Preserving ***"THE FEATHER RIVER ROUTE"***

The Train Sheet

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News from the Feather River Rail Society and the Portola Railroad Museum

THE LITTLE ENGINES THAT DID

by Eugene John Vicknair

There is a very old, almost lost chapter in the history of America's railroads and their motive power. It is a story of the very first diesel locomotives, the first wave in the movement, which would eventually topple King Steam from his throne. Today, they are nearly forgotten, and except for a few scant museum pieces, all but extinct. They did not wear memorable paint schemes, nor were they christened with heroic names like Zephyr or Super Chief. Instead, they go by the pe-

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Our very own "Boxcab", Foley Bros. No. 110-1, the last remaining 100-ton unit, awaits volunteers to take up the call to duty and help restore this important piece of locomotive history. - Frank Brehm

Inside this issue:

INSTRUCTIONS FOR FOLEY BROS. LOCOMOTIVE #110-1

Original mimeo sheets for 100-tonner retyped and reproduced here for your enjoyment with all typos. Courtesy of Norm Holmes collection.

Ingersoll-Rand's instructions:

INSTRUCTIONS FOR LOCOMOTIVE # 110-1.

Weekly inspection, appr. 150 hrs.

1 Clean and inspect all oil purifiers.
2 (oil purifiers bowls should be cleaned every 24 hours.)
3 clean and inspect duplex fuel oil screens.
4 Inspect fuel injection pump plunger adjustment.
5 Inspect distributor adjustment set screws.
6 Fill rocker boxes to proper level.
7 Fill water tanks to proper level.
8 Take up all leaks.
9 Fill crank case with lubricating oil to proper level.
10 After inspection and work is done, equipment should be operated to see all is in first class condition before handing over to operator.

Monthly inspection, appr. 600 hrs.
in addition to other inspections.

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The Little Engines That Did

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destrian name of "boxcabs". Their history is incomplete and little remarked, but their legacy has completely rebuilt the structure of the world's railroads and redefined their methods. It still thrives today.

THE HISTORY

The creation of modern railroading began when steam had yet to reach its zenith. In 1892, Dr. Rudolph Diesel designed the compression ignition internal-combustion engine that would later bear his name. Other inventors, such as England's Charles Stuart (who actually designed an earlier version), joined him in building and marketing these type power plants for marine and stationary industrial uses.

Soon, innovators in the railroading world began investigating this new motive power. Sweden fielded the first known diesel powered rail car in 1913, as a self-propelled passenger carrier. This was the lone example until 1918, when electric traction supplier General Electric first explored the concept of diesels for freight railroading. That year, the firm constructed three experimental units equipped with GE-designed 200 hp, 8 cylinder engines. Two were built as steeple-cabs, while the third was specially armored for the U.S. Army and possible service in World War I. They, and later experimentals by Baldwin, proved unsatisfactory, as their weight to horsepower ratio and reliability were very poor. These locomotives did, however, introduce several very important innovations, foremost being the combined use of the diesel engine and an electric transmission and traction motors to transmit the power to the wheels. This system was pioneered by GE on small, gas-engine switchers beginning in 1913.

Since the inception of internal combustion engines, many methods have been utilized to transmit their power into useful work. The most familiar is a direct transmission, usually through gears or drive shafts, but early on some adjustable belt systems were used, mostly in stationary services. While sufficient for low horsepower, these mechanical systems would prove unreliable in heavy railroading applications, where the force required to move several tons from a dead stop would shear teeth and crush shafts. Hydraulic transmissions later found limited success, mostly in Europe, but still a more powerful, easier to maintain system was required.

What General Electric essentially did in 1918, was marry the diesel engine to an electric freight locomotive, or "motor" as they are commonly called. The principals of electric traction were already well developed, GE simply tossed the power plant along for the ride. A new concept, the "oil-electric" locomotive, was born.

The little 1918 GEs were mainly experimental, and proved to be unsuccessful. But the stage had been set for the first wave of diesels to arrive. In 1924, General Electric decided to follow this start into the marketplace, and teamed with engine builder Ingersoll-Rand to produce a 300 hp demonstrator locomotive in a "boxcab" body. When Alco (American Locomotive Company) joined the consortium in late 1924, the curtain arose on the first line of diesel locomotives ever produced.

THE LOCOMOTIVES

The heart of the Alco-GE-IR boxcabs was the Ingersoll-Rand vertical 6 cylinder 10 X 12 prime mover. This four-stroke, in-line engine displaced 942 cubic inches per cylinder and produced 300 horsepower at a stately maximum of 550 RPM. Rugged and powerful for its time, this prime mover would power over 100 early locomotives, many of which operated for thirty years with their original engines intact. The 60-ton version, which dominated early production, contained one prime mover. The later 100-ton version held two, set side by side in the carbody.

General Electric was responsible for providing the electrical systems. Within each truck were mounted two nose-suspended, 600 volt direct current traction motors, supplied by a 200 kW, 600 volt GEC generator geared to the prime mover. The control system was also adapted from contemporary traction practices, consisting of a throttle, which in the diesels controlled engine output, and a "master controller", which connected the traction motors in either series or parallel and controlled direction of travel. The operating handles were mounted in a small stand at the engineers position, a simple precursor to the larger control stands found in later locomotives.

Alco constructed the carbodies and running gear, and assembled the units at its main plant in Schenectady, New York. Each boxcab rode on two two-axle equalized trucks, equipped with American Railway Association standard friction bearing journals (very similar those used under some contemporary electric motors). The locomotives all had rectangular windows spaced along their length, the number varying as production went on. Early models only had one door on each side, while later versions added a door centered in each end. All of the GE-Alco-IR and later GE-IR boxcabs were constructed with bi-directional control, with a small operator's cab at each end.

Cylinders, cylinder heads, and combustion chambers were all completely water-jacketed and cooled by a closed water system. Water was circulated by a centrifugal pump geared directly from the crank shaft. Most of the early units used sets of tube radiators mounted on the roof for heat dissipation. Several units, including Reading 60-ton 51 and some of the 100-ton locomotives substituted enclosed boxes with prominent fans for cooling. When Alco left the consortium, the style changed to a GE designed radiator, with two large fans on the roof centerline, one at each end, flanked by two boxes containing the

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INSTRUCTIONS FOR FOLEY BROS. LOCOMOTIVE #110-1

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1 Flush and refill water system.
2 Inspect water pump and impellor.
3 Inspect lubricating screen in crank case.
4 Clean air intake filters.
5 Clean fuel filter box and screens.
6 Grease flexible coupling.
7 Inspect gov. and gearing thru hand hole cover.

Quarterly inspection, appr. 1300 hrs.
in addition to other inspections.

Check clearances on crank pin bearings and if they exceed limits close bearings in.

Semi annual inspection, appr. 3600 hrs.
in addition to other inspections.

Change lubricating oil and clean crank case.
Take up main berings and thoroghly inspect interior of crank case.
Take up on crank pin bearings if necessary.

Annual inspection, appr. 7200 hrs.
in addition to other inspections.

A complete overhauling of engine, a representative of the I. R. Co. will be present if notified.

These suggestions may be changed, altered or added to, to suit local conditions, for more detailed instructions please refer to instruction book.

Ingersoll Rand Co. representative,
(s) Ed. P. Gallagher

General Electric's instructions:

INSTRUCTIONS FOR LOCOMOTIVE No. 110-1

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Weekly inspection, appr. 150 hrs.

1. Inspect batteries for gravity and water.
2. TRACTION MOTORS - check armature bearing oil level, axle bearing oil level.
3. Turn grease cup two turns on generator.
4. Turn grease cup two turns on generator.
5. Turn grease cup two turns on traction motor blowers.
6. Turn grease cup two turns on radiator fan motors.
7. Turn grease cup one turn twice a week on compressor motors.

Monthly inspection, Approx. 600 hours
in addition to other inspections.

1. GENERATOR AND EXCITER - Examine commutator, armature clearance, field connections.
2. TRACTION MOTORS - Check commutator bead ring, grease each gear with ½ pound of block gear grease.
3. AIR COMPRESSOR MOTOR - Examine same as generator, fill crank case to proper level with air compressor oil.
4. TRACTION MOTOR BLOWERS - Examine same as generator.
5. RADIATOR BLOWER MOTORS - Examine same as generator.
6. CONTACTOR COMPARTMENT - Tighten all loose connections and parts, replace all burned or worn contactor contacts, examine tension on reverser fingers, clean and lubricate all air cylinders.
7. CONTROLLER - Clean and lubricate fingers, check coil action.
8. THROTTLE SWITCH - Examine connections and spring tension, wipe off contacts.
9. BATTERY PANEL - Inspect for loose connections.
10. SWITCHES - Inspect all hand switches for loose or broken parts.

Semi Annual Inspection, Approx. 3600 hours in addition to monthly inspection.

1. Check air gap of generator after taking up main bearings.
2. TRACTION MOTORS - a. measure bearing wear; axle 1/8" armature 1/16",endplay 5/16" and 3/16" respectively.
   b. replace waste in dip pocket.
   c. examine gear and pinion for mesh wear.

Annual Inspection, Approx. 7200 hours
in addition to other inspection.

1. GENERATOR - Clean by spraying with carbon tetrachloride
2. TRACTION MOTORS - Remove motor from truck - see instruction book for details
3. COMPRESSOR MOTORS - Drain and refill crank case
4. Dielectric test with megger

The above suggestions may be altered or changed to suit local conditions. For more details refer to instruction book.

(s) B. T. Ridgewell
B. T. Ridgewell

General Electric Company representative