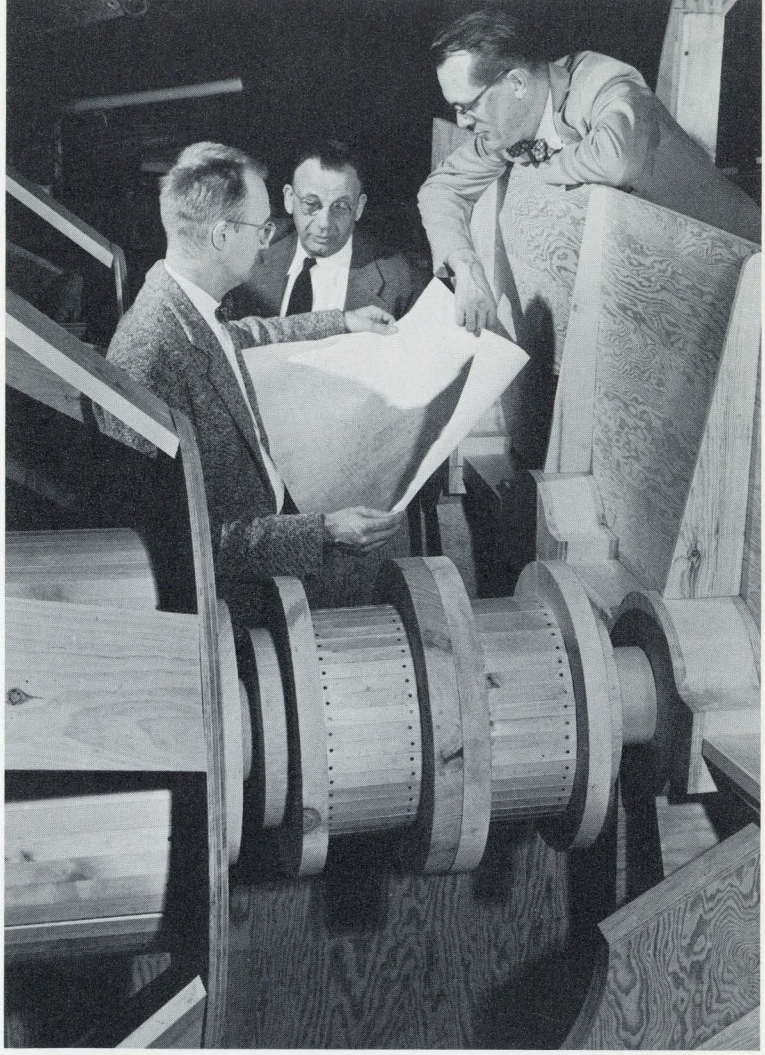
Tomorrow Is Here...

G.E.'S GAS TURBINE-ELECTRICS OPEN UP NEW ERA IN RAILROAD MOTIVE POWER

Now There's New Power On The Rails

brought about by:

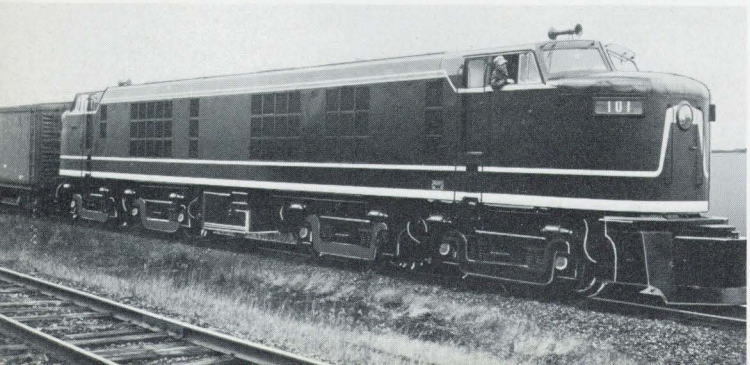


LOCOMOTIVE DESIGN DEVELOPMENTS

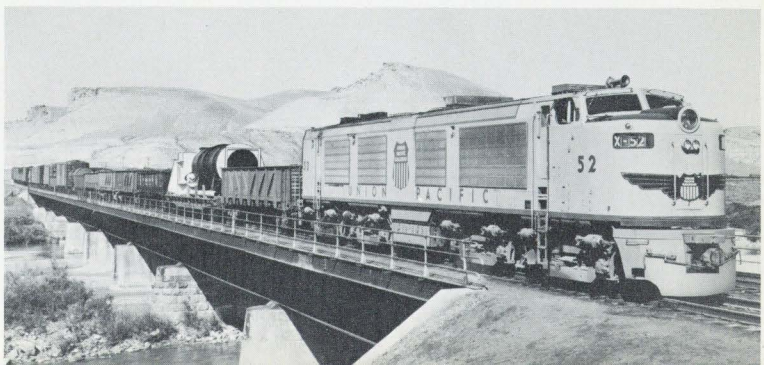
Many major locomotive design simplifications, including modifications of control and mechanical systems, running gear, braking system, and fuel system, are all incorporated in the gas turbine-electric, which also boasts advances in main generator ventilation and maintenance accessibility.

10 YEARS IN

The first American-built gas turbine-electric locomotive, a 4500-hp freight unit, was tested on the Pennsylvania RR in 1948 and later was transferred to the Union Pacific for further evaluation in regular freight service.



In 1951 the Union Pacific Railroad ordered ten gas turbine-electric locomotives from General Electric. Essentially duplicates of the pilot locomotive, the units contained modifications shown desirable by experience in service.



TURBINE DESIGN DEVELOPMENTS

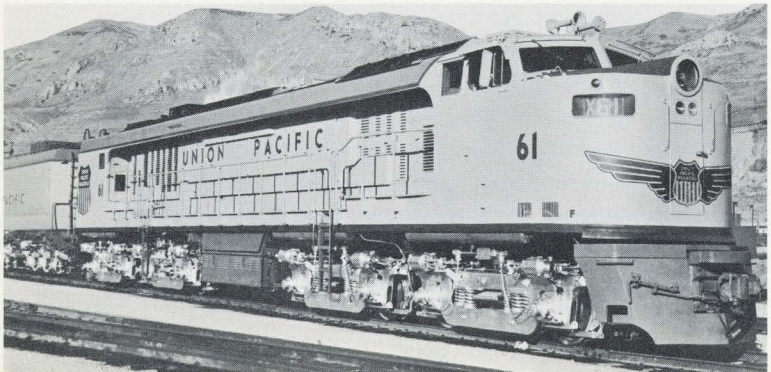
Many important advances in gas turbine design and significant changes in combustion chamber construction contributing to long life, simplicity of operation, reliability, and low maintenance cost give the gas turbine-electric powerplant efficiency to match its superior performance.

RAILROAD OPERATION

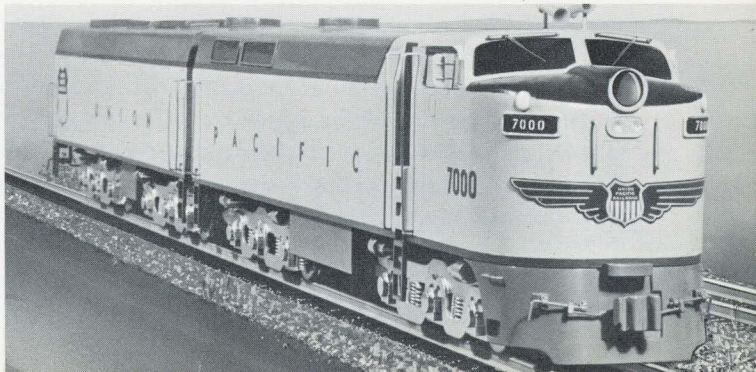
All the tremendous development that has gone into the gas turbine-electric locomotive has been the result of the concentrated knowledge accumulated on gas turbine-electrics in constant railroad service under the most rugged and demanding operating conditions.

THE MAKING

15 additional units of further modified design were ordered by Union Pacific in 1952. The modifications were the result of long in-service hours on the road on regularly scheduled runs. These units were rated 4500-hp.



The new gas turbine-electric now on order by Union Pacific is rated 8500-hp, will develop a continuous tractive effort of 145,000 lbs. It's believed to be the most powerful internally-powered unit ever built.



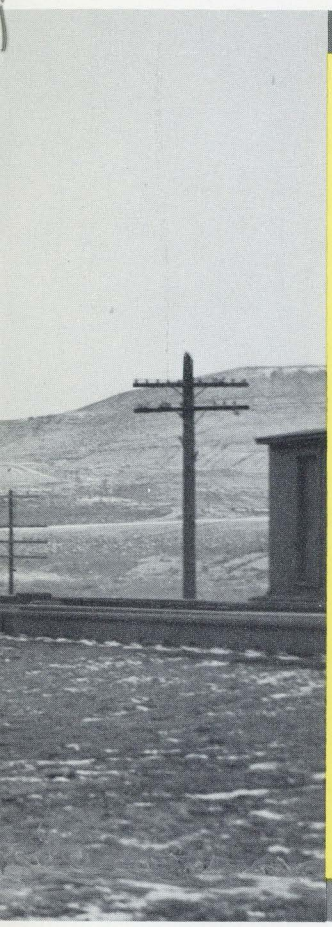
Long Freight Trains Move

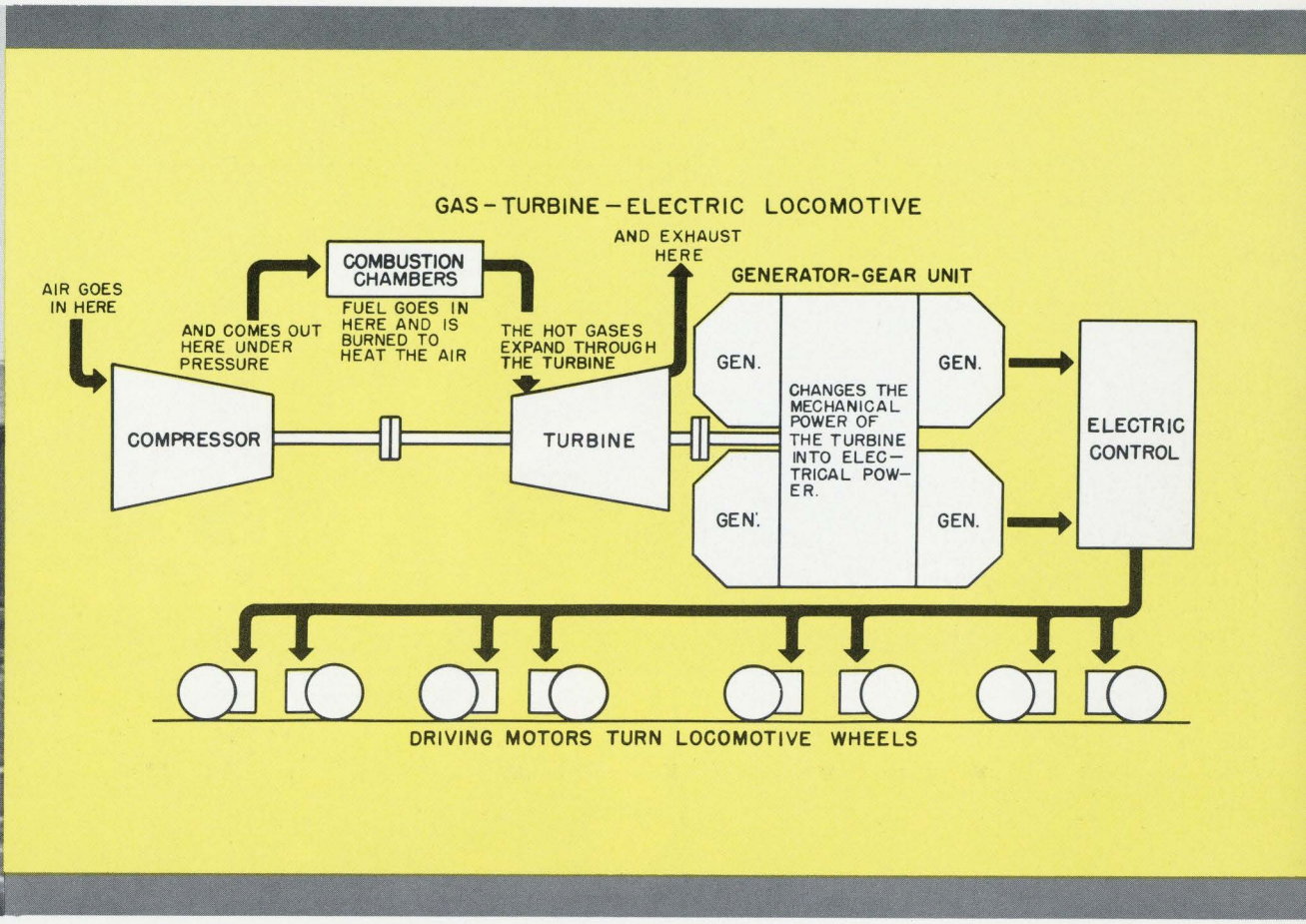
The new gas turbine-electric is specifically designed to move freight trains over the long haul faster and more economically than any other internally-powered locomotive. It is estimated that the new gas turbine-electric (8500 hp) will have 25% less mechanical repair cost than a 7000-hp diesel-electric unit. Increased reliability and decreased maintenance will result from a simplified control and mechanical system which has fewer pieces of mechanical apparatus, fewer electrical machines, and less control devices and contacts than an equivalent diesel-electric.

The new 8500-hp gas turbine-electric locomotives develop 7000-hp at the rail for pulling power. On a straight and level track, a single one of these locomotives could pull 735 fully loaded freight cars, making a train more than seven miles long, at a speed of 10 mph. In daily high-speed operation, one of these locomotives could handle more than 4,200 tons of lading in a single train such as from Omaha to Cheyenne, Wyoming, for example.

At maximum horsepower, the turbine in the new gas turbine-electrics will suck in about 132,000 cu. ft. of air per minute, which is equivalent to the amount of air breathed by about one-half million people. The air is expanded in the turbine by heat and exhausted at a rate of 320,000 cu. ft. per minute at a temperature of 850 degrees F. Velocity of air moving through the turbine is about 1600 miles per hour. The first-stage nozzle temperature during combustion is about 1450 degrees F. Energy generated by the locomotive from less than one pint of low grade fuel oil would be sufficient to haul a freight car loaded with 50 tons of freight one mile on a straight and level track. Electrical generators in one of these giants are capable of producing enough electricity to light 63,410 one hundred watt light bulbs.

Faster, And At Less Cost





PRINCIPLE OF GAS TURBINE OPERATION

The simple-cycle gas-turbine power plant consists of an air compressor, combustion chambers, and a turbine. Atmospheric air is compressed to approximately six times normal pressure by an axial-flow compressor mounted on the turbine shaft.

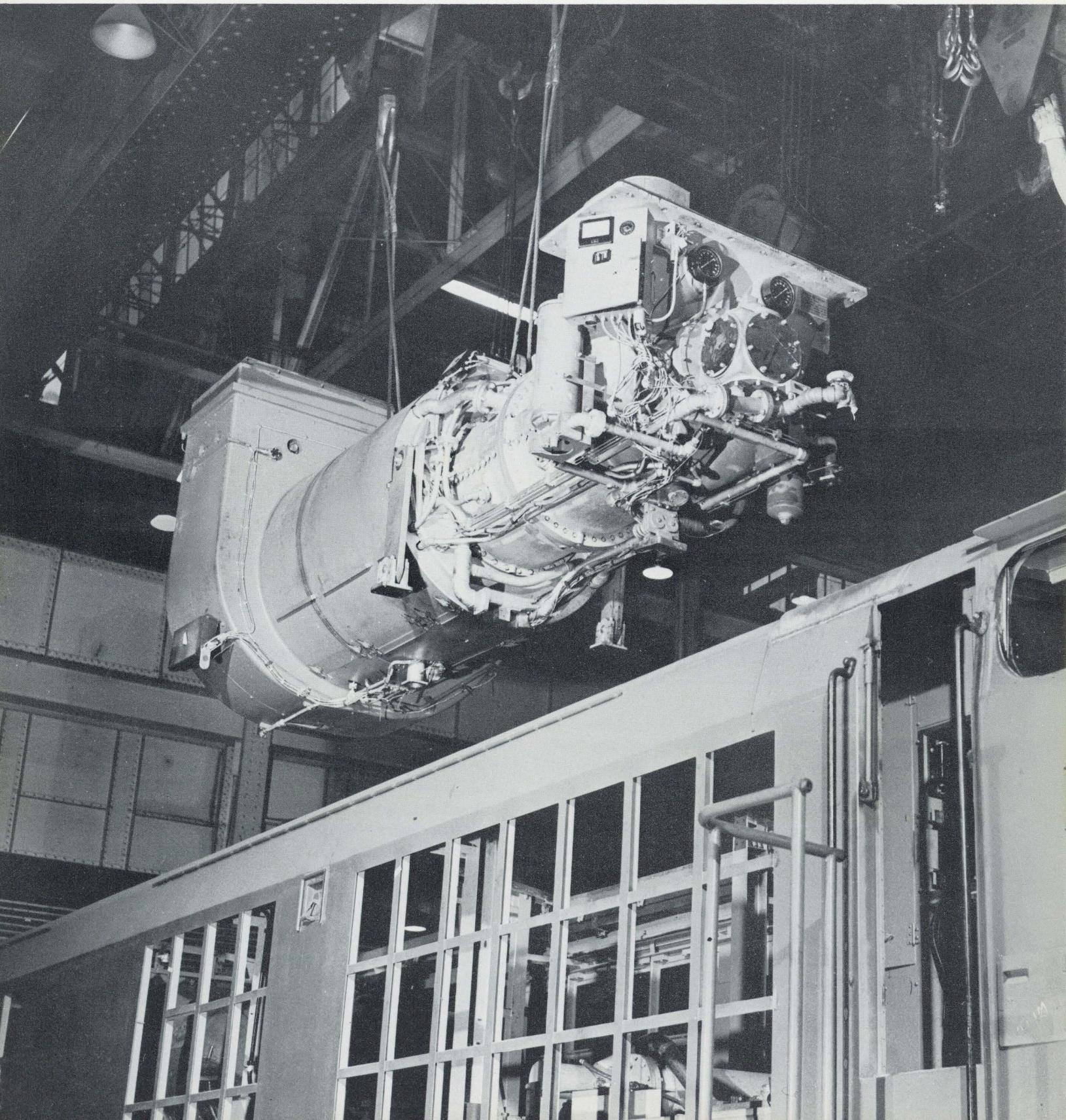
This compressed air enters combustion chambers, where it is mixed with atomized fuel which is sprayed into the combustion chamber through nozzles. The mixture of compressed air and atomized fuels is burned in the combustion chambers. The hot gases pass directly into a turbine where they expand and are then discharged through an exhaust hood. As the gases expand, they turn the turbine wheels and shaft. This shaft drives the air compressor and also delivers power through a reduction gear to the two traction generators.

Like a gasoline or diesel engine, the single-shaft gas turbine has no torque at standstill, since there is nothing to force the working medium through the turbine until the compressor starts to turn.

It must be cranked like an engine and will begin to develop useful power at about half speed.

The locomotive is first started by starting the diesel-driven auxiliary generator set. This furnishes power to one main generator for cranking the turbine. After the generator gets the turbine up to firing speed, diesel fuel oil is fed to the burners. After full speed is reached and all burners are up to temperature, pre-heated, treated Bunker C oil is fed to the burners and the diesel fuel is cut out. Shutting down is practically the reverse of starting.

More Horsepower In A Smaller Package...



TREMENDOUS POWER ADVANCES

The primary advantages of the new gas turbine-electric are:

1 Short length per horsepower compared with other types makes it easy to handle in yards and shops. It produces approximately 51 horsepower per foot (including fuel tender), compared with 35 horsepower for a modern diesel-electric freight locomotive.

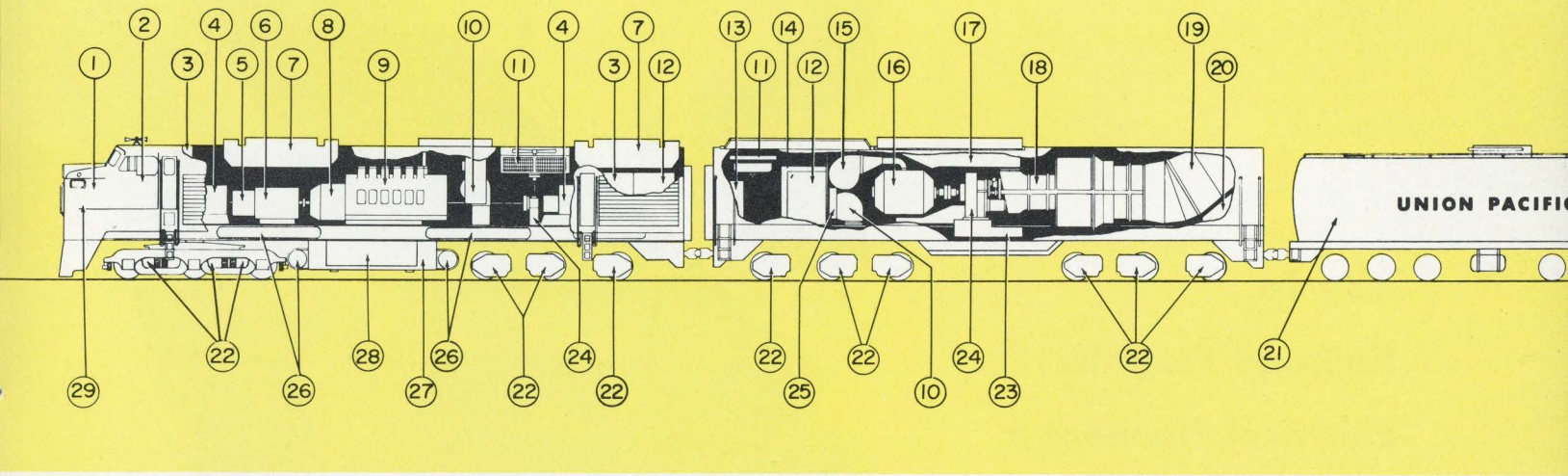
2 Relatively low cost of Bunker C type fuel oil.

3 Elimination of reciprocating parts provides dependable power and promotes low maintenance cost.

4 Excellent riding qualities and ease of handling.

5 High horsepower permits high-speed train operation. In other words, gas turbine-electrics will haul more tons at higher speed, obtaining more gross ton miles per freight train hour.

On a rugged road like the Union Pacific's Ogden to Green River run, the performance of the new gas turbine-electric will be superior to that obtained with a *4-unit 7000-horsepower*-diesel-electric locomotive. New combustion chamber design offers long life, low maintenance cost, and POWER.



1. Air-brake Equipment
2. Operator's Cab
3. Auxiliary Control
4. Compressor
5. D-C Auxiliary Generator
6. A-C Generator
7. Braking Resistor
8. D-C Generator
9. Auxiliary Diesel Engine
10. Traction-motor Blower
11. Radiator
12. Propulsion Control
13. Sandbox
14. Excitation Control
15. Generator Blower
16. Traction Generators
17. Turbine Air Intake
18. Gas Turbine
19. Turbine Exhaust
20. Power-plant Equipment
21. Gas-turbine Fuel Tender (Furnished by Union Pacific Railroad)
22. Traction Motors
23. Lubricating-oil Tank
24. Gear Box
25. Power Transformer
26. Air Reservoirs
27. Diesel Fuel Tank
28. Battery Box
29. Train Control

GENERAL ELECTRIC

Key To

Railroad Progress....

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