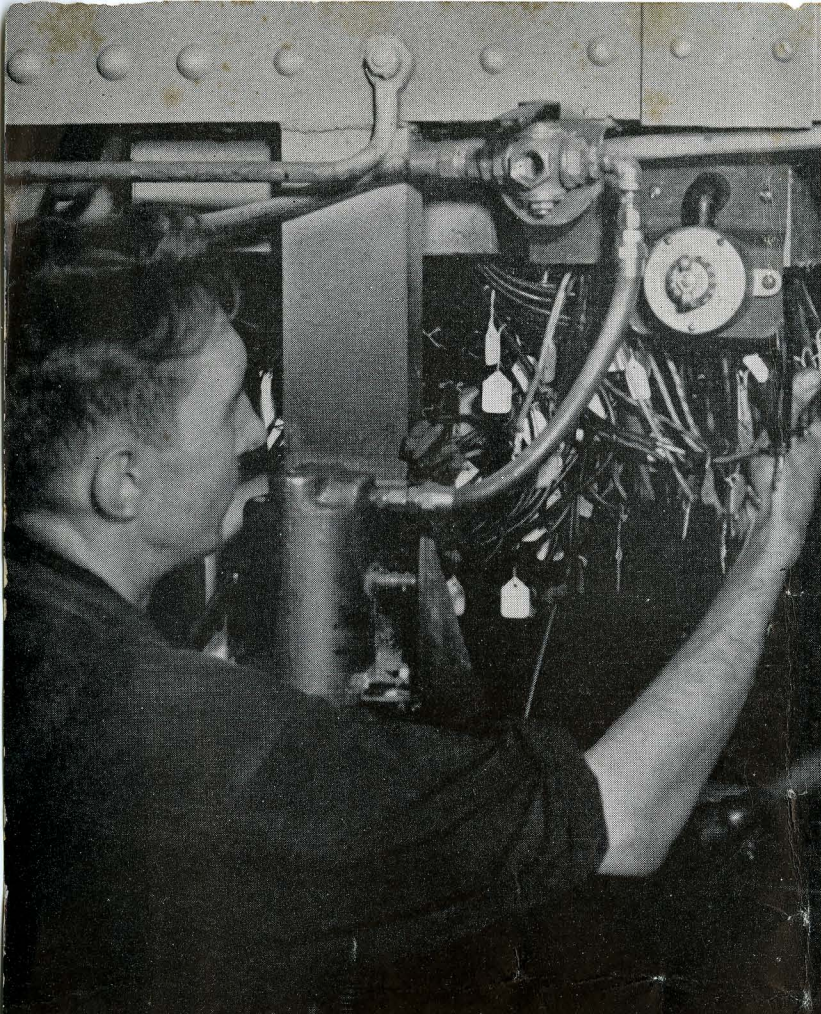


G-MEN *of the* RAILS





This is part of detector car's intricate electric wiring that leads from the searching unit above the rails to the recording units

Working as smoothly as a squad of Uncle Sam's G-men on the trail of a Nazi spy, a group of less than 100 railroad specialists are criss-crossing the nation's steel highways from dawn to dark. They are hunting down mysterious saboteurs of transportation—hidden rail defects.

On these men rests a large part of the burden of seeing that passengers, mail, express and freight get through to their destination safely. This entails preventing rail failure from paper-thin interior fissures no human eye can detect.

Never before have these vigilant experts been so welcome to seasoned railroad maintenance executives as they roll into sight in their bright yellow detector cars. They're only the size of ordinary coaches, but are packed like submarines with scientific gauges and gadgets, motors and mechanisms.

The nation's overloaded rails are taking an unprecedented pounding as the railroads struggle with the task of moving men and materials for war. The freight load jumped 33 per

cent last year and it has jumped again this year. The passenger load figures leaped 80 per cent last year and this year's totals will be much higher, though they have already exceeded the peak of the last war by 24 per cent.

The rails hum ceaselessly 24 hours a day under million-pound locomotives, tanks, guns, gigantic castings, machinery and the thousands of other things necessary to the war effort with 7,000 fewer freight locomotives and 500,000 fewer freight cars than they used at the 1929 peak. They carry the load only because cars are packed to the safety limit and speeded to their destinations. Weight and speed are two things which punish rails.

Railroad men have increased their vigilance to cope with the situation, but there is one hazard they cannot foresee without the help of the G-men of the rails and their novel detector cars. This is the internal transverse fissure which grows into the rail head, or top section, like a hidden cancer and if not discovered is capable of causing rails to rupture.

Scientifically called "sub-molecular disintegration within the steel," the transverse fissure is attributed to fatigue failure in the railhead. It appears to grow gradually, spreading outward from its center across the rail head like an invisible crack, its faces usually acquiring a high polish due to the hammering of the wheel load above. Occasionally, however, the fissure grows rapidly. At any stage in its growth, the internal transverse fissure is dangerous, able to cause a rail to rupture suddenly and break like a brittle iron casting. In nearly every case there is nothing which visual inspection can detect until it is too late.

The late Dr. Elmer A. Sperry, who is famous as the inventor of the gyro-compass and the ship gyro-stabilizer, tackled the problem of internal rail defects and invented the detector car. A generator aboard the car introduced current into the rails by means of sets of copper brushes. Each of these

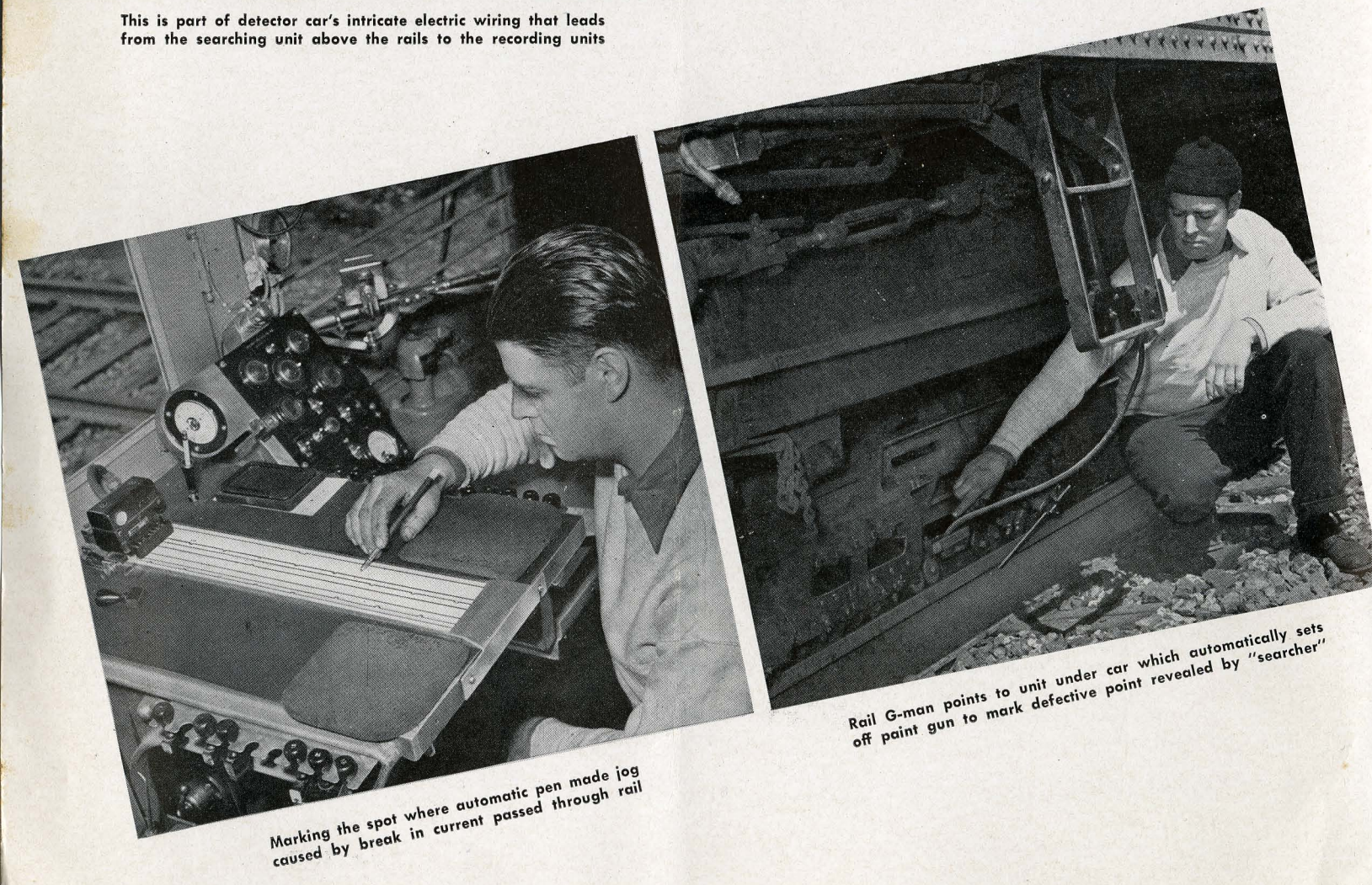
brush clusters carried a searching unit consisting of a pair of electrically opposed coils mounted midway between the current brushes and directly above the railhead.

In a sound rail, current flow remained unimpeded and the flux above the rail head uniform. When a fissure was encountered, current was forced to pass around the internal break and a change in the density of the flux occurred. This variation in flux produced an electromotive force at the terminals of a sensitive "searching unit," and this force was passed into amplifiers. The output of the amplifiers was used to operate automatic pens and a paint gun beneath the car as soon as a variation occurred. A bullet of white paint was shot onto the rail at the suspected point and the pens, recording on slowly winding tape, made jogs in otherwise straight lines.

From these clues, the first G-men of the rails did a good job, but many fissures were missed because the passage of wheels over rails serves to magnetize them and the record did not always tell the truth.

Scientists of the Sperry Rail Service in Hoboken, N. J., kept at the problem until they found that by pre-energizing the rail in advance of the brushes with current that could be controlled, the detecting equipment was more accurate. Another improvement, made by staggering the coils, caught lopsided fissures which were not growing from the center of the rail head. Another device discriminated between a rail burn—caused by setting the brakes too quickly and scuffing off the top of the rail head—and a hidden fissure. Horizontal fissures were revealed and the disclosure of vertical split heads was added to the accomplishment of the yellow detector cars and their crews.

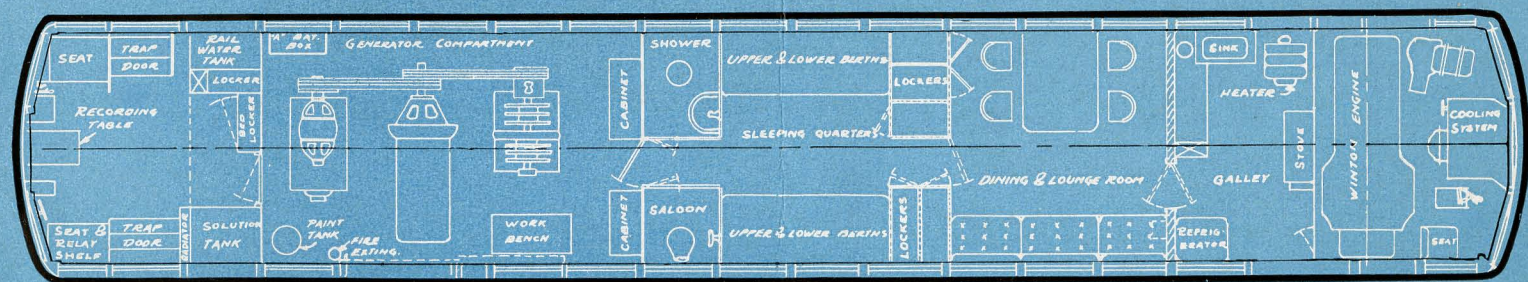
The result is that though less than a score of these yellow cars have crept slowly over the rails of nearly 100 railroads recently, they have prevented a large number of wrecks. In



Rail G-man points to unit under car which automatically sets off paint gun to mark defective point revealed by "searcher"

Marking the spot where automatic pen made jog caused by break in current passed through rail

Below, floor plan of the Sperry detector car, where crew of four or five can work and live in comfort. It boasts stationary berths, lounge and dining room—the chef included



Showing detail floor plan of Sperry Rail-Defect-Detector-Car



Using hand unit (above) to recheck findings registered by the recorder

1942 alone, railways removed from their tracks nearly 90,000 defective rails located by Sperry's fleet. American railroads can boast they carry passengers about 2,000,000,000 miles safely for each one killed.

In fact, Sperry detector cars find an average of one hidden fissure in approximately every three miles of track and the railroads yank out the weakened rails. Maintenance men can heave a sigh of relief when the detector has scrutinized the tracks of their railroad.

Creeping along at a steady six miles an hour, the detector car is routed along a railroad just like a special train. It has a regular train crew supplied by the railroad. This crew includes a brakeman with his flag and torpedoes. When a stop of any consequence is made for examination of a suspected section of rail, the brakeman hurries back to halt any approaching train just as if he were brakeman on a string of passenger or freight cars.

The G-men of the Sperry Rail Service—there are customarily four or five to a car—are usually at their three posts doing the bulk of the operating work. One, in a tiny cabin in front, operates the electric drive which propels the car from power originating in a gasoline marine engine. Another sits at a desk watching the tape which crawls slowly downward as the car moves. A third may be stationed in the recording compartment also watching the tape and ready to leap from the back of the car to examine a spot in the rail when a jog occurs in a line made by an automatic pen on the record tape.

It is start and stop, start and stop, continuously throughout the day. Seldom a mile is traversed that a stop is not made and one or two Sperry men leap from the rear of the car to bend over a rail where the paint gun has marked it. The brakeman hustles down the track, flag in hand ready to stop any oncoming train.

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Most of the stops are for a mere minute or two, but when a dangerous section of rail is found a splotch of red paint is slapped on the spot. Later in the day, or the next day at very latest, a track maintenance crew will follow along and the red splotch spells its message of danger.

Utmost care is taken by the Sperry men not to put a danger mark on a section of good track. When doubt arises, an ingenious hand "searching unit" is used to recheck the findings registered on the tape.

In making a "hand test," a delicate meter wired in circuit with the hand searching unit reveals the exact extent of the hidden defect. Defects which cover up to 20 per cent of the rail head area are classified as "small," 21 to 40 per cent as "medium," 41 to 100 per cent as "large."

The detector cars waste little time between dawn and dark and for that reason the cars are overstaffed so the men can take rest periods. Breakfast, lunch and supper are eaten on the compact car which has a tiny kitchen very much like that on a dining car.

They have a small library, a radio, and some have even rigged up tiny darkrooms where they experiment with photography, the constant traveling giving them opportunity for good pictures. They play cards and games and often take advantage of the nightly stops to go to a small town movie. Such diversions are helpful for detector car crews work long hours.

Aside from the nightly layovers and the halts for rail examination, cars are constantly on the move except when it is necessary to shop for food or gasoline.

Gasoline is the lifeblood of the detector car, for its motive power, as well as electricity to make the tests and to light and heat the vehicle, are provided by the gasoline engine.

A gasoline engine drives a main generator which delivers a current up to 4,500 amperes at 2 to 3 volts to the main brush carriages and an extra generator which supplies current for supplementary "pre-energizing" brush carriages.

These unsung G-men of the rails lead an unusual life, but they like it and the company had a long waiting list of applicants until the draft cut the number. They get an extra dividend in knowing that they are saving lives and materials for Uncle Sam.

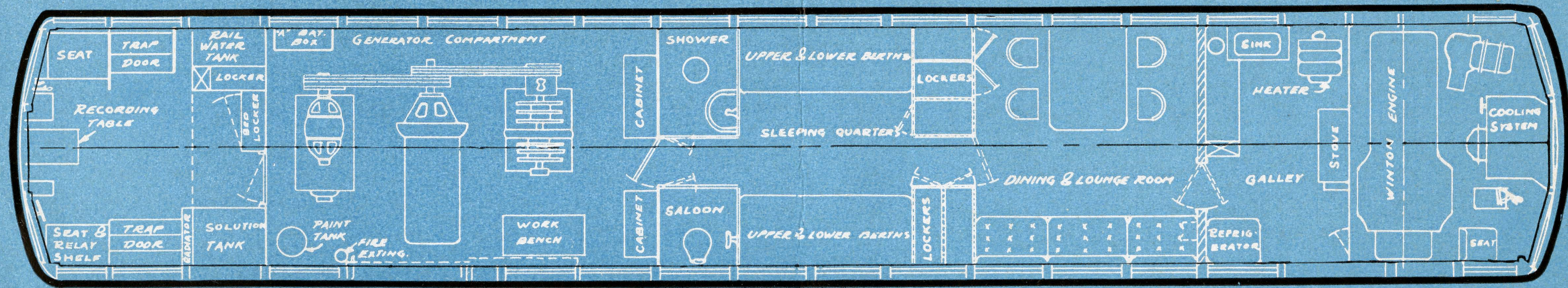


Here are examples of internal rail defects invisible to the eye but found by the rail G-men

SPERRY RAIL SERVICE

HOBOKEN, NEW JERSEY

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