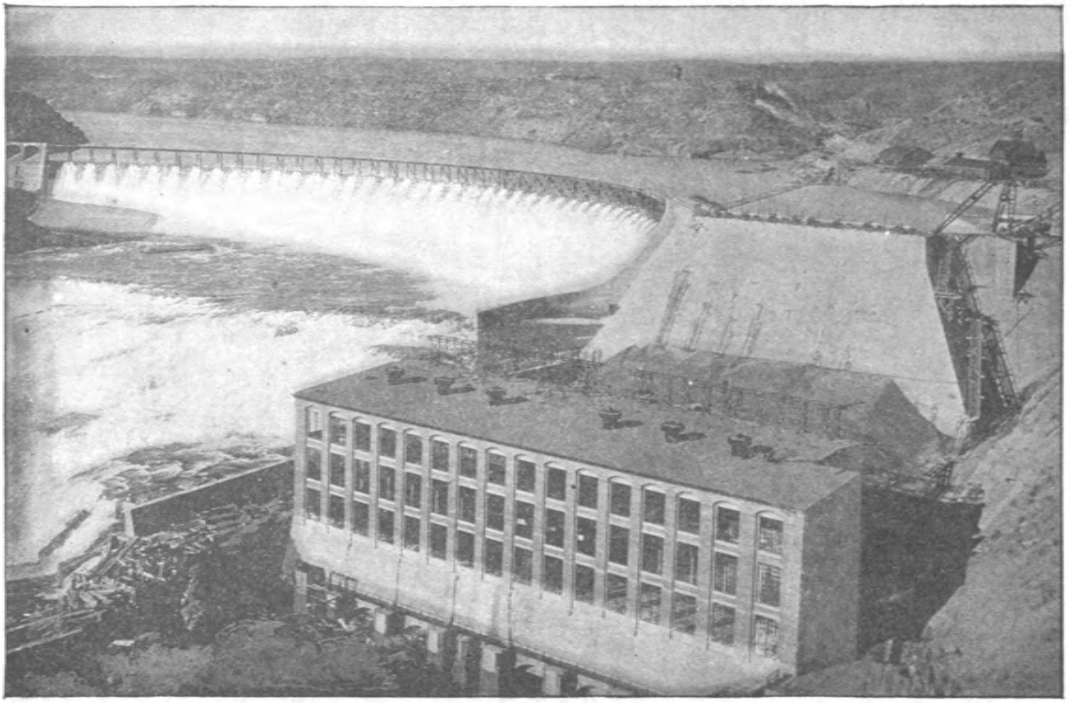
EMPLOYEES' MEETINGS

ONE of the most interesting programs of the season was the moving picture film "The King of the Rails," shown before the employees of the Southern and Western Divisions at Jackson and Grand Rapids. In each place, the showing of the picture was preceded by a talk on the "Electrification of the Chicago, Milwaukee and St. Paul Railroad" by Mr. H. E. Dunn of the General Electric Company. The film itself is a human interest motion picture story of transportation from the cave man's stone sled to the mile-a-minute electric trains of the Great West.

The first film shows the woodsman trying to lift a log. He finds he can draw but not lift; and the still larger log he cannot lift or draw, but roll. The picture successively showed the stone sled, the wheelbarrow, the ox-cart with wheels, the pony express, the relay horseback riders, De Witt-Clinton engine and coaches, the first railroad train. Evolution of street traffic from the horse car to the electric car and the subway and elevated is faithfully portrayed. Then follows the modern railway train and an inspection of the General Electric Co. shops showing construction of immense eight-motor locomotives—Rainbow and Great Falls dams, both providing unlimited sources of power. In conclusion, a railroad trip is taken through the "Great Divide" and Rocky Mountains behind the Twentieth Century "King of the Rails."

The electrified portion of the St. Paul extends from Harlowtown, Montana, to Avery, Idaho, a distance of 440 miles, the same as from Boston to Washington or New York to Buffalo. Three mountain ranges are traversed, the Big Belt, elevation 5768 ft.; Rocky 6350 ft., the Bitter Root 4200 ft. There are 21 miles of 2 per cent grade and 41 miles of 1 per cent grade. The cost of the electrification will be about $12,000,000. The Montana Power Company supplies the current at 100,000 volts, the largest station being at Great Falls, 60,000 KW capacity. The total capacity of the system is 160,000 KW. Fourteen sub-stations placed 35 miles apart supply the current to the lines at 3000 volts DC. Eight motors of 375 HP each, weighing 282 tons, equip the locomotives. It requires 2000 amperes to start a train and 1000 amperes is used by an 11-car steel train running on a level at 60 miles per hour. Forty-four electric locomotives perform the work of what was required formerly of 103 steam locomotives. The division points have been extended from 110 to 220 miles. Passenger cars can make from 20 to 30 miles per hour over the 2 per cent grade. Eighty-two freight cars can make 15 miles an hour with the electric locomotive, while with the steam locomotive 8 to 9 miles was the limit of speed attained.

Regenerative braking is employed where motors become generators returning from 40 to 60 per cent of the current to the line. Street cars will some day probably use regenerative braking, which, on a system like the Boston Elevated, would effect a saving of $1000 per car per year. Two-thirds of the current now used in accelerating is



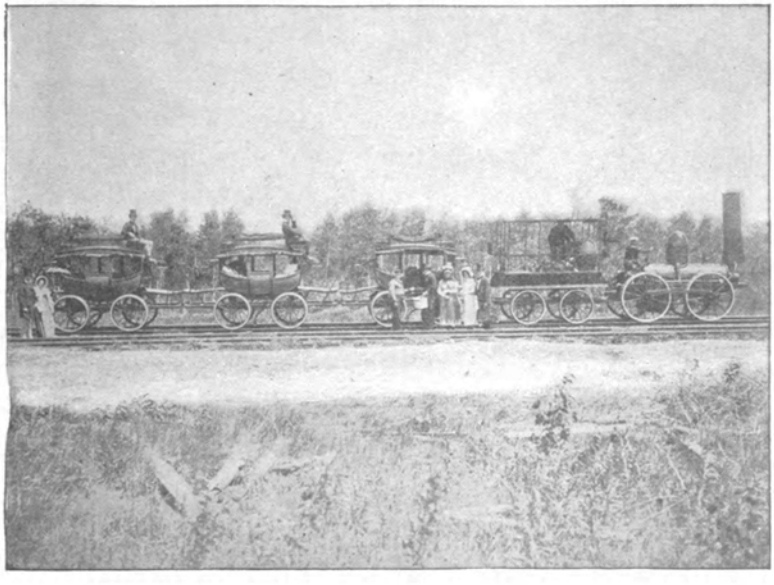
MONTANA POWER COMPANY, GREAT FALLS, SHOWING DAM AND EXTERIOR OF POWER STATION

immediately afterward dissipated at the brake shoes. The Norfolk & Western R. R. uses this method of braking.

The Pantagraph trolley is used to collect the current from the wire. During the severe cold of last winter 75 cars and 3 steam locomotives were stalled in the snow. One electric locomotive easily moved them.

Recently Louis W. Hill, President of the Great Northern R. R., and J. M. Hannaford, President of the Northern Pacific R. R., made a trip of 339 miles, the longest run ever made by any locomotive on the system. At the end of the trip, the locomotive was ready to return to the starting point without receiving any attention whatever.

It is estimated that electric locomotives can make about 1000 miles

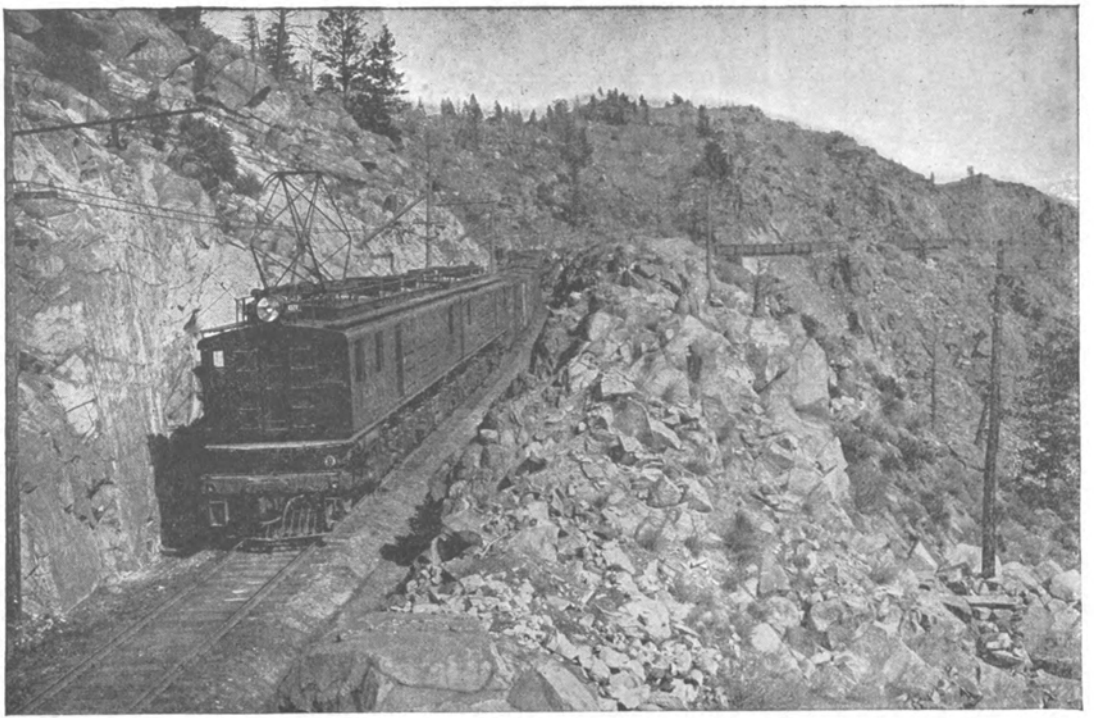


THE FIRST "KING OF THE RAILS" INVENTED BY DE WITT-CLINTON

without receiving care from the roundhouse, while a steam locomotive undergoes inspection at about 115 miles, especially in the mountainous district.

Passenger runs, formerly requiring 1 hour and 5 minutes, are now made in 40 minutes, and freight runs requiring 10 to 12 hours are now made in 7 to 8 hours. The locomotives cost about $35,000.

A tremendous saving has been effected by releasing cars formerly used in hauling coal from long distances, coal once used cannot be burned again, the coal supply is limited, water and coal stations on the system have been done away with as well as the cinder pits and roundhouses. Quick inspection and the turning back into service of the electric locomotive has saved a large amount in the labor item. The



CHICAGO, MILWAUKEE AND ST. PAUL 3000-VOLT, D. C. ELECTRIFICATION

steam engine is at its lowest efficiency in cold weather, while the electric locomotive is at the highest. On the heavy grades when air brakes were used the train was speeded then checked, while with regenerative braking the trains are stopped uniformly.

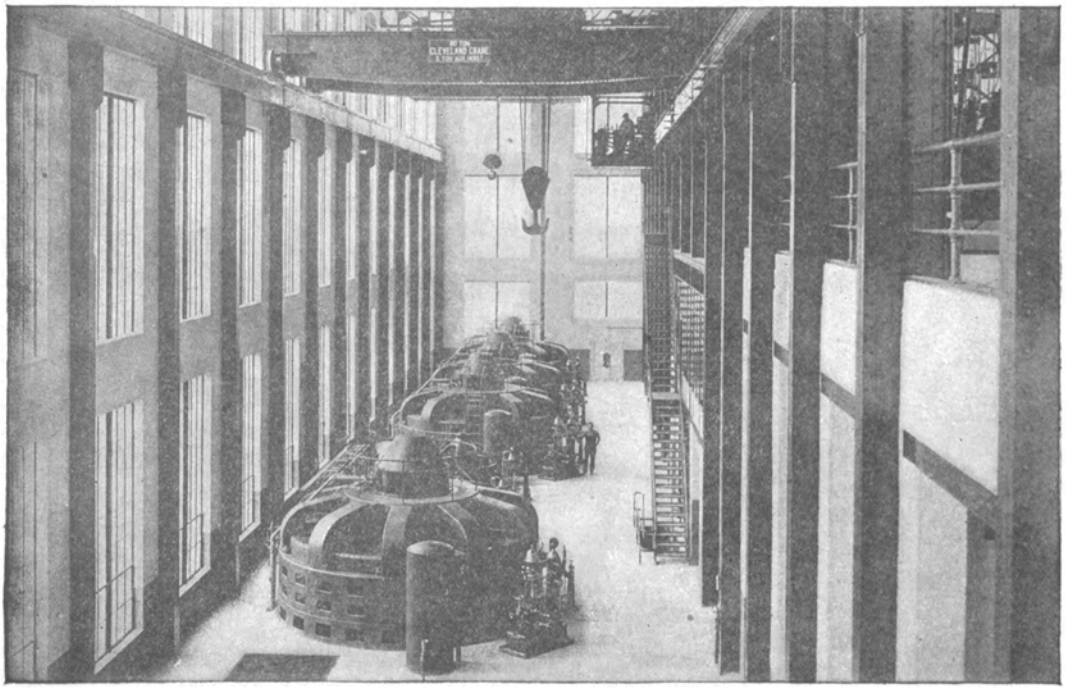
Within five years it is believed that all railroads west of the Rocky Mountains will be electrified. Fuel oil has advanced from 45 cents to $1.15 a barrel. There are 260,000 miles of railroad in the United States, 210,000 miles in all of Europe. In America there are 65,000 steam locomotives. One-half this number of electric locomotives could do the work.

The greatest distance and highest voltage at which power is transmitted is in California at 150,000 volts from the Sierras to Los Angeles, 250 miles away, where it is transformed down to practical voltage for commercial use. San Francisco receives its current 225 miles away from the Sierras. Last year the Pacific Gas & Electric Co. and the Great Western Power Co. used over one billion KW. Plans were completed for a 200,000 volt transmission system 700 miles long in South Africa from the Victoria Falls to the Rand mines. War delayed this project.

For the development of every horsepower from our streams, a saving of 13 tons of coal is made in a year. Fifteen million tons were saved by the water power in 1917. There are about 60,000,000 potential water horsepower in this country, which if developed in steam plants would require the annual consumption of 340,000,000 tons of coal. Only 10 per cent of our hydro-electric resources are now being used. This is national waste on an extensive scale. We are now using about 290,000,000 tons of coal a year for work which these water courses could perform just as well. The steam turbine is a great conserver of national resources. The Central Station of Chicago effected a saving in coal of 2,472,000 tons or 58,000 carloads for last year. This was due largely to utilizing large generating units and the shutting down of small uneconomical stations. In Italy it is figured that for every 1,000,000 KW generated by water, $20,000,000 is saved in coal. Next to men, coal is of the greatest value to that country in the present war. The Montana Power Co. has a load factor of 84 per cent due to the St. Paul load and the power used for irrigation purposes.

Representative Huddleston of Alabama recently spoke in the House on the Niagara Power Bill. Comparison was made of the three cent rate in Cleveland and the rate of 8 cents at Buffalo. He neglected to mention that the Municipal Company of Cleveland had failed to pay a cent of interest on the bonded indebtedness and that the monthly deficit of the Company was about $16,000 to $25,000.

Chicago, with a population of 2,500,000, has but one electricity supply undertaking, while London with a population of 7,500,000 has 60 to 70. The central station output of Chicago is twice that of London. If the entire requirements of Chicago including the small isolated plants were confined to one station $30,000,000 in investment and 5,900,000 tons of coal would be saved a year. Carrying out these proportions through the whole country would effect a saving in the annual coal bill of nearly $500,000,000.



MONTANA POWER COMPANY, GREAT FALLS, INTERIOR OF STATION

Advantages of Electrification of Railroads

Marked reduction in cost of electricity as compared with cost of coal.

Reduction in maintenance cost of locomotives.

Elimination of delays due to coaling, taking water, oil, etc.

Elimination of delays due to natural causes, such as freezing of locomotives, loss of steam in cold weather, bucking snowdrifts.

Elimination of non-revenue trains hauling coal and water for steam locomotives.

Increased tonnage per train.

Increased train speed on grades.

Greater reliability and certainty of maintaining schedules.

Reduction in train crew hours per ton mile.

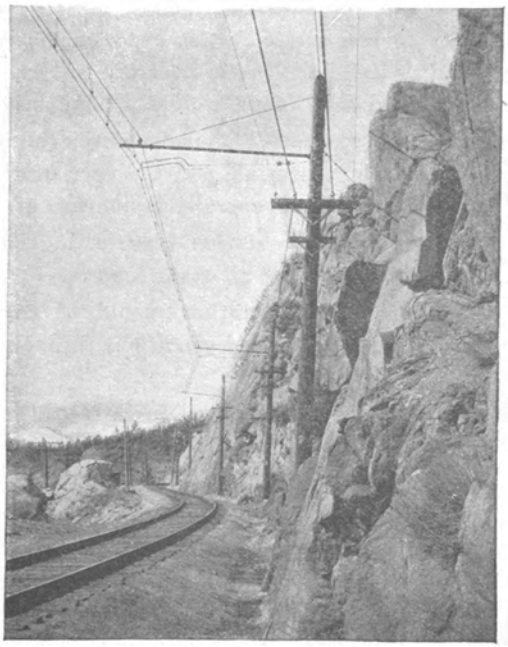
Reduction in damage to rolling stock due to rough handling by steam engines.

Greatly increased safety of operation on grades due to regenerative braking.

Saving in power and reduction in wheel and track wear by use of regenerative braking.

Improvement of tunnel conditions due to smoke and gas, absence of smoke and cinders which obscure scenic attractions, uniform speed and absence of grinding brake shoes on grades, all of which accrue to the benefit of the traveler on the trans-continental electric passenger trains.

(We are indebted to the General Electric Co., Schenectady, for the illustrations that accompany the foregoing write-up.)



Jefferson River Canyon