

Erie railroads with radio

For the price of a passenger diesel, this eastern trunk line has bought the largest four-way train radio network in the world

BY DAVID P. MORGAN

A FEW minutes east of Kent, O., the traveling engineer gestured through the windshield of the 4500-horsepower Electro-Motive F-3 heading Erie Railroad's *Lake Cities*. Squarely down the middle of the east-bound main line the ties were grooved and slashed; obviously flanged wheels had recently climbed off the rail. The fact that we were descending a 1 per cent grade at perhaps 65 miles an hour served to make the impending tale all the finer.

"Something get on the ground?"

"One truck on a box car loaded with heavy machinery," he began, "derailed on a diesel-powered freight coming down this grade at 50 miles an hour. It ran more than six miles at that speed around curves, into facing-point switches, over guard rails atop bridges."

"Who discovered it?"

"The conductor. He happened to glance back from the cupola and saw the sliced ties. Many were cut so badly the section gang had to replace them immediately. The lading was not damaged. In fact, the only casualty to the car was a broken wheel."

What pleases the Erie almost as much as the happy windup to this in-

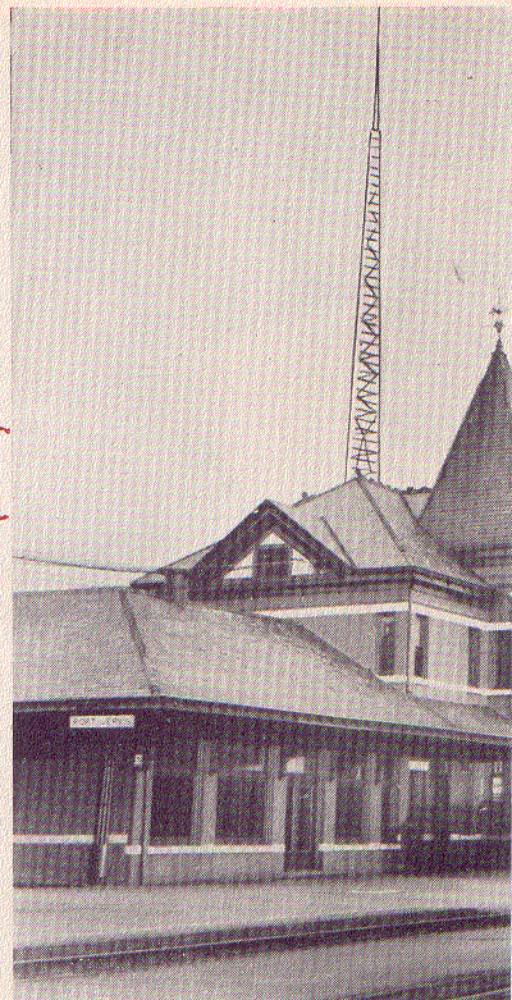
cident is how the alert skipper acted when he spotted the trail of scarred ties. He simply lifted the caboose phone off its hook, called his diesel locomotive by number, and explained what was wrong. Up ahead, the engineer instantly closed his throttle and expertly worked air until the train had stopped. Other trains in the vicinity, hearing this radio caboose-cab conversation over their loudspeakers, were duly warned that the derailed car might be fouling the westbound main. The operator in the nearest radio-equipped station also listened in and dispatched a section crew to the scene.

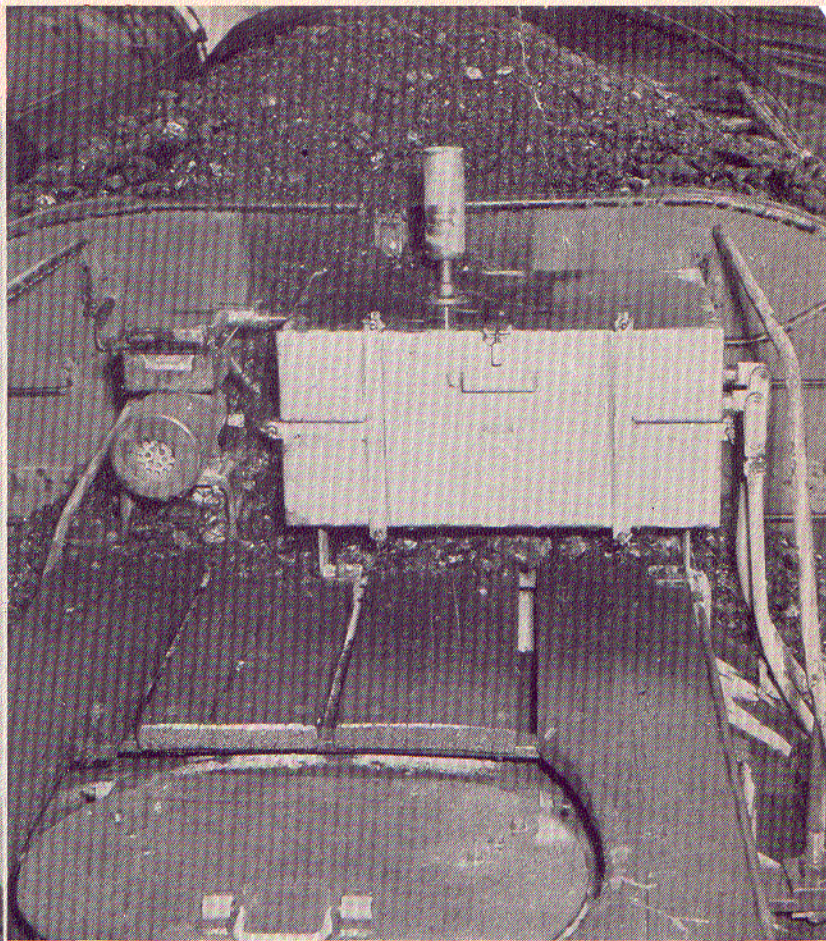
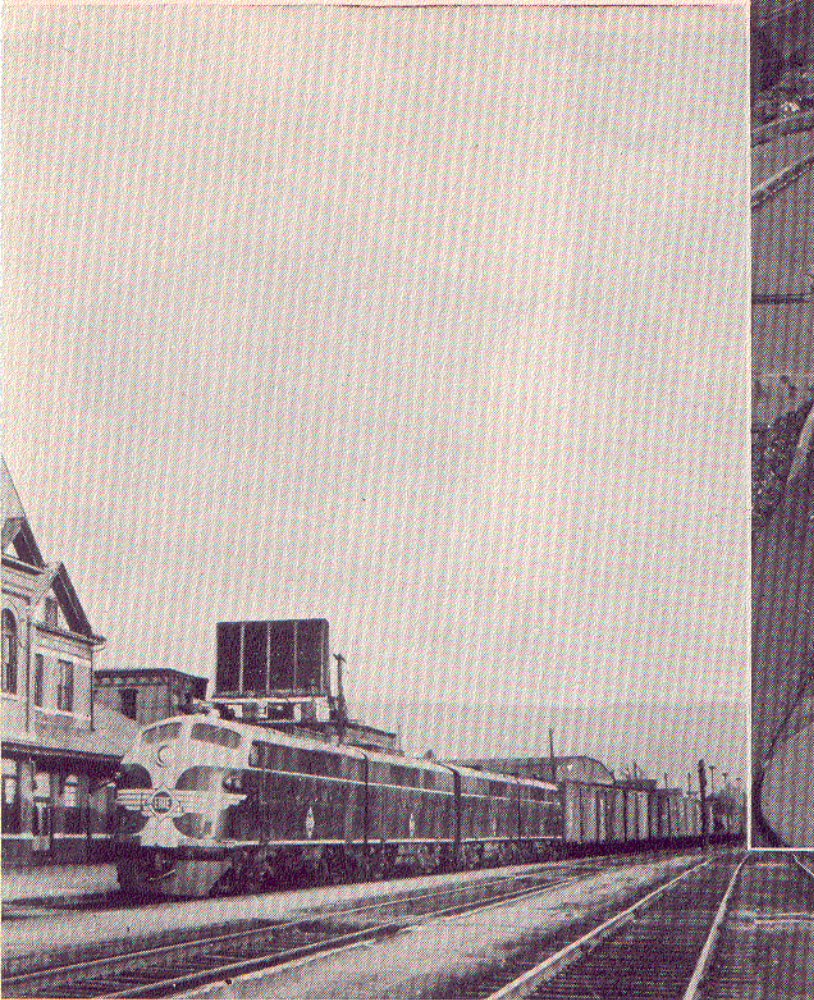
It is credible that on a railroad minus radio communication the derailed car could have jumped and jolted two or three miles more while the conductor and flagman swung washout signals from the caboose, maybe a hundred cars to the rear of an uninformed engineer making time. Or they might have pulled the air in the hack and safely stopped the train. It is also conceivable that in the seventh mile the truck might have violently swiveled crosswise to the track, providing a bulky new folder in the files of the claim department. Or the

derailed box might have bounded off the right of way had the skipper pulled the air and snapped his train in two. One wreck like that could have cost Erie far more than the \$750,000 it has invested in train radio.

Now for \$750,000 you can buy one 6000-horsepower heavy-duty passenger diesel or seven streamlined coaches or possibly 50 miles of single-track C.T.C. Yet for that cash Erie bought the largest, most comprehensive railroad radio network in the world: 884 miles of continuous four-way train radio between Jersey City, N. J., and Marion, O. This advanced tool of modern railroading which now expedites traffic over 85 per cent of Erie's double-tracked Jersey City-Chicago main line is actually 50 wayside transmitting stations and 161 mobile sets (mounted on 119 diesel locomotives and in 42 cabooses).

All this is the domain of a stocky, spectacled man who was "Sparks" on a merchant steamship at the age of 19. Francis H. Menagh, now 60, left the sea in 1913 to work for the Erie as a train dispatching telephone installer. In World War I he furloughed off railroading long enough to complete a





↖Four-way train radio at Port Jervis, N. Y., is indicated by retouched tower atop the passenger depot and the "firecracker" antenna barely visible between horns of 5400-horsepower diesel. ↑Farnsworth radio mounted behind RF&P 2-8-8-2's coal bunker explains why steam installations must be sturdy.

private to first lieutenant elevation in the Signal Corps and spend 19 months in France.

Between world wars Frank Menagh stuck with the same railroad at the same job—Erie's communications department. His personal history during the years 1942-1945 tells of the skill one railroader gave to the Army. Once again in the Signal Corps, he went on special missions to Malta, Italy and Russia and was a key technician at both the Yalta and Quebec policy-making conferences.

VHF (very high frequency) radio was very much on Menagh's mind when he returned home from the war. He liked its clear, static-free reception, its resistance to weather, its stamina in the shock of combat. Erie had been exploring cab-caboose train communication since before World War I and VHF appeared to be an ideal solution.

The immediate alternative was the inductive system (which Pennsylvania employs between Harrisburg and Pittsburgh) which was tested on Bessemer & Lake Erie long before the war; inductive train communication is sent along telephone or telegraph wires parallel to the railroad. Erie

liked VHF better for two reasons: (1) it was independent of lineside wires, which on the Erie are not always near enough to the train to be effective and which on any railroad are subject to failure in a storm or flood; (2) VHF could be operated on low power unsuitable for the inductive setup.*

As Superintendent of Communications for the Erie, Menagh arranged in early 1947 for the Farnsworth Television & Radio Corporation to develop VHF radio for mainline railroad operation, then to engineer and construct all equipment. The 115-mile Marion-Kent (O.) district was selected for testing Farnsworth's ideas. A diesel locomotive, caboose and seven wayside stations were radioized. New or not, VHF performed brilliantly. By July 1948, Erie was railroading with radio between Marion, O., and Salamanca, N. Y., 360 miles.

Greater field experimentation was required for the mountainous geography east of Salamanca because VHF waves hug the earth's surface and are dependent on short, line-of-sight dis-

stances. Working with Menagh's staff, Farnsworth engineers circled tentative base radio stations on U. S. topographic maps, then employed a truck and a diesel locomotive to check their findings. The highway unit was equipped with a fixed antenna on a sliding aluminum pipe that could be raised 63 feet. This station picked up signals sent from a rolling radio-equipped diesel; the man on the locomotive kept the depress-to-talk button on his phone down (thus sending a continuous signal), and reported each passing milepost.

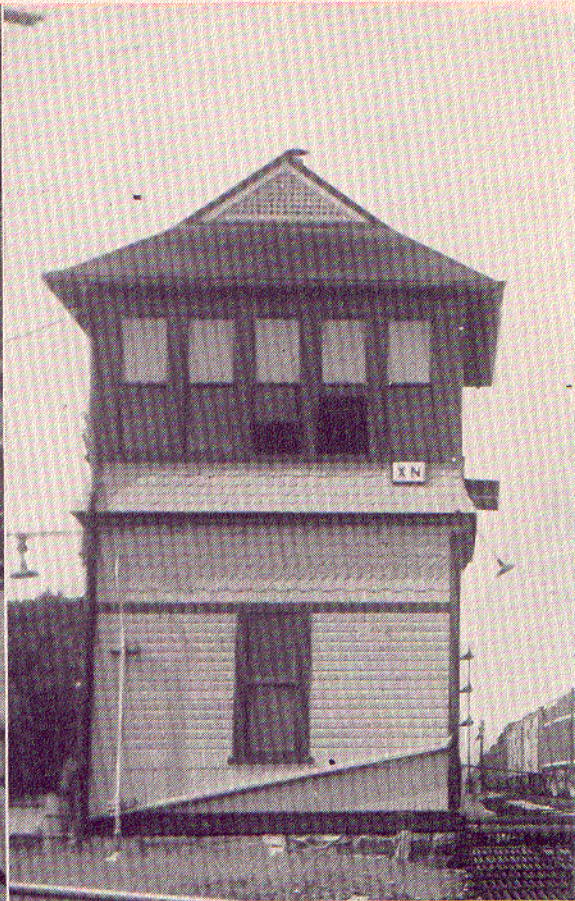
In flat terrain Erie spaced its base stations (stationary transmitters) as much as 30 miles apart, but in the mountains six miles was frequently the maximum. Often, too, the base station did not coincide with the nearest 24-hour wayside office. In these cases the radio outlet is remotely controlled by wire—or by the inductive system from the open office over distances ranging from 18 to 28 miles.

Erie has not limited the splendid success of radio to mainline train operations. In 1947 it radioized New York Harbor Lighterage Service movements; the dispatcher on Pier 4 at Jersey City has only to lift his radio

*In 1945 Rio Grande combined both VHF and the inductive system for road service on its Moffat line. Bendix space radio was used for cab-caboose talk; the inductive system carried train-to-wayside station messages.



Engineer aboard hump locomotive keeps in constant contact with yardmaster through the medium of space radio. Voice of man in yard office comes into cab over loudspeaker mounted above engineer's head (and out of sight here). Engineer, in turn, talks back over phone, his fingers enclosed over "depress-to-talk" button in phone arm. Scene is Potomac Yard.



An eastbound radio-equipped redball of the Erie shuttles past XN Tower behind a 6000-horsepower Alco-GE freight diesel at Shenango, Pa.; it is about to cross over Bessemer & Lake Erie tracks. This partic-

phone to be in contact with any one of 11 Erie tugboats. Yard operations at Jamestown, N. Y., and Marion, O., were improved in 1947 and 1949 by setting up two base stations and radioizing 11 diesel shifters. This year the railroad is equipping four diesel switchers and four cabooses with radio for service between 51st Street Yard, Chicago, and Hammond, Ind., a heavy transfer and industrial district. In addition, Erie has purchased a commercial tower from Station WEBR in Buffalo; this facility, which spires 410 feet above street level, gives radio range over Niagara Falls and 27 miles southeast on the Buffalo Division.

For all practical purposes, railroad radio is a postwar technological advance in the art of moving trains. Aside from radio engineers from Farnsworth and Bendix and other suppliers and railroad officials like Frank Menagh, few in or out of the industry fully appreciate the fundamentals involved. As more and more diesels and 2-10-4's and cabooses sprout antennae, these are typical of the questions being asked about train radio:

1. What does radio cost?

Both Farnsworth and Erie decline to be too specific about the price tag of VHF radio. One variable is insulation. A mobile installation mounted on a diesel or caboose, for instance, is reasonably protected from weather and excessive shock. But a set behind the bunker may be sprayed by a tank overflow or covered in coal. As a rule of thumb, a Farnsworth set costs \$1200 for mobile or wayside service but that figure may vary from \$900 to \$1400 depending on the specific job at hand. One version of a walkie-talkie for trainmen's use costs \$325 (exclusive of excise tax) and is carried by hand; it includes a definite 2½-mile range (up to 4 miles under ideal conditions of weather and topography), 19 pencil-sized tubes and a battery good for eight hours' service. A newer model, now under test by Farnsworth, may be carried pack-fashion on the shoulders, leaving the employee free to pack a journal box or make a coupling while talking on his set. It may retail for \$375 or less.

Over-all cost of any railroad radio installation is largely determined by geography and operating objectives.

In its modernized Evansville yard and on a belt line that encircles the city, Chicago & Eastern Illinois employs a radio-equipped office and four radioized diesel switchers. Cost: approximately \$7500. Erie Railroad's investment of \$750,000, on the other hand, purchased a blanket application of radio communication for practically all through passenger and freight trains on 884 miles of line.

2. What is "four-way" radio?

It is a term for what an insurance salesman would call full-coverage. It is radio that permits communication between (1) cab and caboose, (2) train and wayside station, (3) one train and another within range of nearest base station, and (4) two wayside stations. In practice on the Erie, train radio boasts a fifth channel because the dispatcher may be connected via his telephone circuit to any wayside station to contact all trains within its range.

Erie four-way radio is operated on a dual-frequency basis: Band "A" at 160.05 megacycles and Band "B" at 159.05 megacycles. Normal communication is carried out on "A" with "B" held in reserve for emergencies. For



Charles McCreary.

ular tower is not a wayside transmitter. Firecracker antenna is mounted between air horns on cab unit; under I.C.C. ruling it must be strong enough to support a heavy man who might grab it in a fall.

instance, if a train is in contact with a wayside station on Band "A" when another locomotive in the same zone must contact its caboose, the second crew simply breaks into the conversation on "A" and requests that the conductor immediately switch to "B".

3. Does radio replace orthodox dispatching by train orders or signal indication?

On the Erie, definitely not. Erie men are quick to point out that train radio *assists* existing communication systems by increasing the speed and safety of train movements under standard operating rules. But when winter snow and ice have snapped telephone wires, Erie has employed "radio patches" between stations where the lines were down, thereby protecting constant communication until linemen repaired the storm damage.

4. Is railroad radio popular?

Considering its almost totally post-war development, radio has been mushrooming. Radio, like diesels and welded rail, was first given special, strategic assignments where its value was obvious—that is, in yards and terminals. More efficient equipment



Erie Railroad's Mr. Radio, Frank Menagh, talks with Vice-President R. C. Randall in Cleveland over a caboose radio during press trip to celebrate 884-mile network's debut. Reading over his shoulder are, left to right, John Battison of Tele-Tech Magazine, David Morgan of Trains, and Merrill Wilson, Farnsworth field engineer. Caboose was on westbound freight out of Maybrook.

backed up by its mainline performance on roads like Rio Grande and Erie has now taken radio out of the experimental class; its future growth depends on the manufacturers' salesmanship and the railroads' pocket-book.

As of January 1, 1950, official I.C.C. statistics racked up the following score for radio (excluding inductive and radio-inductive systems):

¶Yards and terminals—93 installations radioized with 120 wayside stations, 583 locomotives, 3 cabooses, 25 other mobile units and 41 pack sets.

¶Main lines—30 installations (9000 miles of road) radioized with 93 wayside stations, 175 locomotives, 147 cabooses, 17 other mobile units and 8 pack sets.

In several instances 200 or 300 miles of main line has been radioized with a handful of locomotives and other mobile units to protect an F.C.C. license. Nationally, railroads in the West and Southwest are adopting radio more rapidly than elsewhere although the kingpins in both radio (Erie) and induction (Pennsylvania) are eastern.

THE rank and file of railroaders are enthusiastic about train radio. The

new gimmick insures a cab-to-caboose and yardmaster-to-switch crew contact previously unknown to railroading. Beyond radio's obvious advantage in personal safety, it eliminates long hikes in bad weather to cabs and cabooses, towers and stations. When trouble develops the *entire* railroad in the vicinity knows of it instantly because of radio's "party line" nature—not just the fireman or conductor or operator who spots the dragging brake beam or flaming hot-box or broken rail.

And because it is as personal as the human voice, radio is piling up its share of railroadians. When VHF train radio was new on the Rio Grande, so one story goes, the superintendent's business car was coupled on behind a diesel-powered hotshot climbing over the Rockies via the Moffat Tunnel line. After an exceptionally rough stop, a Bendix technician called the cab.

"You'd better take it easy up there," he warned. "You just rolled the super out of bed onto the floor."

"Tell him to stay there," the engineer bellowed back, "and I'll roll him back in!"