

Chicago Smoke Abatement and Railway Electrification

A brief summary from an advance statement concerning the report of the Chicago Railway Electrification Commission was printed in *Engineering News*, Nov. 25, p. 1024. The complete report of the commission was submitted on Dec. 1. As previously announced, the commission finds that the electrification of Chicago railways as a whole, while an engineering possibility, would involve an enormous cost wholly beyond the means of the railway companies to raise.

Five years ago the Chicago City Council passed an ordinance requiring the railways after a certain date to use some other motive power than steam locomotives to operate their trains within the city limits of Chicago. Public opinion was in a confused state concerning this ordinance, and with a view to determining the facts in the case the Chicago Association of Commerce appointed a commission of 17 citizens to investigate the whole subject and report. A large engineering organization was created headed by the late Horace G. Burt, former president of the Union Pacific R.R. After Mr. Burt's death in May, 1913, he was succeeded by Dr. W. F. M. Goss, Dean of the Engineering School of the University of Illinois.

AIR POLLUTION AND SMOKE PREVENTION

A vast amount of matter has been published concerning the causes and effects of smoke in cities. The commission's investigations showed that nearly all this published matter is of very doubtful reliability, being based on general impressions rather than scientific data. The commission found, for example, that greater harm to the health of city dwellers is done by the invisible products of combustion, such as sulphurous gas and fine mineral dust, than by the visible smoke. While two-thirds of the pollution of Chicago air is due to the combustion of coal, the other third is due to dust, gases, etc., from other sources, so that even if all combustion of coal were eliminated, considerable pollution of the air would remain. The smoke polluting the air of Chicago is found to proceed from the following sources:

	Per Cent.
Metallurgical furnaces and other manufacturing processes using fuel.....	64.26
High-pressure steam-power plants.....	19.34
Low-pressure steam-power plants and domestic heating.....	8.6
Railway locomotives.....	7.47

The locomotives, however, because their smoke is discharged near the ground, produce a somewhat larger proportion of the visible smoke, a little over 20% according to the figures of the commission.

It is evident from the above that if the steam locomotives were immediately done away with in Chicago, and other sources of air pollution allowed to continue unabated, the effect would hardly be noticeable by the general public.

RAILWAY ELECTRIFICATION

In order to eliminate steam locomotives in Chicago it will be necessary to electrify the lines of 38 steam railway companies owning a total of 3,476 mi. of track, of which nearly half is main-line track. This mileage of electrified steam-railway line would be twice as great as the mileage of all the electrified steam lines in the entire United States and would be even greater, by about 15%, than the mileage of all the electrified lines in the world. The

number of electric locomotives required would be about $2\frac{1}{2}$ times the entire number now existing in the world.

The commission gave much attention to the selection of the best system for electrification, recognizing that if electrification were to be undertaken the system should be made uniform for all lines. The commission finally selected the overhead contact system using a single-phase current at 11,000 volts as on the whole the cheapest and most desirable. The commission recognized that there are objections to this system on account of danger to employees and also inductive interference with telephone and telegraph wires; but the difficulties are on the whole less than would be experienced were direct current used, either from a third rail or from an overhead wire.

The commission's estimate of the total cost of electrification showed a minimum of \$178,127,000. A number of the railways entering Chicago, however, have taken this estimate and find that in order to operate their lines economically under the electrified plan it would be necessary to extend the electrification considerably farther than was assumed by the commission and also to make a large immediate outlay for track elevation and other improvements. These changes increased the estimate made by the commission by something over 50%. Applying this proportion to the commission's estimate as a whole, the final probable cost of electrification would be in round numbers \$275,000,000.

The commission estimated that electrification would produce some gain in the railway earnings and some reduction in the operating expenses together sufficient to increase the net revenues of the railways by \$2,336,000. Deducting this amount from the interest and depreciation charges on the cost of electrification, there is left an annual deficit of \$14,600,000.

RAILWAY FINANCES AT LOW EBB

While some of the Chicago railways are in financial position to assume their share of the cost of electrification, most of the railway companies would find it absolutely impossible. In fact several companies are now in receivers' hands. The city could not share to any large extent in the expense of the work, since its margin of indebtedness under the state constitution would not permit it. If it were attempted to pay the cost of electrification by a tax upon the traffic passing through Chicago it would be a serious handicap to the business of the city in competition with other commercial centers. Moreover, were Chicago to require its steam railways to electrify their terminals, there is no doubt that numerous other cities might and would make similar demands.

It is especially to be noted that the commission's conclusions relate only to the electrification of the Chicago railways as a whole. It did not separately investigate the relative economy of electric operation for suburban service. There is a strong feeling in Chicago that some of its suburban steam lines, notably the Illinois Central, should be electrified not only for the relief from smoke and dust of the densely populated sections of the city through which the line runs, but because of the gain the company would make by reduced operating expenses and increased traffic. The commission held, however, that such investigations were the business of individual roads to make and that its duty was to deal with the problem presented by the proposed sweeping municipal legislation compelling electrification of the entire railway system of the city in order to abate the smoke nuisance.