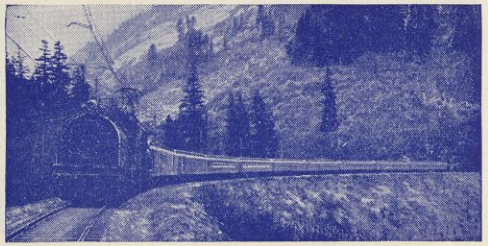
from

The MILWAUKEE ROAD

Electrification Exhibit

A CENTURY of PROGRESS CHICAGO

May 26th to Nov. 1st, 1934



The Olympian in the Cascades

OVER THE ROCKIES TO THE SEA BY THE POWER OF "WHITE COAL"

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You view here today, at A Century of Progress Exhibit, an integral part of this triumph of science. This giant locomotive, known as the Bi-Polar Gearless type, is one of several used in hauling "The Olympian," America's Queen of Transcontinental Trains, across the Cascade mountains. Other types, mainly the Quill type, are used in the zone embracing the Belt, Rocky and Bitter Root mountains, and in freight service in the Cascades.

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How electric power and the electric locomotive have revolutionized passenger service is evident to every traveler. Where previously an otherwise faultless journey was marred by smoke and cinders from the steam locomotive laboring up mountain grades or steaming through mountain tunnels, by the jerking and jarring incident to starting and the application and release of the air-brake on steep gradients and sharp curves, the electric locomotive now picks up its load and The Olympian moves immaculately over the rails with scarce a perceptible motion. Gliding is the word that best describes its even speed. As it is brought to a stop, the thousand ton train is eased down to a standstill by the even application of the current, and in starting again, the passenger is often surprised to find himself under way, so smooth is the application of power.

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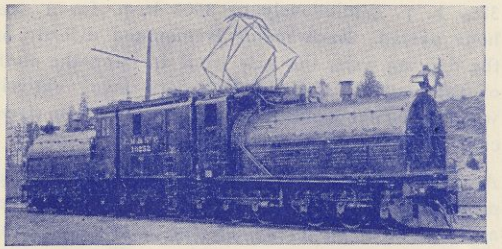

Bi-Polar Type Locomotive

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As it comes down to the sub-stations at 100,000 volts a. c. it is far in excess of any normal requirements, and too strong for direct application. So, through the medium of oil switches, it is reduced to 3,000 volts d. c. It passes out on feeder wires to the trolley suspended from poles along the track. From this trolley the power is taken down to the driving wheels of the locomotive through that claw-like arrangement, called the pantograph, that you see on top of the locomotive exhibited here. In transit it passes through various control devices before it reaches the motor itself. When introduced into the motor, the motor shaft is caused to revolve and it is this action which propels the locomotive.

CAPABLE OF 3500 HORSEPOWER

The locomotive which features this exhibit is called the Bi-Polar Gearless. It is equipped with twelve of these motors and is capable of developing

3200 h. p. continuously or 3500 h. p. for a one-hour period. Each motor is mounted directly on the driving axle, the axle itself forming the shaft of the motor. This method does away entirely with the usual gears such as are found on street cars.

An interesting feature of the locomotive is the means by which it is controlled. The locomotives are operated by many of the same men who formerly ran the steam engines. Therefore, so far as possible, the control arrangement was made to duplicate the arrangement commonly found on a steam locomotive. Also, as it would produce a dangerous condition to have the 3,000 volts in the engineer's cab, all the switches that are in contact with this high voltage are operated by compressed air or low voltage electro magnets.

The Engineer handles only the air control or low voltage switches. The high voltage circuits are all confined in a separate compartment. No one is permitted to enter this compartment while the pantograph is in contact with the trolley.

REGENERATIVE BRAKING

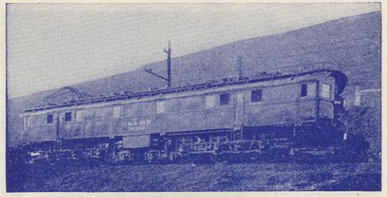
A very important feature of this locomotive is the so-called regenerative braking whereby energy is reversed on the descending grades. This is accomplished by reversing the usual function of the electric motors, thus utilizing the momentum of the train to drive them as generators. On the long sustained grades, encountered in crossing the several mountain ranges, great skill is required to handle the heavy freight or high-speed passenger trains with the usual air brakes. To control a 3500-ton train traveling at a rate of 17 miles per hour on a 2 per cent grade, 6700 h. p. must be dissipated. Is it surprising then that brake shoes sometimes become red hot?

With the electric locomotive the air brakes are used only in emergency or in bringing the train to a full stop and the energy that would otherwise be wasted in heating the brake shoes is converted into electricity and returned to the power plant. Not only is this a big saving but it also contributes greatly to the comfort of the traveler. The grinding and jerking often encountered with the use of the air brake is eliminated and the train descends with a smoothness that is remarkable. From 40 to 60 per cent of the energy that was required to pull the train up the mountain is recovered in making the descent. About 12 per cent of the entire amount drawn from the power plant is later returned or in effect merely borrowed.

656 MILES ELECTRIFIED

The first section of electrified travel encountered en route westward is at Harlowton, Mont., where the line extends to Avery, Idaho, a distance of 440 miles. In this section the railroad crosses the Belt Mountains, the main range of the Rockies, and the Bitter Root Mountains, where the severe winter weather makes operation under steam power very difficult. Scenically, this entire region is one vast expanse of rugged grandeur. The towering mountains, the colored walls of the canyons and winding, tangled, rocky streams create a vista both magnificent and inspiring.

In 1918, after two years of test, the results of the electrification were so satisfactory that a second electrification zone was authorized. This includes the extreme west end of the main line of The Milwaukee Road between Othello and Seattle-Tacoma, Washington, over the Cascades, a distance of 216 miles, where heavy grades and severe winters prevail. This total of 656 miles is by far America's Longest Electrified Railroad.



Quill Type Locomotive

If you ever travel over these two electrified stretches you will readily see how electric power and the electric locomotive have revolutionized passenger service. There is, of course, the complete absence of smoke, soot and cinders; tunnels through the mountains are clean and fumeless. In the summer, open observation cars are an enjoyable part of The Olympian's regular equipment. The combination of these cars and electrical operation makes it possible for the passengers to enjoy full-vision views along the scenically supreme trail of The Olympian.

Other advantages are increased operating ease and economy, reduced wear on rails and equipment, maximum of cold weather safety and for the most part trouble-free handling of traffic in districts that normally present tremendous operating difficulties.

SPARKS FROM THE LOCOMOTIVE ON EXHIBIT

Class.....Passenger
Type of Drive.....Bi-Polar Gearless
Number in use.....5
Length over all.....76 feet
Total wheel base.....67 feet
Rigid wheel base.....13 ft. 9 in.
Total weight.....521,200 lbs.

Weight on Drivers.....457,800 lbs.
Per cent of weight on driver.....87.8%
Average weight per driving axle. 38,150 lbs.
Diameter of driving wheel.....44 in.
Diameter of guiding wheel.....36 in.
Number of driving motors.....12
Continuous rating-total output.....3,200 h. p.
Hourly rating-total output.....3,500 h. p.
Tractive effort available at starting114,450 lbs.

Throughout the entire electrification system of 656 miles, 23,239,208 pounds of copper is used in the different facilities involved.

First! Again and Again—

THE MILWAUKEE ROAD

First and only road to operate over its own rails all the way from Chicago to the North Pacific Coast

First line between Chicago and the Twin Cities —the only double-tracked route

First to adopt roller bearings for through passenger trains

First to operate all-steel trains between Chicago and the Twin Cities; between Chicago and Seattle-Tacoma

First to use open observation cars on transcontinental trains

First to use steam heat and electric lights on trains between Chicago and the Twin Cities

First to operate long distance trains by electric power

First to use electric refrigeration in dining cars

AIR CONDITIONING

of 30 Club, observation and dining cars will be ready for summer service on these

FAMOUS TRAINS

The OLYMPIAN—
Chicago—Milwaukee—St. Paul—Minneapolis—Yellowstone Park—Butte—Spokane—Seattle—Tacoma
Air conditioning on club-observation and dining cars

The PIONEER LIMITED—
Chicago—Milwaukee—La Crosse—St. Paul—Minneapolis
Air conditioning on club and dining cars

The DAY EXPRESS—
Chicago—Milwaukee—The Dells—La Crosse—St. Paul—Minneapolis
Air conditioning on parlor-observation and dining cars

The ARROW—
Chicago—Milwaukee—Des Moines—Omaha—Sioux City
Air conditioning on limousine, observation and dining cars

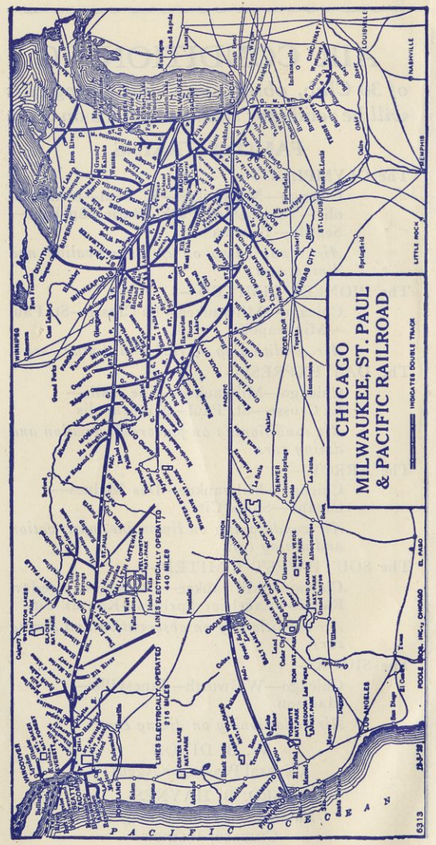
The SOUTHWEST LIMITED—
Chicago—Milwaukee—Davenport—Cedar Rapids—Excelsior Springs—Kansas City
Air conditioning on observation and dining cars

The SIOUX—
Chicago—Walworth—Janesville—Madison
Air conditioning on dining cars

W. B. DIXON
General Passenger Agent

GEO. B. HAYNES
Passenger Traffic Manager

CHICAGO, ILLINOIS



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POOLE BROS. INC., CHICAGO

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Sparks

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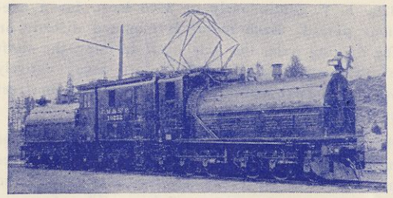

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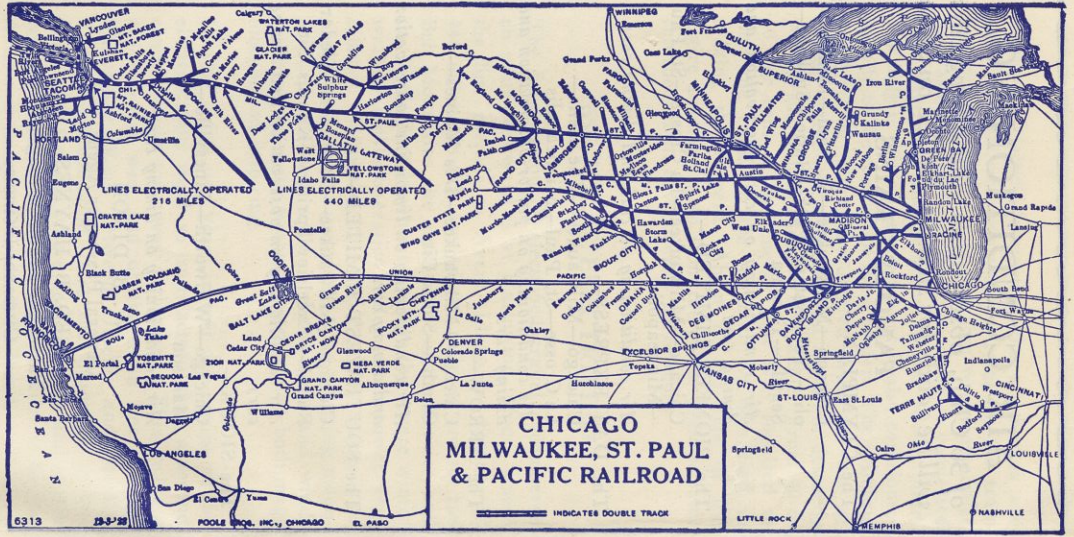

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