

RAILWAY ELECTRIFICATION*

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STILL smarting from the sufferings of two successive winters' fuel shortages, caused by inadequate transportation facilities, we are foregathered to see what can and should be done to prevent, if possible, recurrences of such serious and trying experiences.

No argument is required, I think you will agree, to support the contention that eliminating the need for coal at a considerable distance from the mine is a greater measure of relief, and of true conservation, than increasing mine production and thereby incidentally adding more load to the already overburdened railways. Reducing coal consumption automatically relieves or releases men and apparatus all along the route from the mine to the consumer; it also relieves the route itself from some of its congestion.

So eminent an authority as E. W. Rice, the president of the American Institute of Electrical Engineers, addressing that body in New York last month, made the following statement:—

"It is really terrifying to realize that 25 per cent. of the total amount of coal which we are digging from the earth is burned to operate our steam railroads—and burned under such inefficient conditions that an average of at least 6 pounds of coal is required per horse-power-hour of work performed. The same amount of coal burned in a modern central power station would produce an equivalent of three times that amount of power in the motors of an electric locomotive, even including all the losses of generation and transmission from the power station to the locomotive."

Mr. Rice went on to say that 150,000,000 tons of coal, nearly 25 per cent., of all the coal mined in the United States, were consumed in steam locomotives last year.

Here in Canada, steam locomotives also did their bit and consumed about 9,000,000 tons—30 per cent. of the 30,000,000 tons of coal imported into and mined in this country. Our 9,000,000 tons cover, I believe, wood and oil consumed on steam locomotives; some 49,000,000 gallons of oil are covered by the Canadian record. But in the United States figures, 40,000,000 barrels of oil (15 per cent. of the total output) are not included.

The conservation of—the elimination of the necessity for mining—those great quantities of fuel would be secured if all the railways were operated electrically, and if the electrical energy were generated from water power. Modern steam central stations would save from 50 per cent. to 66 per cent. of the coal now used in steam locomotives if the latter were discarded and electric locomotives used instead.

With such possibilities for fuel conservation in sight may we not soon expect to learn that the fuel controllers in both countries have asked the railways, and that the railway managers have asked their engineers: "How many of these millions of tons of coal can you save? When will the good work begin?"

It is said that our fuel shortages were due to a combination of bad weather and inadequate transportation. As we cannot control the weather our attention and efforts

must be directed to the transportation portion of the difficulty. Railway electrification will reduce coal consumption and haulage; it will also greatly improve traffic conditions. Electrification, therefore, seems to be the solution of the problem. Under these circumstances it may not be out of place to recite in general terms what electrification has actually accomplished on some notable railways.

Railroading in the mountains is the most strenuous kind of railway work. The examples which I have chosen cover mountain sections. The Butte, Anaconda and Pacific Railroad, by electrification, increased its ton-mileage 35 per cent. and at the same time decreased the number of trains, and their incidental expenses, 25 per cent. The time per trip was decreased 27 per cent. It is said their savings in the first year's operation, after electrification, amounted to 20 per cent. of the total cost of electrification. They buy power from water power plants.

On the Norfolk & Western Railway, power is obtained from their own steam station. Twelve electric locomotives have replaced 33 Mallets of the most modern and powerful type. The tonnage has been increased 50 per cent. Electrification obviated the necessity for double-tracking. The salvage value of the released steam engines was 45 per cent. of the cost of electrification. Electric locomotives make eight times as many miles-per-train-minute-delay as the steam engines. Their terminal lay-overs average 45 minutes and they are double-crewed every 24 hours. Pusher engine crews have been reduced from eight steam to four electric. Pusher engines or locomotives have been reduced from seven steam to two electric. Steam locomotives used to "fall down" in cold weather—the electric always "stand up," are really more efficient in cold weather. At the New York Railroad Club meeting last year their electrical engineer stated that "coal wharves, spark pits, water tanks and pumps, as well as roundhouses and turntables, have all disappeared from the electric zone. Our track capacity has been doubled. Our operating costs have been reduced. From an engineering, an operating and a financial viewpoint our electrification has been a success." Speaking of the value of the regenerative electric braking of their system, he went on to say: "The use of the air brake is practically eliminated; it is only used to stop trains. It is regrettable we are unable to put a dollars and cents value on this great asset; to appreciate it properly one must have had experience with the difficulties of handling 90-car trains with air." Another official, referring to the same subject, made the following statement: "Trains of 103 cars are taken over the summit twelve to twenty times every day, down the 2.4 per cent. grade, without ever touching the air. We never broke a train in two or slid a wheel. It is done so nicely we wouldn't spill a drop of water out of a glass in the caboose."

The 440 route miles of the Chicago, Milwaukee & St. Paul Railway which have been electrified will soon be augmented by 450 miles more. Nearly 900 route miles and about 33 per cent. in addition for passing tracks, yards, industrial tracks and sidings will soon represent the extent of this great railway electrification. Among the advantages secured by this railway on its electric sections are the following: The cruising radius of each electric locomotive is twice that of the steam engine. Subdivisional points, where freight crews and steam locomotives were formerly changed, have been abolished; the passenger crews' runs are now 220 miles instead of 110. For railway purposes, these stations do not now exist; seven or eight miles of track have been taken up; through freights do not leave the main line track at all; shops and

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