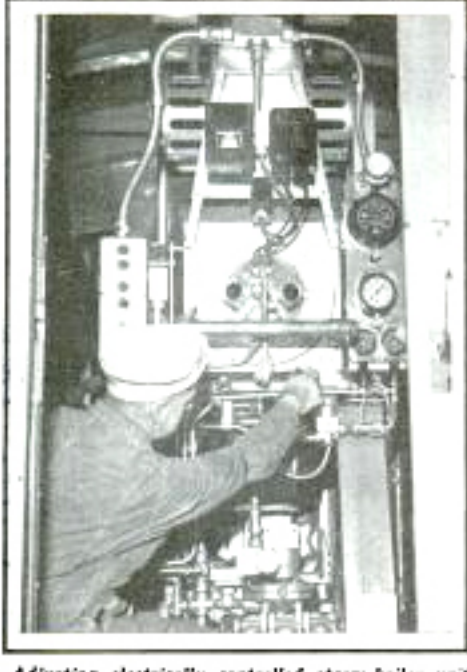
MANICURING



Adjusting electrically controlled steam-boiler unit of Diesel locomotive which automatically maintains desired pressure

THE hearts of railroad men still thrill at the sight of a big steam locomotive pounding down the main line, but their pet today is the pampered streamliner, the dainty high-speed racer of the rails.

Steam goes on the siding while stainless steel swishes across the switchpoints at 100 miles per hour. Dispatchers tilt their eyeshades for a look and telegraphers at mountain junctions listen for the blare of its horn. In the terminal yards, inspectors and machinists drop their work when a streamliner is due and prepare to swarm over her.

Let's swing aboard the M-2, latest of Santa Fe's Super Chiefs, as she finishes her 2,225-mile dash from Chicago to Los Angeles in less than forty hours. Passenger coaches are dropped at the terminal station to be shunted to the coach yard for cleaning and servicing. Then the locomotive with its additional power car moves to the roundhouse. The engineer pulls his throttle to idling, spills enough air to brake the two cars and drops a yoke over the

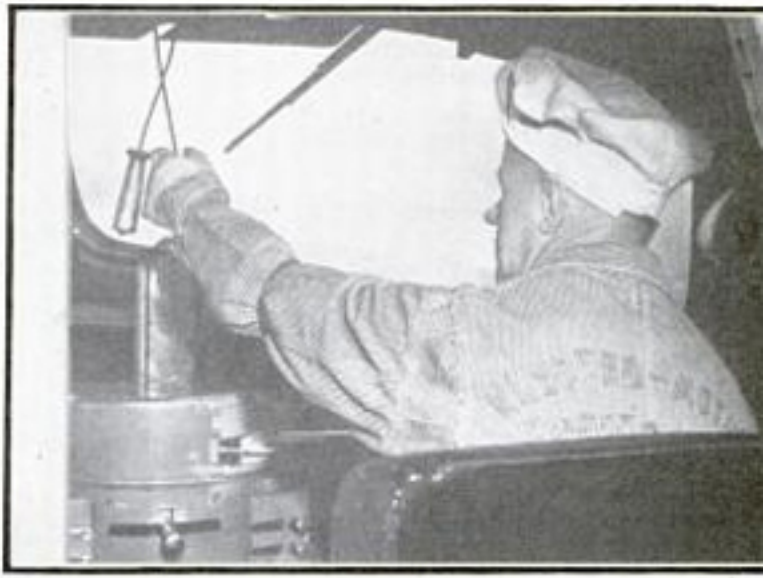
the DIESELS

Part of Santa Fe streamline fleet. All are Diesel electrics except the steam engine in center. Below, engineer of streamliner signaling for crossing

control buttons to lock the power off the wheels. Then the yard crew takes over.

During the next eighteen hours the two power units receive the same scrupulous attention that an air liner gets at the end of a flight. Inspectors go over every moving part. Report sheets from the crew and the expert who rode with the great engines from Chicago are studied, and every inch of the power cars, inside and out, is washed and cleaned until paint and metal sparkle.

First, the power cars are moved to the wash rack where the dust and grime of mountains and desert are scrubbed

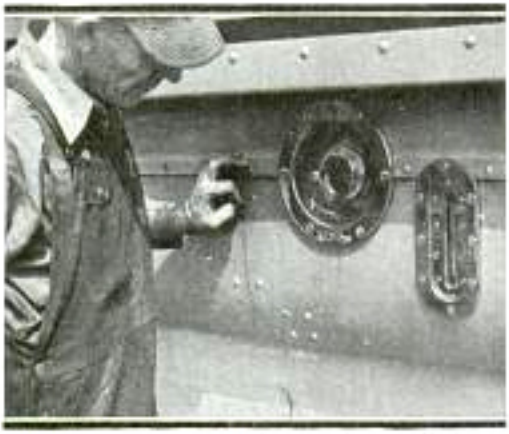


away. Close behind come the inspectors, scrutinizing everything from brake shoes to air horn. Worn parts to be replaced are marked with yellow chalk. Some brake shoes will be replaced, and all of them are replaced at the end of each round trip. All of the cars are moved forward foot by foot while inspectors examine every inch of the wheels, looking for cracks or other defects.

There are two twelve-cylinder Diesels in the locomotive and another pair in the following power car, and part of the engine inspection includes a look at the condition of each piston. The "wind box" cover between each bank of cylinders is removed and pistons are examined through open air ports while the engines are turned by hand. As a final check, the heads of one bank of cylinders are removed for close inspection at the end of each run. Oil and air-cleaning units are removed and cleaned. Crankcase covers are removed for a look at the crankshafts. Covers are taken off the traction motors, the brushes inspected, and the motor compartments cleaned with compressed air.

Meanwhile, new supplies are being taken on. Lubricating oil flows in through a hose, sand is poured into the sand boxes, radiator water and boiler water are replenished, and the 1,200-gallon fuel tanks in each car are filled. It takes only enough fuel oil to make a mark the size of a pea to feed a cylinder at full power but the 2,400 gallons in the two cars must be replenished before the trip is over. Including oil for the steam boilers, the Super Chief averages two gallons of fuel per mile while drawing a nine-car train.

The fireman and maintainer have little to do when the train is under way except make routine inspections of such things as water temperatures and oil pressures. Depending upon outside air temperature, they adjust the air intake shutters that direct blasts of air through the overhead water-cooling radiators. Automatic safety



Fuel-hose connection and gauge on power unit. Right, inspecting 750-volt generator coupled to one of Diesels. Top, unloading Diesel piston and connecting rod for overhaul

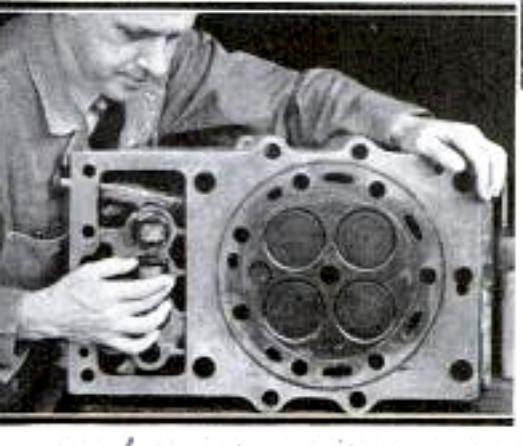
alarms attract their attention if anything goes wrong.

A pyrometer on each engine records exhaust temperatures of individual cylinders, and if the temperature of one rises or falls from normal the crew gets busy. Since there are four engines in the power cars, any unit can be stopped and repaired without stopping the train. Often, except when going up-grade, the engineer can't tell by the performance that one engine has been cut out.

Almost any kind of necessary repair can be made while the train is rolling. Replacing a faulty fuel injector in a cylinder head takes about fifteen minutes. Even such a major breakdown as a scored piston head and cylinder liner can be remedied by the maintainer without stopping. If, however, he decides to have the work done at the terminal, the faulty cylinder is cut out and its water ports blocked so the remaining cylinders can be put back to work.

The locomotive contains two General Motors 900-horsepower, "V" type, twelve-cylinder two-cycle Diesels similar to those used in submarines. The locomotive is really a Diesel electric because each main

(Continued to page 128A)



Manicuring a streamliner. Top, detector of train control pickup which receives signals from rails. Bottom, head of Diesel cylinder

Manicuring the Diesels

(Continued from page 363)

engine spins a generator which supplies current for two traction motors on one of the wheel trucks. Each engine also operates a five-kilowatt auxiliary generator for charging the starting batteries, an exciter generator which supplies current for the main field of the big generator, drives a

Scrubbing front of streamliner with a mixture of steam and soap solution

centrifugal blower that supplies air for cooling the traction motors, and operates an air compressor that maintains pressure on the air-brake system. Coupled behind the locomotive is an additional power plant identical with the front one.

The power combination provides 3,600 horsepower but the train requires less effort to drive than an automobile. Virtually everything operates automatically and the controls in the cab perform multiple duties, reducing the burden on the engineer. The controls lead to a high-voltage control cabinet in the engine room where they operate a small compressed-air engine which moves the automatic grouping switches, the reversing switches, and where protective relays such as the wheel-slip relay and the current-limit relay are located.

Each power car contains an electrically operated steam boiler for the train's air-conditioning system. The boiler is an example of efficient self-operation. A continuous 10,000-volt arc combusts the flow of vaporized fuel oil, and an electric eye focused on the flame rings an alarm if anything goes wrong. It takes only seven minutes to raise 200 pounds of steam from a cold start, and the boiler maintains a desired steam pressure after it has been started.

Among the safety devices are the "dead man control" foot pedal that stops the train if the engineer removes his foot, and the train control pickup, an electrical induction device that responds to a flow of current in the rails, warning the engineer by a system of colored lights of track conditions and signals ahead, blowing a warning whistle when the yellow caution light or the red danger light at the engineer's elbow flicks on, and bringing the train to a stop after a fifteen-second interval if the engineer fails to slacken speed. An overheated journal will explode a strong stench bomb in each wheel journal box, warning the crew by the odor of an impending "hot box."

Ordinary steam locomotives average 12,000 miles per month but the M-2 has averaged more than 20,000 miles per month. The streamliners now make round trips of about 4,500 miles every week, loafing in the yards between runs because train schedules can't yet take full advantage of the new speedsters.

While the power cars are getting the attention of the roundhouse crew, the passenger coaches are given just as thorough inspection in the coach yard. The single cars one at a time go over an inspection pit where rolling gear, couplers, and vestibules are examined. Passenger compartments are scrubbed and polished and the air-conditioning apparatus is inspected. Lubrication alone requires a special crew, since there are 122 automobile-type grease fittings on each car, as well as eight journal-box fittings, to be serviced.

Finally, when the locomotive and its power unit have picked up the rest of the train, come the check-up tests. The steam system, air-conditioning, plumbing, wiring, and air-brake systems are given operating tests to make certain everything works properly. Then the streamliner is ready for another trip two-thirds of the way across the continent.