The Chicago, Milwaukee, St. Paul and Pacific Railroad today owns and operates America's Longest Electrified Railroad. Stretching for 656 miles, over four of America's greatest mountain ranges, it represents nine times as much electrification as all other transcontinental lines combined and its first stretch—440 miles from Harlowton, Mont., to Avery, Idaho—constitutes the longest continuous electrified ride in the world.

From all parts of the world, men who have spent a lifetime in the study of transportation, have come to these very mountain barriers to see for themselves how great a thing man has accomplished. 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.

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.

The source of this compelling current is in the mountain rivers, some of them as far distant as 200 miles from the rails over which you ride. These rivers are fed full with the waters of lakes and springs and with the melting snows of mountains that reach their summits into altitudes of almost perpetual winter. There the rivers leap and plunge down rocky cataracts, their maddened waters momentarily impounded and the full head of their imprisoned force is turned against the giant wheels of dynamos that generate electric power.

This current, generated at plants of several water-power companies, is carried along high-tension wires to twenty-two substations on the main line of The Milwaukee Road throughout the Belt, the Rocky, the Bitter Root and the Cascade ranges. As it comes down to the substations 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
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 long sustained grades, encountered in crossing the several mountain ranges, great skill is required to handle the heavy freight or high-speed passenger trains through the region. To control a 3,000-ton train traveling at a rate of 17 miles per hour on a 0.6 per cent grade, 6,700 HP must be dissipated. If it is 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 brakes 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 15 per cent of the entire amount drawn from the power plant is later returned or in effect merely borrowed.

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 pantographs are in contact with the trolley.