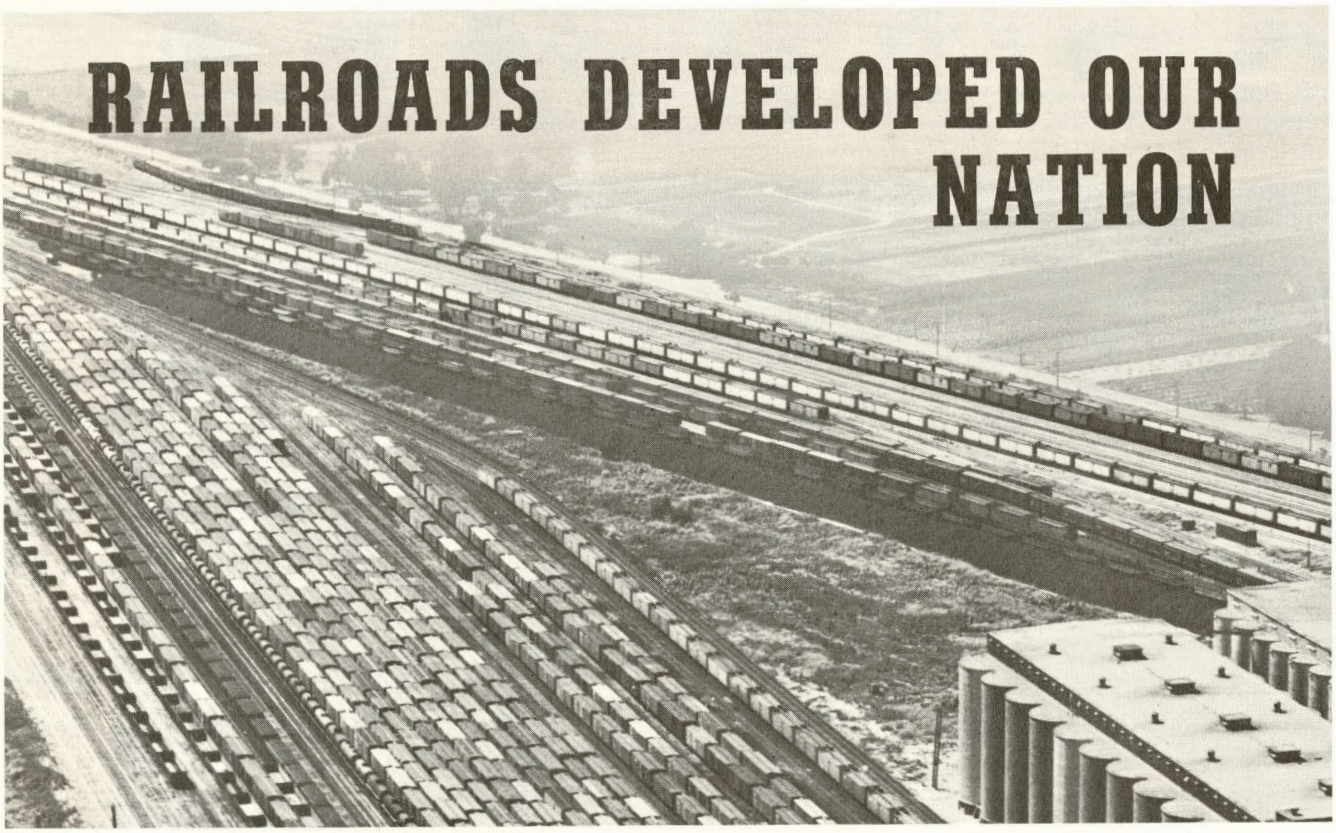
Materials on a platform at San Bernardino, Calif., for one of the Santa Fe storehouses.



This map shows how American railroads grew from small beginnings into the enormous transportation systems that we know today. The white lines show what the Santa Fe had grown to be in 1880 when it ran from Atchison and Kansas City to a little beyond Santa Fe. Compare that with the

tremendous net work, shown by all the lines, that now reaches from the Great Lakes to the Pacific Ocean and the Gulf of Mexico. Around the border of the map are small drawings used by Indians when they occasionally sent "written" messages. Whole letters can be written with them.

RAILROADS DEVELOPED OUR NATION



Wheat harvest time is a busy time on the Santa Fe. Thousands of cars move the grain from the farm to storage in huge elevators.

No civilization can exist without transportation. Great stones had to be transported to build the Pyramids of Egypt. Ships were important in the development of Greece in her greatest days. The Roman Empire built famous roads. When the wheel was invented, even though for centuries it was used only on rough carts or chariots drawn by animals, civilization advanced rapidly. And railroads are the most important form of transportation the world has yet known.

Where transportation is primitive, so is civilization. With only horse-drawn transportation the city of Santa Fe remained about as it was in the days of the Spanish conquerors for nearly 300 years. In Central America some cities still lack any adequate transportation. Although they were founded before the Pilgrims landed on Plymouth Rock, they are still about the same today. For more than two centuries the American Colonies were dependent on boats; cities grew up on the Coast, or along rivers. It took three days to travel from New York to Philadelphia, 90 miles.

Modern transportation began in earnest when men placed a flanged wheel on a steel rail, and substituted steam-power for horsepower. The flanges kept the wheels on the rails. The smooth rails made bigger loads easy to haul; more and more powerful engines pulled them faster and faster.

Amount of Intercity Freight Moved in a Year By Different Forms of Transportation. (The figures given are in ton-miles; that is, each unit represents one ton of freight moved one mile. Year 1960)

TYPE OF TRANSPORTATION	TOTAL FREIGHT MOVED (TON-MILES)
RAILROADS	579 Billion
HIGHWAYS	299 Billion
PIPELINES	229 Billion
INLAND WATERWAYS (Including the Great Lakes)	223 Billion
AIRWAYS	8/10 Billion

About 300,000,000 travelers board fine American passenger trains each year.

Railroads have enabled us to jump across the entire country, joining our civilization on the east coast with our civilization on the west coast, and letting still more civilization, with its industry and culture and prosperity, grow up between. You can eat fresh California oranges and grapefruit in New York, and buy Carolina cloth in Seattle. The same books and magazines are on sale in Denver and Baltimore and Los Angeles and St. Louis and Miami and Chicago. Albuquerque and Amarillo can have just as much culture, can receive or send merchandise just as easily, as Boston or Cincinnati or New Orleans or San Diego. Railroads and railroad travel and railroad shipments have welded the whole United States into a single great unit.

Today a single great locomotive can haul more than 100 freight cars loaded with 4000 tons of freight at 50 or 60 miles an hour. That's enough cargo for a good-sized ship. To haul that much freight on a highway would require a thousand 4-ton trucks. It costs less than one and one-half cents to haul a ton a mile, on rails. On a single gallon of fuel the Santa Fe can move a ton of freight a distance of nearly 200 miles.

As the railroads have grown and developed, both industry and agriculture have grown and developed with them. In this country there are thousands of trains moving every day. In a day 80,000 freight cars are traveling on Santa Fe. Every year passenger and freight trains on American railroads travel approximately 650 million miles. Those are amazing figures. Nearly 750,000 workers, including thousands of women, are needed to make them possible.

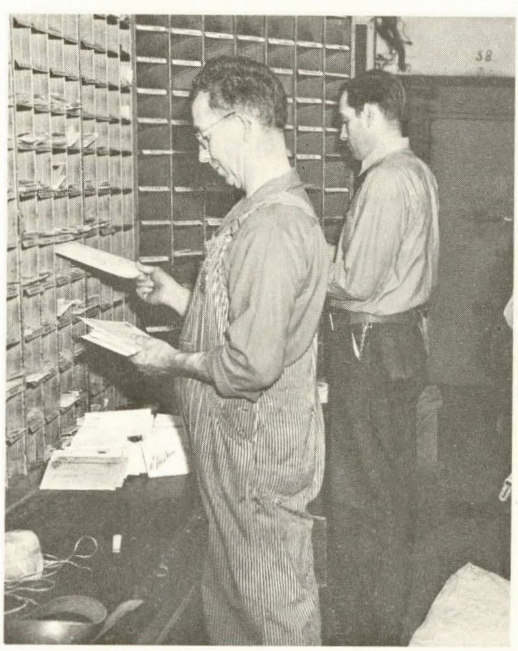
During 1960, the Santa Fe hauled enough wheat to supply the nation's bread requirements for 13½ months; cement to build 834 miles of 4-lane highway; potatoes to supply greater New York for a year; steel to build 33 mighty Mackinac Bridges—plus nearly 4 *million* head of livestock and enough petroleum to drive your car around the world 900,000 times.

On the preceding page is a table showing the different amounts of freight moved in this country in different ways.

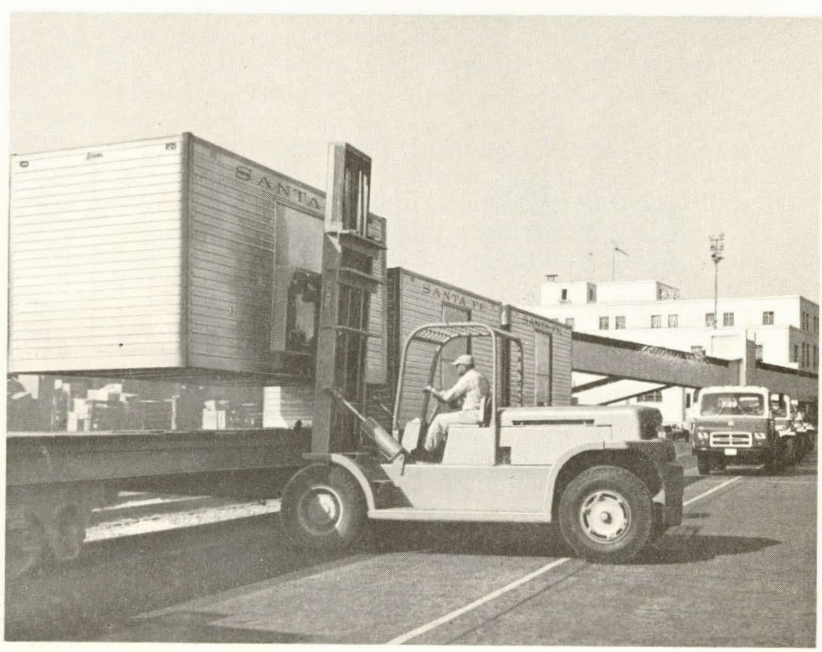
Answers to Questions on Inside Back Cover

Early Days: 1, d; 2, c; 3, a; 4, c.
Railroad Costs: 1, a; 2, d; 3, d; 4, e.
The Size of Railroads: 1, d; 2, e; 3, c.
The Santa Fe: 1, b; 2, c; 3, b.
Railroads for Defense: 1, e; 2, e; 3, d.
Science and Research: 1, b; 2, b; 3, d.

Railway Post Office cars for picking up, sorting and distributing mail en route, are really post offices on wheels.



Containerized handling of mail is a recent development. Loaded containers, moving on special flat cars in passenger trains, are trucked from main terminal to outlying Post Offices.



Detailed chemical and engineering tests are made on the soil along the right-of-way before a railroad is built.

SCIENCE *on the* FAST TRACK

Have you ever heard of a tie remover? Or a tie inserter? Or a multiple tamper? Or a grouting machine, Or a ballast cleaner? Or a leveling wing?

These are only a few of the modern devices science has put in the hands of railroad men just for maintaining the firm, smooth track and roadbed over which your 90-miles-an-hour passenger flyer, or long freight train speeds away the miles so quietly and steadily.

Each year more than a thousand research engineers and scientists are steadily at work, inventing and adapting and developing new scientific knowledge and machines for railroad use. Under our great "best service to the public" competition that free enterprise necessitates, failure to keep up with science means letting the other fellow get ahead of you, and business begins to fall off.

Take the tie remover and tie inserter, for instance. Formerly a whole gang had to get to work when rotted or weakened railroad crossties had to be replaced, to dig away the ballast or surfacing material around them, pry them loose and pound them out, then put in new ties and bed them down again.

"But why not," someone asked, "use hydraulic power to do that?" So they did. Almost as simple as a hydraulic jack, which in effect is what it is. Instead of a hand-lever, a small motor gives still more power. The hydraulic pressure applied to the tie forces it right out from under the rails, and another small hydraulic powered machine then follows to push the new tie into its place. One man, running each of the small machines, can accomplish in a few seconds what formerly took many minutes with half a dozen men. The old-time "gandy dancer" and his spike hammer has given way to a modern spike driving machine that can drive hundreds of spikes an hour.

A "multiple tamper" does still more work. One type runs by electricity, almost after the manner of a giant vibrator. Long crab-like steel claws dig deeply into the ballast and pack it firmly into place. Another type operates by compressed air with steel hammers pounding the crushed slag or rock ballast along the railroad track into place to give the track those easy-riding qualities demanded by modern high-speed operation.

"Grouting" consists of forcing a watered mixture of cement and sand into the roadbed under the ballast, which helps to prevent settlement resulting from rain water soaking the earth embankment. The forcing is

done by hydraulic pressure through pipes driven through the ballast. Santa Fe is a leader in grouting operations.

If the crushed rock on a roadbed is kept fairly clean and free of dirt, it drains better, stays level longer, and is relatively dustless. (Years ago, in dry weather, the air in passenger cars was often full of dust; it is not so now.) So a huge "Ballast Cleaner" now moves along a railroad track, ploughing up the crushed rock, lifting it into the machine on endless conveyor belts, screening it, and then pouring it smoothly down onto the road bed again. Other great "ballast drainage cars", so named because they shape the crushed rock so that it will drain properly, now carry "levelling wings" that take care of the space between double tracks.

Welded rail is taking the "clickety clack" out of modern railroad tracks. Rail is welded into quarter-mile lengths to provide a smoother ride with much less track noise and greatly decreased maintenance costs. The Santa Fe has already installed approximately 1,400 miles of continuously welded rail and hundreds of miles are being added each year.

But all the improved right-of-way work, with far more new scientific machines than can even be listed here, is only one small portion of the scientific advances railroads are making.

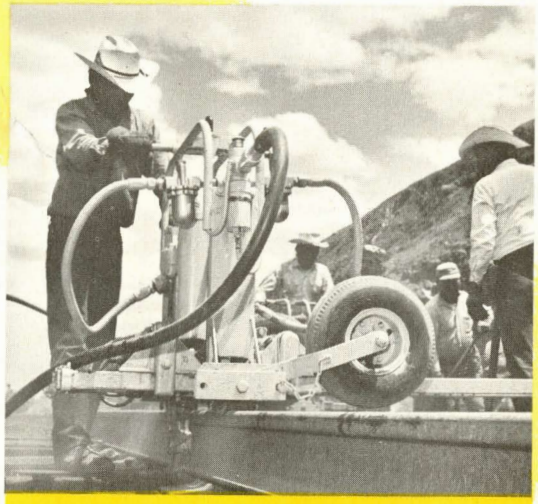
To get the maximum volume of traffic out of any set conditions of roadway, it is necessary to employ the most improved means of train control. Railroads spent more than $2,000,000 in research to perfect a single type of brake. You probably never heard of it, and few people ever read about it—but today it helps thousands of trains stop even more smoothly than before.

These efficient air brakes, which operate on every car and locomotive wheel in the train, are essential to the safe operation of railroad trains outside of trainyard limits. In addition, Diesel locomotives are equipped with *dynamic brakes,* which act somewhat like the motor of a truck in low gear does as it goes down a steep hill. These dynamic brakes can hold freight trains on steep descending grades without a lot of wear on the wheels and frictional heating which might reduce the wheel life.

The element of flexibility or ability to apply any part of the total range of braking effort at the desired moment is obtainable with the modern air brake. This permits all degrees or graduations of braking effort from the very minimum needed to slow down or stop at low speeds to the very maximum needed in an emergency while running at high speeds.

The Santa Fe began experimenting with radio telephoning as early as 1915. Today engineers on long freight trains can talk back and forth with the crew in the caboose; train crews can talk to offices along the right-of way; yardmasters can talk back and forth to switch engines shunting freight cars; car checkers can call car numbers to office workers with walkie-talkies. In many freight yards there are talk-back speaker systems so that workmen can be talked to by their boss, and talk back as well, from half a mile or a mile away.

Another scientific advancement now in use on the Santa Fe is microwave communications. Today's



An example of Santa Fe's modern track maintenance equipment. This machine can drive hundreds of spikes an hour.

"Straddle Buggy" designed by Santa Fe engineers to pull quarter-mile lengths of continuously welded rail into position, when laying new track.

Rail detector car uses electronics to check the rails for possible hidden defects. It can operate on the highway or the railroad.

Using radio telephone, engineers on long freight can talk to train crew in caboose, as well as passing freight and passenger trains.

Car checkers in yards can call car numbers to office workers with walkie-talkies.

Microwave antennas tower sentinel-like atop Hill Flash 2 near Barstow, Calif.

growing demand for financial information, car reports and the huge amounts of data used by modern electronic computers made additional communications channels necessary. Existing pole lines were approaching capacity and microwave was selected as the most economical and reliable answer to this need.

Microwave, like radar, uses high frequency radio waves. Since these waves travel in a straight line, a series of special antennas which are shaped and act like the reflector in a spotlight are used. These antennas concentrate the waves into a beam and aim it at the next antenna which receives the signal, strengthens it and sends it to the next antenna where the process is repeated. When Santa Fe completes its system, which will provide 240 or more telephone channels, it will connect Chicago with Los Angeles.

The Santa Fe has over seven thousand miles of track equipped with automatic block signals which protect both passenger trains and freight trains and permit them to be operated safely at the maximum speed permitted in each district. These signals are designed on the inherently safe principle so that the "go-ahead" signal cannot be given unless the block ahead is clear of trains, all switches properly set, and other conditions safe for the train to proceed. Electric currents flowing in the rails are short-circuited by the wheels of each train as it moves along the track so that the train is constantly providing its own protection and setting the signals against other trains which might be following it or otherwise conflicting with its movement. Similar signals are used in connection with interlocking plants to control trains safely through the routes which are set up in advance by operators located at adjacent stations or at offices many miles distant.

Traffic Control System called T.C.S., goes further still by combining the functions of automatic signals and interlocking. It is one of the scientific marvels that is being extended year by year, and enables a train dispatcher in a city office building or other railroad headquarters to close and open switches, set signals, and control the movement of trains over hundreds of miles of track. The control machine in the office has a panel with a miniature diagram of the track on which indicating lights show the location of all trains as they travel along the railroad. The dispatcher operates small levers and push buttons by which he can route the trains in and out of sidings or up the main track as he desires. The Santa Fe has more than 3,100 miles of track operated by the T.C.S. system which is foolproof, and by its safety devices and electric circuits will prevent the control office from setting up any conflicting routes endangering the safety of trains.

By the use of automatic block signals and other similar devices, passenger trains can safely be speeded up to 90 miles per hour and freight trains to 60 or even more. By means of T.C.S., freight schedules can often be cut in half, and the capacity of a single-track line can be brought up to nearly 80 per cent of a double-track line.

Automatic train control, and automatic train stop systems which would stop the train if the engineer does not acknowledge a signal requiring a reduction in speed, have been installed on over 3,300 miles of Santa Fe tracks.

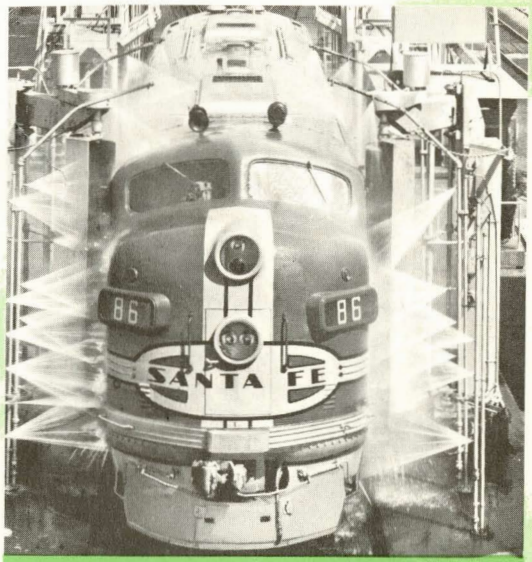
Today, in all modern passenger cars, air-conditioning is taken for granted. You ride or eat or sleep in comfort, even in stiflingly hot weather. Among the newest ideas in railroading is the Hi-Level equipment which is used on El Capitan, the Santa Fe's popular streamlined all-coach train. Reclining seats located on the upper level of this "two-story" type passenger car, a full eight feet above the noise of the rails, provide a smoother, quieter ride. The added height and the wide picture windows combine to give the passengers a better view of the passing scenery. By building the washrooms, toilets and baggage storage downstairs, the whole upper deck can be used for seats Resulting in each car having more seats and each seat having more room than on older cars. This Hi-Level equipment is just one more example of how science and engineering continually provide better service and more comfortable facilities for today's railroad passengers.

Modern machinery has replaced old methods of cleaning passenger car interiors. They are now cleaned by machines that literally create a windstorm inside the car and work much like a huge vacuum cleaner. The movable machine, nicknamed "Windjammer," has two huge fans and a wire mesh trash catcher. It is attached to one end and the other entrance is left open. As a man moves through the car dislodging refuse with an air hose, the fans pull the trash into the receptacle. This machine cleaning is so effective that carpeting which used to require washing four times a year now needs laundering only once a year. The "Windjammer" is also used to clean dust from the sensitive controls, generators and motors of Diesel locomotives.

Better and better refrigerator cars, or "reefers," as they have been named by railroaders, are being designed for transporting fruits and vegetables. The latest type, built primarily for moving frozen foods, has its own Diesel-powered Mechanical Temperature Control unit which keeps the shipment cold much the same as the refrigerator or deep freeze at home. Cars equipped with this unit are called "MTC" cars and are able to hold car temperatures at the desired level day after day. A similar unit has also been installed on truck trailers for use in moving these commodities in "Piggy Back" service.

To keep abreast of the latest accounting methods, a modern transistorized electronic computer was installed in Santa Fe's Data Processing Center at Topeka The computer is able to add or subtract 17,000 five-digit numbers in a single second. It solves, in minutes, complicated problems which took many hours using slide rules and other calculators. One ten-inch reel of magnetic tape stores the same data as about 130,000 IBM cards requiring two large file cabinets. This "electronic brain" will condense and convert huge amounts of statistical information into useful form very quickly. Just one more example of how science helps keep Santa Fe competitive. Since World War II, American railroads have spent *$17 billion* to improve their property.

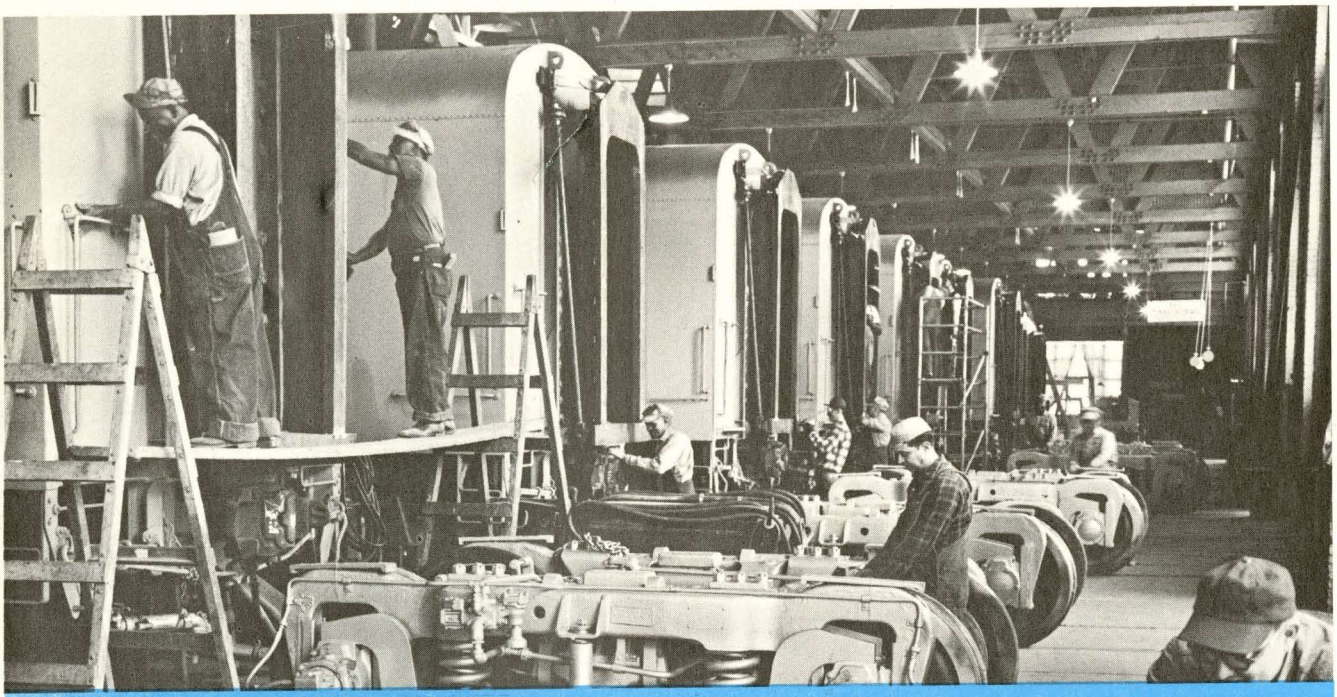
Safety, Speed, Comfort, and Economy. Remember those four words. They are increased, year after year, by innumerable scientific advances in railroading, necessitated by competition in our American system of Free Enterprise.



A huge machine with revolving brushes and squirting water washes whole trains that pass slowly through it.

The "Windjammer" cleans the interior of passenger cars like a king-sized vacuum sweeper.

A modern transistorized electronic computer is the "brain" of Santa Fe's Data Processing Center at Topeka.



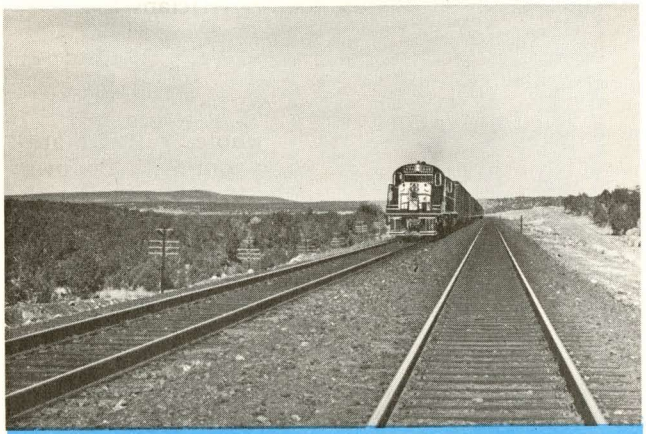
New semi-lightweight baggage cars are assembled at the Santa Fe's Topeka Shops. Railroads require huge facilities for building and overhauling all types of rolling stock.

IF YOU HAD YOUR OWN RAILROAD

Would you like to own and run a railroad?

Suppose you wanted to start one of your own. How would you go about it? Even the greatest railways in the country today, like the Santa Fe, had to have a beginning. Often it was just one man, like Cyrus Holliday, who had the first idea and made a start.

It is not as simple as merely buying land, laying tracks and getting a few trains. First of all you have to decide: Will it be *useful?* Will it be able to make a living, like a human being? Will enough people pay to ride on it, or pay to have freight carried by it?



Tracks are ballasted with crushed rock, slag or volcanic cinders to keep roadbeds smooth and strong and level.

In America we have what is called the system of "Free Enterprise," which means that almost anyone can start a business. It also means that in any business likely to be profitable there will be competition. Only the best will succeed. Each railroad will have to earn a profit, or show a loss. Your railroad will have to be so well run, so useful and well liked, that it can make money instead of going bankrupt.

You have to decide where your railroad will run. It may be between two new cities that are growing rapidly. It may be still more ambitious, as much of the Santa Fe construction has been: from a city or thickly populated area into new, open country, that will fill in, partly because of the railroad, and grow up with the railroad, and *presently* have passengers and freight enough to make it profitable.

Next you have to get the permission of the Interstate Commerce Commission to build your railroad where you want it. Freight and passenger transportation is so important that the government regulates railroad services and routes, and rates.

If the Commission decides that your plan is a good one, that the railroad you propose to build will be of real value to the cities and districts you plan to serve, it can give you the right to start in.

You have to incorporate your company. You do it in the state where your principal offices are located. Until you have your incorporation papers, which have to be looked over to make sure you are really sincere in your plans to build a railway, you can't sell stock or bonds to raise the money you need to start your road. It may take millions of dollars.

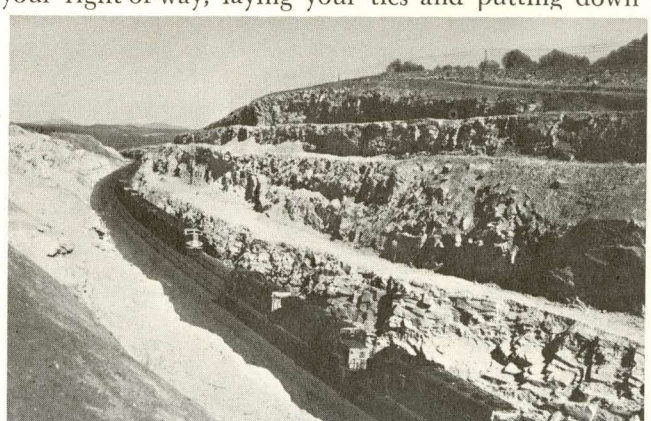
Nowadays your stock selling would probably be arranged through a single investment firm or a group of "underwriters" who agree to purchase the entire issue for a stipulated price. They will then expect to earn a commission of a few cents on the dollar in reoffering the shares for sale to the investing public.

When enough money has come in you send out surveyors to locate and mark your right of way. They have to select the route which will be the least expensive to construct and operate. For example, they avoid as many hills as possible; you are not building a roller-coaster! Every hill means either a deep and expensive cut, or a grade that because of the extra power required to haul freight and passenger trains over it will for years give an advantage to your competitor with a more level road. On the other hand too many curves and detours may give your competitor an advantage because his road is shorter. The decisions are not easy. All along your surveyors and other employees, because of the certainty of tough American competition, have to use good judgment.

Next the land along the right-of-way selected has to be bought. One man may not want to sell; another may ask an unreasonable price. In either case you have to begin legal procedures; law courts will compel the owners to sell at a reasonable price, just as they will order you to pay a reasonable price for the property. That is because the right-of-way for your railroad, since it is going to serve and benefit thousands of people, is more important than the property-rights of any one person along the line.

Now your engineers have to determine each particular grade. They may decide to tunnel through hills that cannot be avoided. Rivers may have to be bridged. Long fills may be made across stretches of low land. In other places trestles may have to be built. All the time there is that ceaseless need for good judgment, for balancing a greater expense now against a lower cost of operation later on; your surveyors are continually matching their good sense and knowledge against that of your present or future competition. You have to be good!

When the Santa Fe was built picks and shovels were the most important tools. Horses and mules pulled scoops and graders. Today costly bulldozers, power-shovels, scrapers, modern explosives and other elaborate machinery hurry along the work of levelling off your right-of-way, laying your ties and putting down



Deep expensive cuts, like this one on the Santa Fe, must be made to avoid steep hills and sharp curves.

When railroads "go to sea." A big Santa Fe tug pushing freight cars across San Francisco Bay.

the heavy steel rails. Behind the track-layers come trainloads of additional ties, rails, and crushed rock to be spread along the road-bed and beneath the ties.

You have to build freight and passenger stations. In big cities your great depots may have lunch-rooms, telephone booths, barber shops, shoe-shine stands, telegraph offices, news-stands, drug-stores and other shops as well as the necessary ticket-offices, baggage rooms, waiting rooms, and information booths. Your large freight depots will have hundreds of feet of loading-platforms; mechanical "fork-lifts" and tiny trucks; all sorts of modern freight handling machines; traveling cranes that can lift immense weights from one open car to another.

You will need millions of dollars worth of "rolling stock"—freight and passenger engines, passenger cars, thousands of freight cars, switch engines to hurry cars into their proper order as trains are made up.

You will need great freight warehouses, grain elevators, coal yards, shops for light repair work and large machine shops for heavy repairs.

Every one of these things requires careful account-keeping. Remember those competitors of yours; you can't afford to waste a dollar! So you have to have big office buildings, too, with hundreds of clerks and accountants, and modern computers.

It takes a whole army of workers to run your railroad—cooks and carpenters and electricians and mechanics and painters and even doctors and lawyers, as well as the track-walkers and section-gangs and engineers and switchmen and brakemen and conductors and yardmasters you may think of first.

Imagine looking down at the whole United States from miles high in the air. There is your railroad down there, just a little part of a shining steel spider web of more than 380,000 miles of tracks! Thousands of trains moving at once! Thousands and thousands of men, each doing his particular job to keep them all moving. Teamwork on a gigantic scale, developed by equally good team-work competing with it, like Big-league baseball teams trying to win the pennant.

Railroad presidents and officers, like yourself, are responsible to their employees and their stockholders, and to the shippers and passengers who are their customers, and whose approval and patronage alone can keep them in business. It is all part of the Competitive System that has made American railroads the most efficient form of transportation devised by man.

Like men in the army, railroad workers have a lot of loyalty; they are part of a great organization.

"WORKIN' ON THE RAILROAD"

Railroading offers many job-possibilities to boys and girls who are wondering what to make their life-work. There are opportunities for alert, intelligent, and ambitious young people willing to work hard to master the jobs they are assigned. Almost every trade or profession is represented among the nearly 750,000 men and women employed by the Nation's railroads.

Thousands of young men and women start with the railroads each year. Some drop out, perhaps because they feel that advancement is not fast enough; they might feel that same way in any field. Others rise gradually, and live contentedly. Still others through a combination of ability and hard work rise to high positions.

All work on the railroad is vital and exacting. Railroaders realize that delays in service may cause serious losses to shippers and receivers of freight. They know that the nation would be paralyzed by even a brief interruption of rail service. Whether they are engaged in train operation, track repair or any other railroad occupation, they recognize and learn to live with this responsibility.

"Piggy back" is the name given movement of trailers on flatcars.

There is no room in railroading for the careless, temperamental, or indifferent worker. The need is for accurate, reliable, well-trained, efficient employes to meet the exacting demands of safe, uninterrupted railroad operation.

Railroad families live in towns and cities throughout the country, wherever railroads operate. As respected residents, they own homes, send their children to local schools, and are active in the civic and religious life of the community.

One thing that railroad workers enjoy, whether they are at the top or the bottom of the ladder, is that of *belonging*. A sense of loyalty to a big organization is a great thing. It seems to be stronger among railroad men than almost anywhere else. On leading Western railways like the Santa Fe it is particularly strong. Friendliness is a railroad tradition.

We can take a look at some of the widely different things that railway workers do.

Here is a freight handler driving a fast little "fork-lift." He comes up to a pile of boxes placed on a pallet, a little crate-like platform on the floor. Pulling a lever, he sends flat metal arms something like the prongs of a strong pitchfork into the pallet under the pile, and up comes the whole thing, pallet and all. Off he goes to the car-loading platform on the storage warehouse

and makes his trained machine set the whole load down again, still on its little platform-pallet. His job takes a lot of skill.

Here is an electrician rewinding the armature of one of the big generators for a Diesel-electric locomotive.

Here is a deck-hand on a 150-foot tugboat, handling the heavy rope-cables that fasten the tug to a railroad barge with a load of 12 or 14 freight cars it is pushing across San Francisco Bay.

Here is a telegraph lineman working on the long private communication wires of a railroad.

Here is a freight-agent in a small western town, known and liked by nearly all his fellow townsmen who bring him goods for shipment.

Here are accountants, detectives, jewelers in charge of watch-repair for trainmen, stock-handlers, crane-operators, welders, magazine editors getting out house-organs, car-washers, surveyors, chemists, appraisers, painters, and hundreds of others.

Resourcefulness, energy, friendliness, and persistence rate a man high for railroad work. Beyond that, it comes to what a person *likes*. A railroad president who began at $60 a month, writes:

"It is easy to do what one likes to do. A man who enjoys his work achieves more success than do less happy workers."

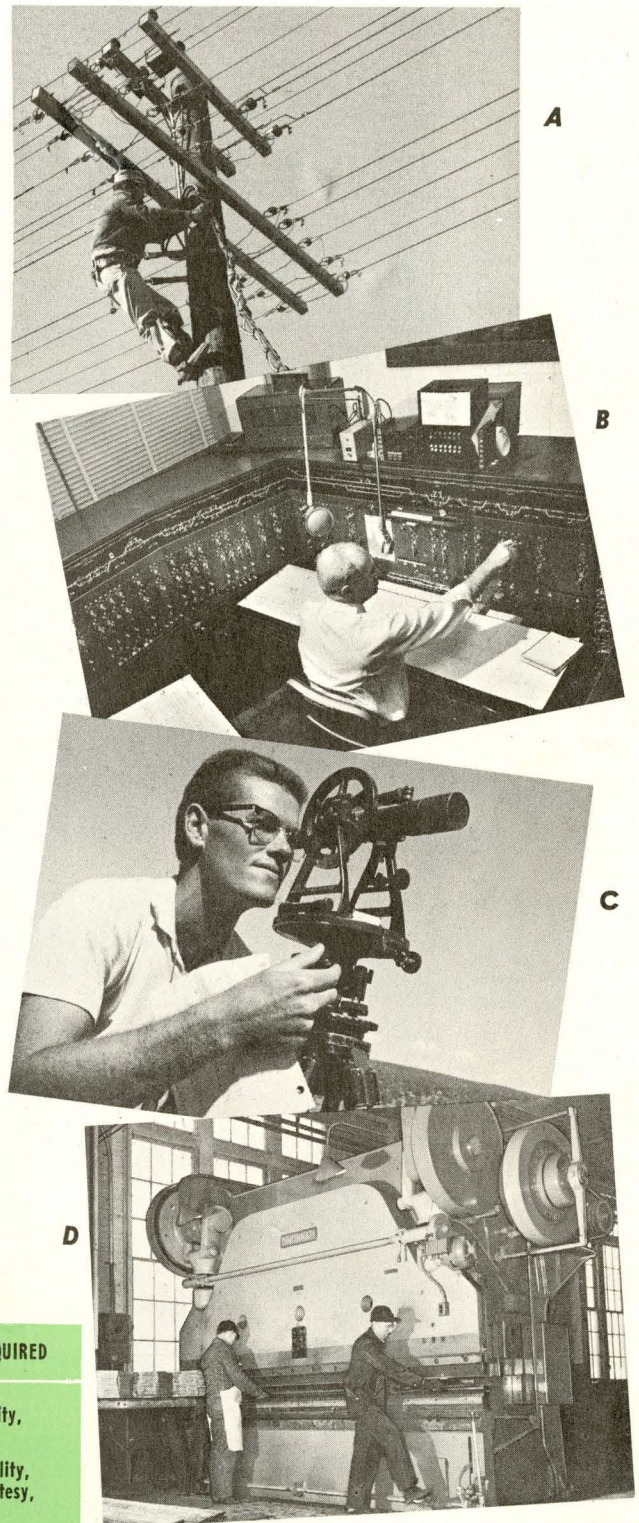
Almost every top railroad executive worked his way up from a very humble position. He may have started as a clerk, or a trainman, or a telegrapher. It doesn't matter. Because he had the ability and the stamina, the staying-quality, he went on up.

There are many jobs for youngsters seeking employment with the railroads. In the maintenance of way department the beginner's job is usually that of track apprentice. In the mechanical branch, as an apprentice or helper in shop work. In signaling, a beginner starts as a helper in signal construction; in locomotive maintenance work, as a machinist's helper or an electrician's apprentice; in a railway office, as office boy or messenger. There are other jobs for beginners in storehouses and freight warehouses.

The Santa Fe trains many young men. They are steered toward the particular kind of work that they seem best fitted for. They may become carmen, sheet metal workers, gang foremen, machinists.

Here's a table showing some of the jobs available in the railroad industry and the qualities they call for:

KIND OF EMPLOYMENT	NUMBER	YEARLY WAGE RANGE	QUALITIES REQUIRED
Maintenance of Way (Carpenters, Section Hands, etc.)	105,000	$4200 to $5700	Strength, Dexterity, Responsibility.
Clerks, Typists, etc.	150,000	$4300 to $7000	Mathematical Ability, Accuracy, Courtesy, Responsibility.
Shopmen, Mechanics, etc.	165,000	$4500 to $5700	Mechanical Ability, Responsibility.
Signalmen, Telegraphers, Truckers, Agents, etc.	80,000	$5400 to $6000	Accuracy, Alertness, Responsibility.
Train Dispatchers, Yard-masters, etc.	11,000	$5800 to $7100	Resourcefulness, Alertness, Responsibility.
Train Crews (Engineers, Conductors, Brakemen, etc.)	185,000	$6200 to $10,500	Skill, Responsibility, Friendliness, Courtesy.



A A lineman works high in the air on railroad telegraph and telephone lines.

B "Traffic Control System" dispatcher controls trains on many miles of track.

C A surveyor uses a transit to check the route and grade of a section of track.

D Shop employees operate a huge machine to cut and bend sheet metal for use in building cars.

TRAVEL is a GOOD TEACHER

We first learned how pleasant travel on a modern Santa Fe streamliner can be.

Food and service in the dining car are as good as in the finest cafes.

One day we had lunch brought right to our room instead of eating in the diner.

the Chief Way

DEAR CLASSMATES

REMEMBER WHEN OUR TEACHER TOLD US WE COULD LEARN FROM TRAVEL? BOY, WAS SHE EVER RIGHT! THE TRAIN WAS REALLY SOMETHING, JUST LIKE A BIG HOTEL ON WHEELS. EVERY ONE ON THE SANTA FE WAS REAL FRIENDLY. MOM SAID THE WHOLE TRAIN CREW WAS HELPFUL. EVEN SHE WAS SURPRISED AT HOW EASY IT IS TO ARRANGE SIDE TRIPS ON THE RAILROAD.

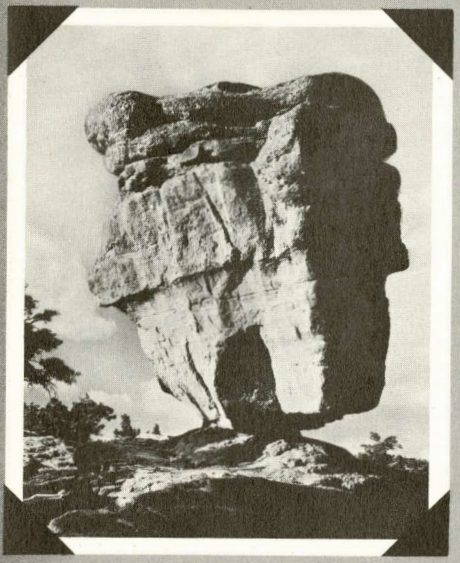
THERE IS SO MUCH TO SEE AND DO THAT I CAN'T TAKE TIME TO WRITE ALL ABOUT IT IN A LETTER. I WILL TELL YOU EVERYTHING WHEN I GET BACK HOME NEXT MONTH. I AM SENDING SOME PAGES OF PICTURES FROM MY ALBUM SO THAT YOU CAN ENJOY MY VACATION TRIP WITH ME

YOUR FRIEND
DONNA

P.S. MOM HELPED WITH THE LETTER AND ALBUM.

Super Chief • The Chief • San Francisco Chief • Texas Chief • Kansas City Chief • El Capitan

Roomy beds pull right out of the wall and ceiling.



Famous Balanced Rock, Garden of The Gods, Colorado.

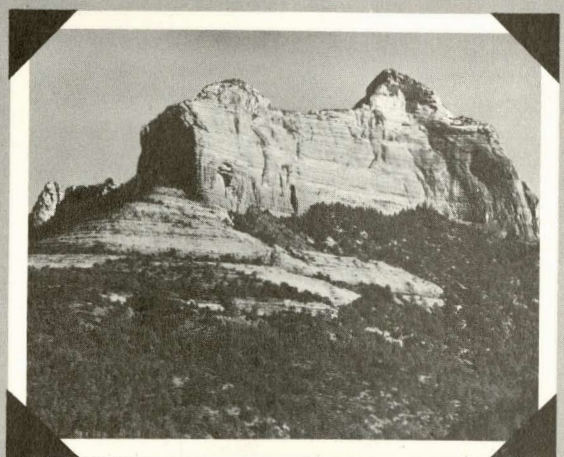
Stalagmites and stalactites in the Carlsbad Caverns.

Pike's Peak Cog Railway reaches 14,110 feet above sea level.

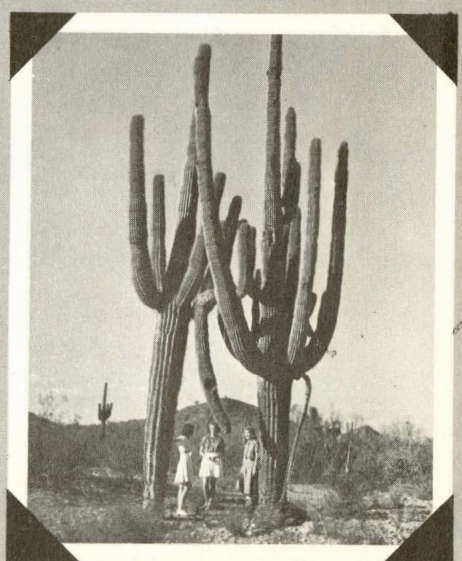
People ride sure-footed mules to the bottom of gorgeous Grand Canyon.

Navajo women are good basket weavers.

An Indian cliff-dweller's castle in Arizona cliffs.

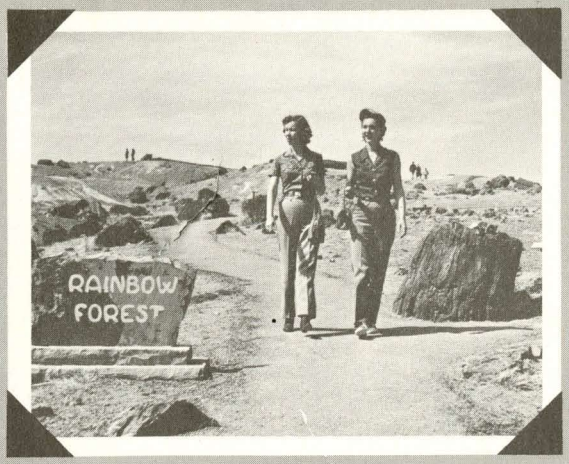


Steamboat Rock in beautiful Oak Creek Canyon in Arizona.



Arizona's Saguaro cactus grow to 60 feet tall.

Navajo women create colorful blankets on home-made looms.

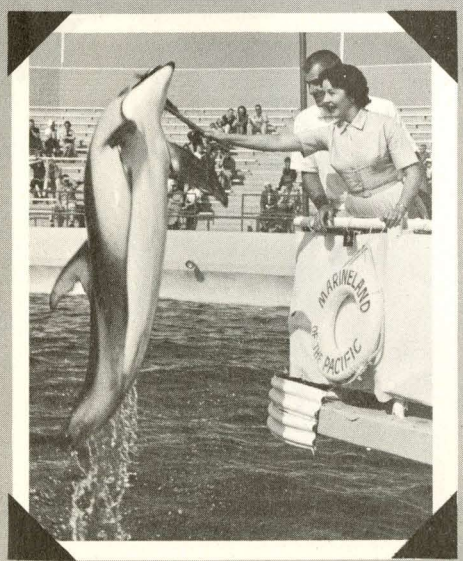


Huge boulders, which were once trees and logs are scattered throughout Petrified Forest.

Joshua Tree, typical of the vegetation of Mojave Desert.

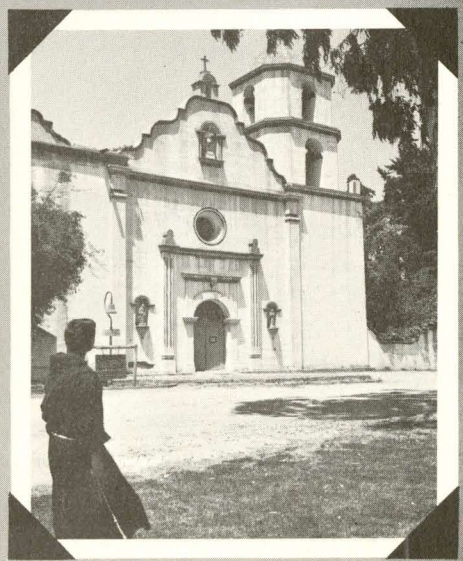
Indian dancers perform the graceful ceremonial Eagle Dance.

Travelling with pack mules in a New Mexican desert.

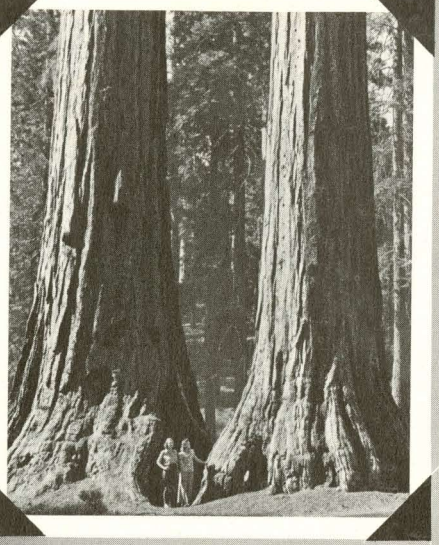


Marineland where the trained fish put on a show.

Natural "Rainbow Bridge." Size is shown by the tiny horseman.



San Luis Rey Mission near Oceanside, Cal. built in 1798.



About 200 Giant Sequoia trees grow in Yosemite Park.

Rippling sand dunes in Death Valley.

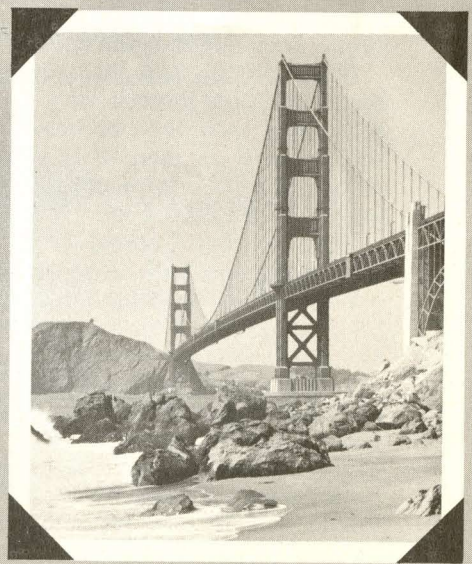
Famous Yosemite Falls in Yosemite National Park.

Seals sun themselves on Seal Rocks near the entrance to the Golden Gate.

An unusual Bactrian camel in San Diego's remarkable zoo.

San Francisco's world famous cable cars and Chinatown.

Santa Fe train and main depot are among attractions in fabulous Disneyland.



Huge Golden Gate Bridge at San Francisco.

ESSENTIAL FOR DEFENSE

U.S. Army Photos

In wartimes vast quantities of war materials and millions of soldiers are transported by the railroads.

Just as railroads are important in the development of a country, they are still more important in its defense. In any time of great need, such as war, they are absolutely necessary.

Of course, we all hope there will be no more wars. We know that if war should come, it will be so horrible that, no matter who wins, all countries that engage in it will be losers. But we also know that if we have to defend ourselves against attack, if war cannot be prevented, we must win. And if we are to do that, railroads will again have to do a tremendous job as they did in World War II. It takes *six tons* of guns, ammunition, trucks, tanks, food, tractors, tools and all kinds of equipment *per man* who is at the Front overseas. A whole shipload of tanks, ammunition, machine guns, hospital supplies, can be hauled in a single mile-long freight train!

It used to be said that whichever side "Got there firstest with the mostest men," won. But there are also those vast quantities of heavy materials, in modern war, as well as men, that have to be there too. A million tons of equipment, for a modern, mechanized army of even 10,000 men that goes overseas!

Here is what General Charles P. Gross, Chief of Transportation, U.S. Army, said during World War II:

"The railroads are essential to our nation's capacity to make war. This was proved in World War I, and has again become overwhelmingly apparent in this war. They must be sustained by the American people with full appreciation that they are vital to us and must always be prepared to go into action, to make effective the might of the United States."

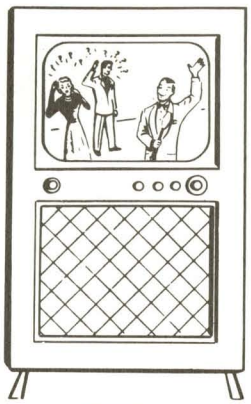
Within a year after Pearl Harbor, when we entered World War II, the railroads had moved more than 11,600,000 troops besides other millions on furlough. Within about three years and a half the number had swelled to 43,730,000 members of the armed forces, in special troop trains or special cars, in addition to millions and millions of regular passengers, including servicemen going home on leave to see the folks. The total number of troops and passengers carried in 1944 was about 910 *million!*

To move a single army division (15000 men and their equipment) even in this country means getting together and loading, in addition to 315 passenger cars, about 1800 freight cars. That is about 50 trains. Again and again, between the end of 1941 and 1945, all those trains, jam-packed with troops and their equipment were rolling on their way within 48 hours after the request or order came in.

Materials to build war plants have to be hurried to their destination. Great machines of all sorts have to be transported for factories. Steel for guns, leather for shoes, parts for planes and jeeps and trucks of all sizes, cloth for uniforms and overcoats, silk or nylon for parachutes—tons and tons of raw materials and finished products of every description have to be rushed smoothly along if the men at the front are to have even a chance of defending the country successfully and winning the war.

During World War II the railroad industry carried more than 97 per cent of all organized military traffic and more than 90 per cent of the war freight.

In the years to come, even more than in the last war the power *to produce,* which does not exist without transportation, will determine not only the winner, if war has to come, but whether or not war will come at all. If our production is great enough, if our railroads and other forms of transportation are obviously better than those of any possible antagonist, no one is likely to start a war against us.



A RAILROAD QUIZ

(Based on information in this book)

Here are some questions to see how much you know about railroads. Check the figure, after each question, that you think is the right one. For each correct answer, score yourself 5 points. Perfect for the whole page is 100.

Early Days.

1. Before railroads were built, wagon trains travelled from Mexico City to Santa Fe in about: a, 9 hours; b, 9 days; c, 9 weeks; d, 9 months; e, 9 years.
2. A pack mule could carry a load of about: a, 25 pounds; b, 100 pounds; c, 250 pounds; d, 1000 pounds; e, 5000 pounds.
3. The first Santa Fe train had a run of: a, 17 miles; b, 37 miles; c, 70 miles; d, 170 miles; e, 770 miles.
4. To build the railroad as far as Santa Fe took: a, 3 years; b, 7 years; c, 11 years; d, 15 years; e, 19 years.

Total points: 20. Your score:_____

Railroad Costs:

1. Today, railroads can haul a ton of freight a mile for an average cost of less than: a, 2 cents; b, 20 cents; c, 90 cents; d, $2; e, $5.
2. This is in spite of the fact that a single Diesel unit may cost: a, $10,000; b, $50,000; c, $100,000; d, $250,000; e, $700,000.
3. Just for steel spikes and bolts and other track fastenings they paid: a, $10,000,000; b, $20,000,000; c, $30,000,000; d, $67,000,000; e, $50,000,000.
4. And in *wages* American railroads have paid out in a single year more than: a, $500,000,000; b, $1,000,000,000; c, $2,000,000,000; d, $3,000,000,000; e, $5,000,000,000.

Total points: 20. Your score:_____

The Size of Railroads:

1. Each year the number of miles travelled by railroad trains in the United States is: a, 50,000; b, 150,000; c, 500,000; d. 650,000,000; e, 1,000,000,000.
2. The number of freight cars on United States railroads is: a, 50,000; b, 150,000; c, 500,000; d, 1,000,000; e, 2,000,000.
3. Electrical materials purchased by the railroads every year total: a, $10,000,000; b, $25,000,000; c, $50,000,000; d, $67,000,000.

Total points: 15. Your score:_____

The Santa Fe:

1. The number of head of livestock—cattle, pigs, sheep, horses, hauled each year on the Santa Fe is: a, 400,000; b, 4,000,000; c, 40,000; d, 40,000,000.
2. On a single gallon of fuel, the Santa Fe can haul a ton of freight: a, 50 miles; b, 100 miles; c, 200 miles; d, 20 miles.
3. And the number of miles of four-lane highway that could be built out of the cement hauled by the Santa Fe every year is: a, 34; b, 834; c, 1,340; d, 483.

Total points: 15. Your score:_____

Railroads for Defense:

1. The amount of freight that has to be carried—food, ammunition, guns, hospital supplies, clothing—for each soldier fighting overseas is: a, 50 pounds; b, 100 pounds; c, 200 pounds; d, 1,000 pounds; e, 12,000 pounds.
2. The number of freight cars needed to move an army division of 15,000 men is: a, 100; b, 250; c, 750; d, 1,500; e, 1,800.
3. In 1944 the number of troops and passengers carried by American railroads was more than: a, 1,000,000; b, 50,000,000; c, 450,000,000; d, 910,000,000; e, 100,000,000,000.

Total points: 15. Your score:_____

Science and Research:

1. The number of research engineers and scientists working for American Railroads each year is: a, 500; b, 1000; c, 10,000; d, 100,000; e, 1,000,000.
2. The number of miles of welded rail installed on the Santa Fe is approximately: a, 140; b, 1,400; c, 400; d, 40,000.
3. Since World War II the total amount of money spent by American railroads on improvements was: a, 17,000,000; b, 71,000,000; c, 170,000,000; d, 17,000,000,000.

Total points: 15. Your score:_____

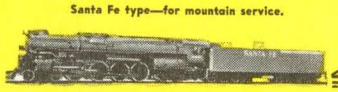
(Answers on page 19)

Can You Name Them?

Steam locomotives are identified by the way their wheels are arranged.

Mikado type—for heavy freight service. 2-8-2

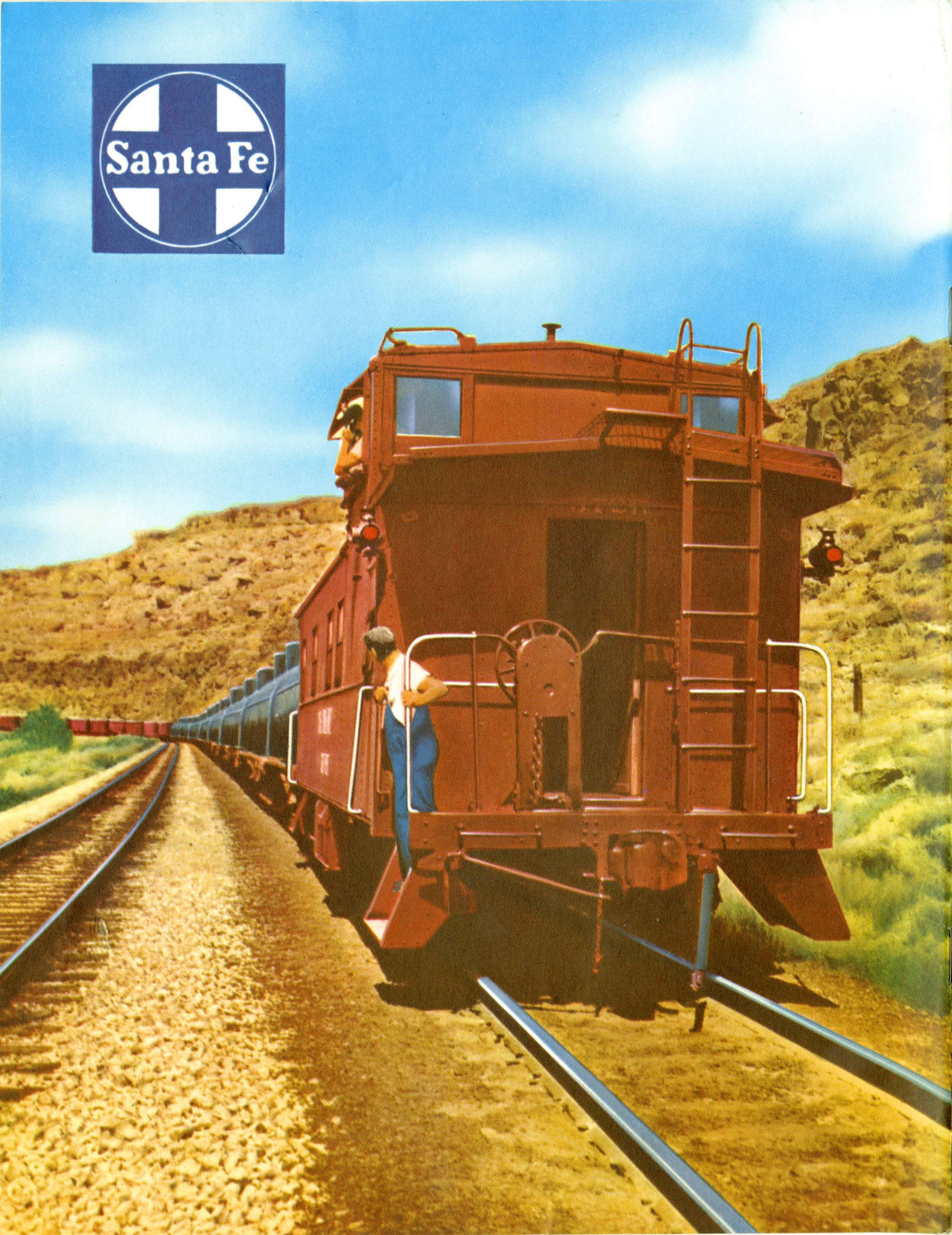
Santa Fe type—for mountain service. 2-10-2



Mountain type—new high speed steam engine. 4-8-4

Santa Fe type. (Sometimes referred to as Texas type)—heavy duty freight locomotive. 2-10-4

Neely Printing Company, Inc., Chicago


Santa Fe