in the tunnel is about 5000 ft. and the grade on this inside run is only ½ to 1%.

Railroad Electrification.

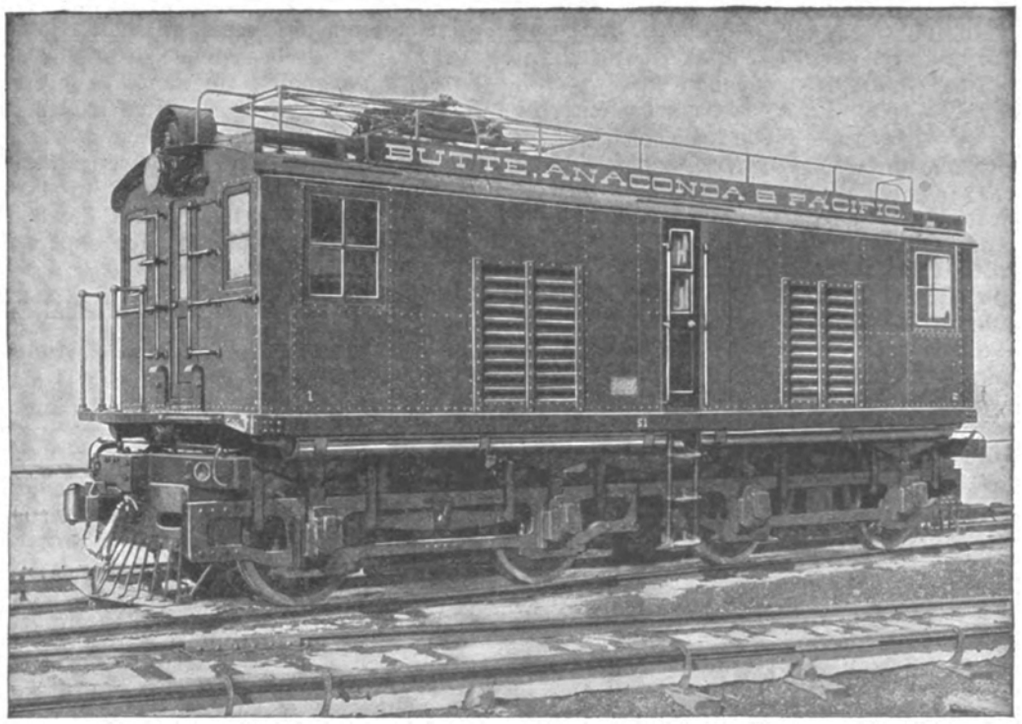
While the work of electrifying the Butte, Anaconda & Pacific railway was largely done in 1912 and 1913, the work was not entirely completed and in good running order until early in the present year. The system is essentially an ore-hauling road. The electrified lines are 32 miles in length, extending from the Butte Hill yards to the company's smelter. Sidings, yards and smelter tracks are equipped with overhead wires, making a total of nearly 95 miles of single trackage. The freight traffic in normal times will total 5,000,000 tons annually and is handled in steel ore-cars weighing about 18 tons, with a 50-ton capacity.

Energy for the operation of electric trains is purchased from the Great Falls Power Co. The generating plant is located at Great Falls, Mont., on the Missouri river. Six hydro-electric units are installed, having a nominal rated capacity of 21,000 kw.

The initial equipment of the road consisted of 17 locomotive units, 15 for freight and 2 for passenger, of General-Electric types. Each unit weighs approximately 80 tons. The two units for forming the freight locomotives in each case was coupled together and operated in multiple unit. The combination freight locomotives haul the usual trains of 3400 tons at a maximum speed of 15 miles an hour against the ruling grade, and at 21 miles per hour on level tangent track. The passenger locomotives are the same design as the freight locomotives, except that they are geared for a maximum speed of 45 miles per hour on level tangent track. All the locomotive equipment, as well as the sub-station apparatus and overhead line material, was designed and built by the General Electric Co.

As the prime cause for the change to electricity was an expected decrease in operating expenses, the results of the first 6-months' period of electrical operation, must have been exceedingly gratifying to the originators of the scheme. On an expenditure of $1,201,000 the company during this period made a net saving in operating expenses at the rate of $242,299.12 per year, or an earning of 20.02% on the investment.

The Chicago, Milwaukee & St. Paul railroad started work late in the year in preparation for the electrification of the Puget Sound lines, between Avery, Idaho, and Harlowton, Mont. This work involves 440 miles of main line and 10 miles of sidings and means the expenditure of $13,000,000 within the next 4 years. The section to be electrified is in the Rocky Mountain district. The road has signed a contract with the General Electric Co. involving a preliminary expenditure of over $2,000,000. It is proposed to haul freight trains of 2500 tons at a speed of from 15 to 18 miles an hour and passenger trains at a speed of from 25 to 30 miles an hour on a 2% incline. Powerful, especially designed electric locomotives for developing this speed, ascending maximum grades, have been ordered. Long time contracts with the Montana Power Co. and the Thompson Falls Power Co. have been entered into for the electrical energy necessary to perform these services. Plants will be erected at several points along the line. In time there eventually will be developed a tremendous reservoir of electrical energy at Great Falls from which may be drawn any amount of power to operate the railway.



TYPE OF ELECTRIC FREIGHT LOCOMOTIVE ON BUTTE, ANACONDA & PACIFIC RY.

The past year witnessed the installation of a large number of electrically-operated locomotives. Among these were those for the Boston & Montana Reduction works—two 8-ton bar-steel locomotives of the Westinghouse type, and Alaska-Treadwell—one 4½-ton storage battery locomotive and one 8-ton bar-steel trolley locomotive; all of the Westinghouse make.

Three new electric lomotives of unusual design were built early in the year for the Pennsylvania Lines west for handling cars at their Cleveland ore docks. These locomotives do not run on the same tracks as