Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

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Cincinnati Explains the Difference

IN THE issue of March 20 we commented on the excellent report on the street railway situation made in Kansas City. This week we print a digest of a Cincinnati report analyzing the reason for fare difference in Cincinnati and Cleveland. It is another piece of evidence of the rapidly growing appreciation of the electric railway business. The report shows a comprehension of some of the costs of furnishing local transportation.

But, more than this, it is another example of what happens when two parties who have different conceptions get acquainted with each other's views and problems. We have consistently encouraged such efforts on the part of both company and public and believe these efforts should never be allowed to lag. The final result is sure to be an appreciation on the part of the public of many of the problems of transportation and also a growing confidence in the managers and operators of transportation properties.

Novel Features Introduced in a "Service-at-Cost" Plan

THE idea of cost of service as a basis for the conditions under which city transportation is to be supplied is extending. The latest city to adopt the plan is Memphis. In the method of its adoption, however, the Memphis case is unique, at least so far as we now recall. In that city the plan was not the result of a bargain between the company and the city, but it became an order through the new Public Service Commission of Tennessee. It has been accepted, however, by both company and city.

The origin and the authority under which the plan was promulgated, however, are not the only novel features of the Memphis agreement. One departure from previous practice is that the agreement provides for two reserve funds, each with critical upper and lower limits and independent of each other, one for a depreciation fund and the other for determining fares. The latter, as usual, is the surplus after all the charges of every kind are paid, while the former is a variable percentage of the value of the depreciable property of the company, the variation in percentage depending upon the amount of money in the fund. Incidentally, there are some other novel features, such as the use for a service index of car-miles per passenger instead of its reciprocal and the establishment of a maximum service limit, that is to say, a minimum number of passengers per car-mile. The latter we regard as a salutary sign of the growing interest of cities and the public in general in limiting the expenses of the companies. The provision of procedure to follow in the case of emergencies is a rather wise planning for the future.

It is only reasonable to expect that there will be progress in franchise making, as in other branches of human endeavor. The service-at-cost franchise is one of the youngest forms of agreements for railway operation and evolution in it is to be expected. The Public Service Commission of Tennessee has helped the industry by its contributions toward this development.

What Electric Railroading Is Like Under Arctic Conditions

NO PLAN has yet been formulated to build an electric line over the route from northern Greenland to the North Pole followed by the late Admiral Peary. Nevertheless, if such a line should be built there are many managers in this country who feel that so far as experience with fighting snow is concerned, based on the experience of the past winter, they would be fully qualified to operate such a line. Evidence from every side is that the past three months have been the worst as regards snow ever experienced, at least in the northeastern part of the country.

January was unusually severe on electric operation, but it remained for the next two months to cap the climax. The storm of Feb. 5 was so heavy that many of the routes had actually to be abandoned, and some of them had not been dug out when the storm of March 6 put things in as bad condition as they were before, or worse. There are still parts of New England, or were last week, where there are cars on the road in the position in which they were stalled on Feb. 5. Even in New York City traffic was stopped because of the weather on at least one of the longitudinal lines for about the same length of time as on the interurban stretches. The sections thus blocked have been, it is true, lines of normally light traffic, and the energies of the operating companies have naturally been devoted first to clearing the heavily traveled routes, but the fact that traffic had to be suspended on them for more than seven weeks shows the severity of the climatic conditions.

The trouble seems not to have been due entirely to the quantity of snow which fell during the two major snowstorms in the period in question, but to the nature of the precipitation. This consisted in many areas in part of fine hail, which, combined with partially melted snow, coated the tracks with ice. This made necessary the use of picks as well as shovels. Another factor more important than ever before to delay electric railway traffic was the increased number of automobiles, particularly of motor trucks. These not only kept on the tracks, because the tracks were the only parts of the highways which were cleared, and thus impeded the

car movements, but with their heavy loads they packed the snow down again on the rails and made not one but many clearings of the tracks by the railway companies necessary.

There is no doubt that the large increase in the number of motor vehicles during the last few years makes necessary some change in the plan by which our highways, both in cities and between cities, are kept free from snow in winter. Heretofore, this burden has been thrown almost entirely on the electric railway companies. They have removed snow from their tracks, and as other streets have not been touched all traffic has naturally used the narrow strip cleared by the railway company. This condition prevails not only in the city but also in the country where electric tracks are built along the highway. Even where the space between the rails is at one side of the highway and not paved the motor vehicles will use the tracks, because the snow soon becomes packed there to the height of the rails and the rest of the road is impassable.

To lessen the delays which have been caused by the use of his single-track line in this way by motor vehicles last winter one ingenious railway manager organized a sort of dispatching system between his cars for these trucks. He dug out turnouts for the trucks at intervals along the line and then sent his cars through in batches. Otherwise, there would have been endless confusion and congestion. It was not done primarily as an act of civic betterment, but purely to permit his own cars to use his own tracks after they had been dug out by his own men.

But this was not the only gratuitous work that he had to do to keep his tracks clear for his own cars. On account of the severity of the weather individual motor trucks would frequently break down, and as they always broke down on the track, because that was the only clear part of the highway, they had to be lifted off by railway employees. Again, motor vehicles which used the track at night, when there were no railway employees to help, and were broken down or became stalled from the snow would frequently be found in the morning abandoned and blocking the track. Even the movement at night of motor trucks which did not break down and did not require dispatching was a source of considerable expense to the company. This was because they would pack down hard on the track and roadway any snow which fell in the night or drifted over onto the tracks, with the result that railway traffic in the morning could be resumed only if the solidified ice and snow left by the motor trucks was removed by the renewed use of pick and scraper by the railway company. The experience of one manager has been cited not as an isolated instance, but because it is typical of many roads in New England similarly situated.

Something must be done to remedy this state of affairs. We believe that every one will admit that it is not the duty of the railway companies to act in the winter as a servant without pay to every user of the highway, providing the only route by which they can travel and helping them out if they break down, at least to the extent of getting them off the track. The question has not been a critical one before because the number of motor vehicles has not been large, nor have they constituted so large a percentage of the total number of users of the highway. The farmer's sleigh would use the portion of the road intended for general vehicles, but if the number of vehicles on wheels is now so large in winter as to require cleared roads they should be provided by the county or city. Otherwise, the railway companies may well consider making no attempt to keep in operation after a heavy snowstorm those sections of their tracks which have only a light traffic.

Snow and Water Keep the Motor Maintainer Awake at Night

THE recent terrible weather has brought up questions other than that of whose duty it is to remove snow and ice from the highways for the use of vehicles other than the electric cars. One of these questions is as to what is the most efficient form of snow-fighting equipment. Another is whether there is any way of making motors so that they will be less adversely affected by such weather as we experienced during the past few months.

Undoubtedly the conditions have been most unfavorable for electrical apparatus. Motors with ample capacity to operate cars on a dry, clean rail become overloaded unless very large when the cars have to be forced over a rail covered with snow and with the grooves often filled with ice. Where the wheels slip motormen will leave the current on for a long period, hoping that the wheels will bite. Water will find its way into the casing and snow and small particles of ice will be drawn in through the ventilating ducts. If brine from the salt used to melt the snow at switch points gets into the motor it will hasten deterioration.

Alternate baking from overload and wetting will affect the windings of any motor. In spite of these difficulties some means must be found for preventing motors from failing even under the arduous conditions presented by winter service. It will not do to consider the motor only as a "fair weather" machine. This is a matter which should be taken up most seriously by the electrical companies.

"In the City Hall" a Continuous Performance

"NIGHTIE NIGHT" is a play that sounds naughty but turns out nice. It is a legitimate farce with a thousand laughs. One pays a speculator $3 for a ticket and feels well repaid. In New York, however, there is a greater farce than "Nightie Night" or even "Up in Mabel's Room." It is the uproariously funny "In the City Hall." The principal actors are all politicians. The direct admission price is nothing. There will be an ultimate price, however, but that is another story. In "In the City Hall" the unwilling villain recently withdrew. The going got too rough for him. He had been heckled enough. The late Richard Mansfield was a rough leading man, but he was gentle compared with leading man Hylan and his understudies in the great traction drama. But the *dramatis personnae* of "In the City Hall" announce that the show will go on without the villain.

Of course it will. Jesters are jesters. But let us return to the stage. The Interborough villain was arraigned by the city for not saving enough. The New York Railways villain was arraigned for saving too much. Buses were put on Staten Island by the city to replace the trolleys that were withdrawn. Now the city wants to buy electric cars, seize the Midland Railway and run the road itself.

In Manhattan, however, more than a million dollars is appropriated by the city to purchase buses to replace street cars. In the midst of the play New York's Mayor, all worn out shoveling snow, went to Palm Beach, leaving the sun and the rain to do away with the snow that he hadn't removed. Nature's slow process has succeeded where human nature failed. And yet Barnum & Bailey have come to New York with their clowns. As if there were not enough high-paid circus talent in New York already!

Of Course Shoe Prices Are Higher

THE Allied Council of the Shoe and Leather Industry and Trades (a name to conjure with!) is reported to have decided upon a campaign of publicity. Its purpose is not primarily to increase the consumption of shoes, but to explain why shoes cost more than they did. And this is a perfectly straightforward proposition, because the shoe industry wants satisfied patrons. Of course the shoe men are not pleading for permission to charge a higher price, they do that anyway; but they want shoe users, which category takes in everybody, to wear their footgear contentedly, feeling that they have had a "good buy."

How similar is the case of the shoe men to that of the electric railway operators, and yet how different! Car rides cost more than they did, just like shoes. But the ride makers and vendors cannot put up their prices and then tell the public, "It's too bad, but it must be done." No, the public somehow has a different standard for utility service and shoe service. In fact, the shoe purchaser says almost with pride: "I paid $16 for those shoes; some price, eh?" And as for luxuries, the people are throwing money away like water. They seem to enjoy paying high prices. But who ever heard of a car patron hankering for a higher fare?

All of this is so obvious to the railway operator that it seems as if the dullest member of the body politic ought to see it. But he doesn't, or possibly he will not. Hence there is on each railway manager a burden, not only of giving the best service possible under his circumstances, but of convincing the public, often against its will, that if diamonds, shoes and toothpicks legitimately cost more, as they do, then it must be willing to pay a small part of the enormously increased contents of its pay envelope for being transported safely, reasonably, quickly and, in general, comfortably from place to place by means of the electric car.

The Water Bug and His Monomania

THE water bug is a creature who is obsessed with the monomania that if he could run electric railway securities through a clothes-wringer the electric railway's fare would shrink in the same ratio as the dehydrated securities. Without entering into any of the "reproduction cost new" or other valuation theories of the day, we venture to affirm that in most cases the amount of water squirted out from the wringer rolls would be much less than the water bug expected. In fact, we had a specific case called to our attention recently where the "rentals and interest" item proved amazingly small despite the fact that the property in question is not exactly as dry as the United States at large. "Rentals and interest" were actually less than 10 per cent of all expenditures. Hence if this railway had no overhead at all, the fare could not possibly be cut more than ½ cent if figured from a 5-cent basis. It would have astonished the water bug to find that "taxes," if abolished entirely, would have permitted practically the same reduction! But, of course, the water bug does not believe in the elimination of taxes, even if he does dream that people will lend money to a concern which cannot guarantee either the payment of interest or the return of principal.

The real reason for the insufficiency of the 5-cent fare lay exactly where the railway had asserted it did, namely, in the higher cost of labor, materials and fuel. Thus the increase alone of platform wages was in itself equal to entire fixed charges and taxes together. If electric railway managers would but stress points like this more often there would be less backbiting by the water bugs. It is proper enough to insist that fictitious values should be squeezed out, but the public ought to and can be made to understand that on most electric railways "rentals and interest" is not of primary or even of secondary importance in the allocation of the fare to the several channels of expenditure.

Steam Railroad Electrification Must Be Considered More Broadly

SO far the transportation interests of the country have merely dabbled in the subject of steam railroad electrification. Probably this is natural and logical, but the time is now here when the situation must be changed. In the past attention has been focussed more on the technical than the economic phases of the subject. This is certainly not to be deplored, as it is the normal and proper order first to develop a new system to a reasonable degree of perfection, then to fit it into its proper place in the industrial machine. It would have been foolish to spend a lot of money in equipping a railroad for electrical operation before the locomotives and power supply had emerged from the experimental stage. They have done so now, however, and attention may well be turned toward the next stage, that of application to the transportation needs of the country.

A glance at the pages of transportation papers here and abroad will show the change which is now going on in the minds of the leaders of thought in this field. There are at least two salient features here. One is the necessity for fuel conservation, a conspicuous factor in European electrification plans. The other is the urgency of complete rehabilitation of the steam roads, involving vast sums, running into the billions of dollars. Now if electrification is coming, and all thoughtful transportation men seem to feel that it is, it is vital to bring in a logical electrification program in connection with the coming great expenditures. We realize that the money for all of this work is not in sight and that 1920 budgets are being pruned to the limit. But the country's life depends upon good transportation. The H. C. L. will come down when the character of our transportation in all of its various phases goes up.

We must have good railroads, fine railroads, and what we must have we can have; maybe not in 1920, but progress will not stop with 1920. We may have to think in decades, rather than years, but whatever the unit of time in which we think, the unit of investment cost in railroads must be the billion.

Norfolk Invites the Public Utility Investor

This Virginia City Announces a "Service-at-a-Profit" Policy— State Corporation Commission Encourages This Attitude

A POLICY of actual encouragement and invitation to public utility investors is now the official corporate platform of Norfolk, Va. We believe this to be the first case in which a municipality by corporate action, in this instance unanimous, has *guaranteed* both capital and cumulative return at an inviting rate on that capital invested in public utilities within its limits. It is perhaps the most striking example of the changing attitude of the public toward public utility enterprises and may prove a leading case in the future treatment of public utilities by governmental agencies. In effect, the city recognizes not only the right but the necessity of a public utility earning a fair profit.

The present case has to do with the City Gas Company of Norfolk, one of the subsidiaries of the Virginia Railway & Power Company, but this is merely the first of a series, for there are rearrangements of railway and light and power relations to follow. A policy had to be determined at the start. The city, therefore, when advised by the company that an increase in gas rates would be requested through the State Corporation Commission, set out to determine its own attitude in the matter. Norfolk acts in public utility matters on the advice of its Public Utilities Commission, an advisory body of leading citizens, which reports to the council of five. The commission and council engaged A. Merritt Taylor, former Transit Commissioner of Philadelphia and manager of the Division of Transportation and Housing of the Emergency Fleet Corporation during the war.

A valuation and report were made by Mr. Taylor and his associate, Charles B. Cooke, Jr., some details of which were noted in the ELECTRIC RAILWAY JOURNAL of March 27. A principle announced in this report was unanimously adopted by the Public Utilities Commission and also by the City Council as a sort of city platform toward utilities. Personal interviews with the chairman of the commission, the city attorney and others indicate that the city means what it says. The authorities have gone into the matter with their eyes open and with a full appreciation that the public utility is a business responsive to the same fluctuations and limitations as other businesses.

As corollary to the platform the city states further its belief:

"Municipalities which ignore this cardinal principle are not entitled to the confidence of those who have capital to invest and will be shunned by them.

"Municipalities which adopt and adhere to this cardinal principle will be sought out as safe places to which capital will become readily available for the up-building of public utilities and other constructive enterprises."

The city and company met on this platform and agreed on a valuation and a rate. The understanding was not one-sided, for there was disagreement as to valuation, as well as criticism as to service and as to quality of gas, points on which the company recognized its duty and so made concessions in valuation and arrangements to restore 100 per cent service condition. The company felt assured that the city's attitude would make possible the obtaining of necessary funds for extending and improving the service. The city authorized its representatives and Mr. Taylor to urge its program before the State Corporation Commission at the hearing.

When the case came before the State commission on Monday of this week Virginia's attitude as a state was shown to have that same broad-gage business policy reflected by the city of Norfolk. There was no trial, or even a presentation of testimony in the usual sense. The commission, while reserving the right to check the figures in detail, took the business-like attitude that if the city authorities, the city's expert and the company agreed on a working basis, on a platform approved by the commission and on a rate for gas, the agreement was probably fair and the new rate would be approved. Commissioner William A. Rhea, chairman, repeated the commission's policy that "Unless public utilities get some relief, Virginia will either lose its utilities or get poor service. . . . The present instance presents a *prima facie* case and it appears the commission's duty to approve this agreement." There were a few objections from irate citizens who didn't want to pay $1.60 per thousand cubic feet for gas, but even they expressed a desire to deal fairly with the company and merely questioned the accuracy of figures.

The general impression, after a study of the situation on the ground, is that the city of Norfolk and the State of Virginia desire to encourage utility growth. They believe that public utilities are necessary and as businesses are amenable to the same laws as other businesses. They realize that successful public utilities encourage not only healthy growth in the utilities themselves but also the development of other enterprises in the community. They believe that the "service-at-a-fair-profit" policy they have adopted will assist in the material and social advancement of the whole state.

Norfolk Public Utility Platform

"Capital legitimately invested in public utility properties must be safeguarded and protected by municipalities, both as to principal and as to a just and inviting return thereon after reimbursement to the company for expenses incurred in providing service."

The Place of the Bus—II

Details Are Presented of the Relative Costs of Car and Bus Operation in Great Britain, Together With Some Notes on Bus Design, Weight and Capacity — Operating Speeds, Legal Regulations, Fuel and Roadway Taxes Are Also Considered

BY WALTER JACKSON
Consulting Engineer

ALTHOUGH British unit costs are different from our own, there is much that can be learned by studying comparisons of car and bus operations in Great Britain, particularly where the figures relate to the respective operations in the same community and under the same management. These figures will show that wherever the services are co-ordinated instead of competitive the number of passengers per vehicle-mile is usually much less on the bus than on the car, clearly indicating that the buses are being used for light-traffic routes. Furthermore, the earnings per bus-mile and the receipts per passenger are generally in excess of like classifications on the electric railway because the average ride on the bus is longer and the rate of fare on the bus is higher. The schedule speeds of the buses are almost always higher than those of the cars, not on account of superior flexibility or higher maximum speeds but because the buses average fewer stops per mile and have a much larger proportion of their runs in suburban territory or open country.

LONDON'S NEW DOUBLE-DECK FORTY-SIX-SEATER, WHICH WEIGHS ONLY 170 LB. PER SEAT

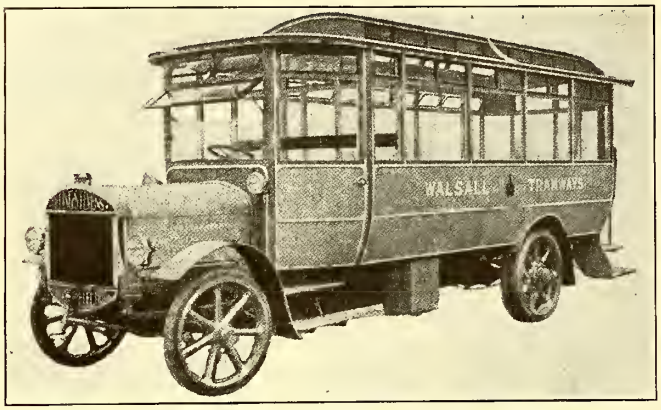
Facts like the foregoing can be readily deduced by a study of the accompanying Table I, which has been prepared from the private records of a number of British tramways conducting bus services. In this table there have been included the bus figures for both 1917 and 1918, whereas the car figures were available only for 1917. It will be understood, of course, that the operating expenses of the cars have also gone up during 1918, as will be seen from the following data, but not in the same proportion as for the buses. The reason that favors the car is its larger capacity, which makes the predominant increase, wages, less troublesome than with the smaller bus. On the other hand, the bus is not held down by statute to fixed maximum rates of fare and therefore has been more successful in getting more revenue per passenger carried. As the average length of ride is also greater on the buses, there is less tendency to lose traffic because of any increase in fares.

Table I shows that on System "E" the passengers per vehicle-mile for 1917 ran as low as 2.6 per bus - mile compared with 9.3 per car-mile, and as high as 6.6 per bus - mile compared with 11 per car-mile on System "H." System "C," enjoying the extraordinary traffic of 19.4 passengers per car-mile, did not do better than 3.3 passengers per bus-mile. These figures clearly indicate that the buses are confined to lines of what the British consider extremely light traffic, or to routes of seasonal or pleasure traffic. System "C" has been running buses for nearly fifteen years, System "E" for nearly seven years and System "H" for six years, so it may be assumed that these companies have had enough experience to determine the correct field of the motor bus.

TABLE 1—COMPARATIVE EARNINGS, EARNINGS PER PASSENGER, EXPENSES, PASSENGERS PER VEHICLE MILE AND SPEEDS OF CARS AND BUSES RUN IN THE SAME DISTRICT UNDER THE SAME MANAGEMENT. BUS AND CAR FIGURES FOR 1917, ALSO BUS FIGURES FOR 1918

Community	A Cents	B Cents	C Cents	D Cents	E Cents	F Cents	G Cents	H Cents
Earnings per car-mile 1917	31.4	31.0	36.9	32.8	22.11	28.5	27.9	31.3
Earnings per bus-mile 1917	47.0	46.9	38.3	43.0	34.6	36.7	36.4	34.8
Earnings per bus-mile 1918	60.6	50.8	45.4	52.9	43.6	43.7	45.8	41.2
Earnings per car-pass. 1917	2.54	1.92	1.10	2.46	2.38	2.38	2.54	2.38
Earn. per bus-pass. 1917	10.04	11.04	11.24	13.82	12.24	8.48	10.34	5.28
Earn. per bus-pass. 1918	11.58	12.18	11.72	16.16	13.04	9.20	12.34	5.60
Earnings per car-hour 1917	$1.88	$2.34	$2.67	$1.41	$1.36	$1.80	$1.80	$2.16
Earnings per bus-hour 1917	3.85	4.04	3.34	2.89	3.94	2.61	3.34	2.81
Earnings per bus-hour 1918	4.20	4.18	3.79	3.51	4.49	3.12	4.01	3.36
Expenses per car-mile 1917	20.2	24.0	20.9	17.8	13.2	17.4	17.1	14.9
Expenses per bus-mile 1917	26.2	27.1	31.4	27.5	24.5	25.6	29.4	28.9
Expenses per bus-mile 1918	34.1	32.3	31.3	37.1	28.7	32.1	39.1	33.6
Exp. per car-hour 1917	$1.21	$1.81	$1.51	$1.08	$0.82	$1.10	$1.11	$1.06
Expenses per bus-hour 1917	2.16	2.33	2.74	1.86	2.09	1.82	2.61	2.33
Expenses per bus-hour 1918	2.98	2.65	2.61	2.46	2.96	2.32	3.43	2.73
Miles per car-hour 1917	6.0	7.5	7.2	6.1	6.2	6.3	6.5	7.1
Miles per bus-hour 1917	8.2	8.6	8.7	6.7	8.5	7.1	8.9	6.6
Miles per bus-hour 1918	8.1	8.2	8.3	6.6	10.3	7.2	8.8	7.3
Pass. per car-mile 1917	12.3	16.0	19.4	9.4	9.3	11.8	10.8	11.0
Pass. per bus-mile 1917	4.6	4.2	3.3	3.1	2.6	4.2	3.6	6.6
Pass. per bus-mile 1918	5.2	4.1	3.7	3.2	3.0	4.6	3.3	7.3

That the fares are higher and the average length of ride longer on the buses is shown by their universally higher intake per vehicle-mile and per passenger. In 1917 System "A" showed 47 cents per bus-mile against 31.4 cents per car-mile, although the cars had 12.3 passengers and the buses only 4.6 passengers per car-mile. Hence the earnings per passenger were more than 10 cents on the bus against only 2.54 cents on the car. Similar conditions prevail on the other systems. The schedule speeds of the motor-buses varied



SINGLE-DECK BUS FOR WALSALL CORPORATION TRAMWAYS

from 6.6 to 8.9 m.p.h. as compared with 7.1 to 7.5 m.p.h. on the larger cars in heavier service.

Table I also shows that the operating expenses per vehicle-mile are invariably higher with the bus even without due allowance to the car for its larger capacity. Against 13.2 cents per car-mile on System "E" we have a bus cost of 24.5 cents (28.7 cents in 1918); against 17.8 cents per car-mile on System "D" we have 27.5 cents per bus-mile (31.1 cents in 1918), etc. It will be understood that in both cases only actual operating expenses are presented. Taxes, depreciation and overhead charges are not included. The operating expenses charged against the car include power, distribution, track, line and buildings.

COMPARATIVE COSTS ON MUNICIPAL TRAMWAYS

The Manchester Corporation Tramways has been running buses since 1914. The relative development of the bus service in this city of 950,000 is expressed by the following comparative data for the fiscal year ended March 31, 1919:[1]

Passengers carried on cars	253,940,203
Passengers carried on buses	1,821,310
Car-miles run	18,146,551
Bus-miles run	218,292
Revenue per car-mile	36.2 cents
Revenue per bus-mile	29.8 cents
Operating expenses per car-mile	25.5 cents
Operating expenses per bus-mile	23.2 cents

The foregoing comparisons are not absolutely exact because the last annual report gives the over-all statistics with buses included, aside from the separate bus tabulation. However, the bus is so small a part of the whole that it is hardly necessary to make corrections for the same. The operating expenses per bus-mile are in this case less than for the cars, but the cost per bus-seat furnished is undoubtedly much higher, judging from the fact that Manchester operates double-deck, double-truck cars. As 218,292 bus-miles were

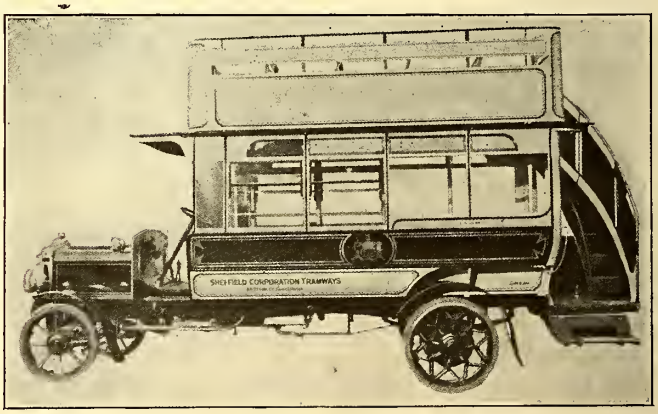
[1]In this and all other tables in this article 2 cents have been taken as being the equivalent of 1 penny.

TABLE II—OPERATING COSTS PER MILE OF MOTOR BUSES OF MANCHESTER CORPORATION TRAMWAYS

Traffic expenses:	
Superintendence and other traffic wages	0.2d.
Wages of drivers and guards	2.507
Bonuses and sick pay	0.040
Cleaning and oiling	0.719
Depot expenses	0.192
Ticket check	0.285
Uniforms (furnished free)	0.113
Licenses and sundries	0.065
General expenses:	
Salaries and wages—administration	0.138
Taxes on depots	0.088
Printing and stationery	0.023
Fuel, light and water	0.022
Compensation	0.055
Insurance	0.044
Repairs and maintenance:	
Tires	0.530
Chassis	1.500
Bodies	0.255
Buildings and machinery	0.060
Power—petrol	4.801
Total operating expense	11.637 d.
Depreciation	1.376 d.
War bonuses	1.674 d.
Balance	0.231 d.
Total income	14.918 d. or 7.5 cents

required for 1,821,310 passengers, the passengers per bus-mile equal 8.3 while the revenue per passenger is 3.6 cents. The passengers per car-mile during the same period equal 13.9 while the revenue per passenger is 2.6 cents. The present Manchester bus routes are extensions from the Palatine Road tramway terminus to Northenden, Cheadle and West Point. The headways are thirty and sixty minutes. Table II is a detailed statement of the cost of Manchester motor-bus operation for the year ended March 31, 1919. It will be noted that, because of the present abnormal price of automobile fuel, the cost of petrol is even higher than wages.

Without question, the paper on motor-bus costs versus car costs presented before the 1919 conference of the Municipal Tramways Association by A. R. Fearnley, general manager Sheffield Corporation Tramways, is the best presentation of the subject to date. It will be well, therefore, to repeat and supplement some of the figures presented by Mr. Fearnley and



DOUBLE-DECK BUS FOR SHEFFIELD CORPORATION TRAMWAYS

abstracted in the ELECTRIC RAILWAY JOURNAL for Dec. 13, 1919.

The first point to be noted in Mr. Fearnley's paper is that the expenses of different classifications (traffic expenses, general expenses, repairs, road maintenance and fuel) have risen as follows:

Cost per bus-mile in 1915	14.070 cents
Cost per bus-mile in 1918	28.044 cents
Cost per bus-mile in 1919	35.792 censt

It will be interesting to compare these increases with those pertaining to Sheffield cars as presented in the annual report for the fiscal year ended March 25, 1919:

Cost per car-mile in 1915	13.136 cents
Cost per car-mile in 1918	20.344 cents
Cost per car-mile in 1919	24.776 cents

From this it appears that while the bus has risen 21.722 cents per mile since 1915, the car has risen but 11.64 cents per mile. The maximum carrying capacity of the Sheffield buses is thirty-seven each, and of the cars seventy-six, or more than twice as great.

Mr. Fearnley observes that on the basis of unit per unit, regardless of seating capacity, the comparison of operating and fixed charges works out as follows for his conditions:

	Car, Cents	Bus, Cents	Per Cent for the Bus
Operating expenses per mile	24.776	35.792 or	44.5 more
Fixed charges or overhead per mile	3.376	1.846 or	45.3 less
Total cost per mile	28.152	47.638 or	33.7 more

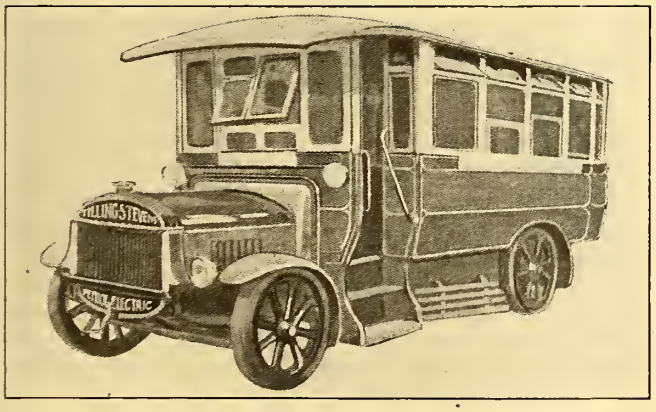
But this is only part of the story, because it is also necessary to credit the car with its greater passenger-carrying capacity. The comparison then stands:

	Car, Cents	Bus, Cents	Per Cent for the Bus
Operating expenses per passenger	1.432	4.274 or	198.0 more
Fixed charges or overhead per passenger	0.196	0.220 or	12.3 more
Total cost	1.628	4.494 or	176.0 more

Upon the basis of passengers actually carried, even the fixed charges were greater with the bus than with the car. Again, upon the basis of number of seats provided per vehicle-mile run, we have the following:

	Car, Cents	Bus, Cents	Per Cent for the Bus
Operating expenses	0.460	1.064 or	131.3 more
Overhead or fixed charges	0.062	0.054 or	12.9 less
Total cost	0.522	1.118 or	114.1 more

The receipts per bus-mile were 40.914 cents compared with 33.326 cents per car-mile, an excess of 23.5



GAS-ELECTRIC BUS WITH FRONT DOORWAY

per cent; while the receipts per seat-mile provided were 1.216 cents for the bus and 0.614 cents for the car, an excess of 98 per cent. Although the bus fares averaged 3 cents a mile against 1.304 cents a mile for the car, an excess of 130 per cent, the higher rate and slightly higher speed were not sufficient to offset the higher cost of giving bus service. With regard to speed, Mr. Fearnley noted that as about three-fourths of the bus operation was in open country, a superiority of 15.26 per cent for the bus (9.97 m.p.h. against 8.65 m.p.h.) was not important. Mr. Fearnley might have added that the speed of the buses would have been considerably less if they had been seventy-six seaters like the cars, and operated under like conditions of traffic.

While the Sheffield management is well aware of the higher cost of the bus on any comparable basis, it does not hesitate to recommend the installation of motor buses where thin-traffic extensions, cross-town routes,

SINGLE-DECK BUS WITH BAGGAGE RACK, USED FOR RAILROAD STATION CONNECTIONS

high-grade residential districts and seasonal pleasure routes are to be served. In fact, it also considers the possibility of paralleling a tramway route, or running toward the same terminus, for purposes of traffic relief.

London General Omnibus Company No Longer a Bonanza

Without questioning the value of the motor bus for the various purposes outlined in these articles, it is necessary to emphasize the fact that the bus does not cure all the difficulties incident to transportation on rails and that it is not exempt from the necessity of earning more than it spends. For these reasons, it is well to look closely into the operations and history of the London General Omnibus Company, because conscienceless bus promotors in this country are pointing it out as the "embodiment of everything that's excellent" in the way of making money. A recent prospectus, for example, declares that: "The £100 shares of the company which stood at £18 in December, 1909, had risen steadily to £400 in June, 1913." How many investors are buying *electric railway* stock on the basis of the quotations of 1913? About as many as are buying London General Omnibus shares after the heavy losses of recent years!

There is no mystery whatever about the status of this company, for, following an application for fare increases, an audit of its books was made last year for the Home Office of the Government by Sir Arthur F. Whinney. Some of the following figures are derived from this report, published in July, 1919:

In 1913, gross earnings per mile were	8.57d. and expenses, 7.10d.
In 1914, gross earnings per mile were	9.14d. and expenses, 7.44d.
In 1915, gross earnings per mile were	10.78d. and expenses, 8.58d.
In 1916, gross earnings per mile were	10.99d. and expenses, 9.26d.
In 1917, gross earnings per mile were	12.72d. and expenses, 11.58d.
In 1918, gross earnings per mile were	15.32d. and expenses, 14.05d.
In 1919, gross earnings per mile were	16.68d. and expenses, 17.71d.*

* From abstract of London General Omnibus Company's Report for 1919 in *Electric Railway Journal* for March 20, 1920, page 620.

Table III on page 686 shows the principal operating expenses for 1913-1918. From these figures it is clear

TABLE III. OPERATING EXPENSES IN PENCE PER BUS-MILE, LONDON GENERAL OMNIBUS COMPANY, YEARS 1913 TO 1918, INCLUSIVE

	1913	1914	1915	1916	1917	1918
Traffic expenses, wages, etc	2.92	3.24	3.70	3.86	4.24	5.26
Maintenance, repairs and renewals	1.52	1.56	2.13	2.47	3.17	3.41
Petrol	1.00	1.16	1.31	1.46	2.60	3.80
Tires	....	....	....	....	....	....
Other expenses, including administration and depreciation	1.02	1.10	0.59	0.52	0.51	0.50
	0.64	0.68	0.85	0.95	1.06	1.08
Total	7.10	7.44	8.58	9.26	11.58	14.05

NOTE—Platform expense alone (drivers and conductors) was 2.6d. per bus-mile in 1916, 2.8d. in 1917, 3.7d. in 1918. These increases do not include increases and 8-hour day inaugurated during 1919.

Cost of petrol rose from 7.8d. per gal. in 1913 (when 7.8 miles were being obtained per gallon) to 27.5 d. in 1918. These prices include a net tax of 1.5d. per gallon up to 1915 and a tax of 3d. per gallon since 1915.

that all items have advanced except tires. The increases in gross earnings during the latter years of the war are due more to overcrowding than to increased fares. There was so great a shortage of equipment by the end of the war that it was necessary to impress 143 motor trucks into an emergency service that resulted in a loss of 10 cents per mile operated. An idea of the conditions caused by the war is indicated by the fact that in 1918 the operation of 67,197,422 bus-miles brought £4,289,114, whereas in 1914, 99,365,363 bus-miles were operated to earn £3,785,581. That increased fares had little to do with this appears from the following record:

DECREASES IN LENGTH OF AVERAGE PENNY RIDE (IN MILES)

	To Sept. 1917	To Aug. 1918	To April 1919	To June 1919	Since
Central area (including city) west and northwest area	1.60	1.53	1.38	1.25	1.25
Rest of London and suburbs	1.52	1.52	1.46	1.46	1.31

It will be observed that the figures also include changes made during 1919. Nevertheless, the London General Omnibus Company's report for the quarter ended March 31, 1919, showed an operating loss of £9,590, while the deficiency for all of 1919 (as met by the Common Fund payment herewith described) was £424,003.

Returning now to Table III, it will be seen that by the end of 1918 the operating expenses had doubled during the war period in rising from 7.1d. (14.2 cents) to 14.05d. (28.1 cents) for vehicles seating no more than thirty-four passengers. The differential of 1.27d. (2.54 cents) between receipts and expenses in 1918, the year of maximum crowding, has been wiped out by the coming of the eight-hour day, as shown by the figures for 1919.

In the meantime, the majority of the buses had been in use for more than the five years which the company fixes as their efficient life. For this reason, the company had accumulated a reserve fund of £1,904,868, which, however, was over £1,000,000 short of the £3,000,000 needed to replace outworn equipment, with 2,500 forty-six-seaters costing at least £1,200 each. In addition to this renewal fund, the company had on hand the sum of £511,153, derived from the sale of motor buses for war purposes, but this still left it several hundred thousands of pounds short for renewals. The effect of keeping equipment in use for an average of seven instead of five years appears in part from the fact that the maintenance charge per bus per annum rose from £222 in 1913 to £451 in 1918. In other words, the annual upkeep of buses averaging less than thirty-four seats was more than one-third the first cost of the new forty-six-seat bus!

Stripped of all detail, the actual status of the London General Omnibus Company is best revealed by its relationship to the Common Fund established under the London Electric Railway Companies' Facilities Act, 1915, whereby each company (the bus company and the underground lines) pays its own operating expenses, fixed charges and interest on debentures, dividends on preferred stocks and shares (except the second preferred stock in the Metropolitan District Railway) and retains such sums as it thinks necessary for depreciation and reserve. The balance of income is then paid over to the common fund, of which the London General Omnibus share was 40 per cent up to Dec. 31, 1915, and 32 per cent thereafter. The respective London General Omnibus payments follow:

	Paid In	Received
1915	£311,803	£180,546
1916	259,077	162,230
1917	*Nil*	190,396
1918	*Nil*	210,043
1919	*Nil*	424,003
Total	£570,880	£1,167,218

From this it is clear that the London General Omnibus Company is no longer the rich uncle of the famous London combine. It never would have been that welcome relative at any time in its career if buses had been taxed as heavily as trams. Thus, in the year 1915, when the London General Omnibus showed a profit of $1,500,000, it was figured by H. H. Gordon of the London County Council that proportional taxation would have wiped out this profit, for the buses were then paying only $200 each a year as a contribution toward public needs compared with $1,000 per annum by every car in the London area. One must conclude, therefore, that the motor bus, like the electric car, is not gifted with any miraculous powers over the laws of economics.

If anything, the bus has suffered far more from the effect of war increases. Gasoline has risen more than coal; shorter-lived rolling stock must be replaced regardless of cost, and wage increases naturally have been more hurtful to a vehicle employing two people for thirty-four-seats than one employing the same number for seventy-six or seventy-eight seats. Thus, while the bus-mile operating cost rose from 17.16 cents in 1915 to 28.1 cents in 1918, the West Ham Corporation Tramways in East London had a car-mile increase from 15.3 cents in 1915 to 22.56 cents in 1918. The bus increase was therefore 10.94 cents and the car increase 7.26 cents, and the greater increase had to be applied to a vehicle of one-half the capacity of the car.

It is to be hoped that the present Government inquiry into the London traffic situation will result in the elimination of wasteful competition, for it is doubtful whether the London General Omnibus Company can afford to continue along the old lines. On the other hand, it has done and must continue to do its greatest and most necessary work in serving the trackless heart of London where the density of traffic and demand for short-haul riding should still permit profitable operation without a prohibitive increase in rates of fare.

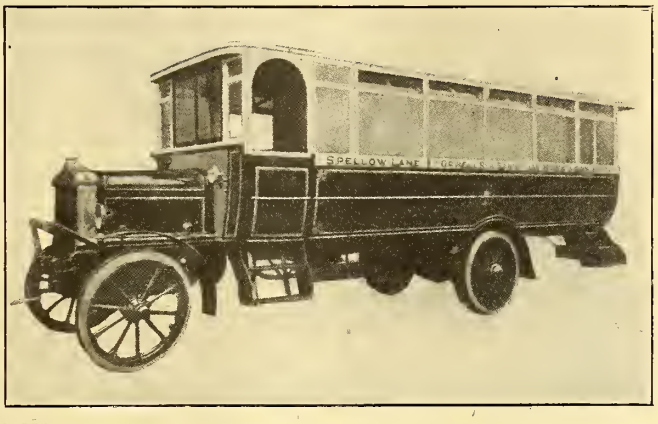
London's Steam Buses Are Withdrawn

In concluding the subject of whether motor buses pay invariably or not, attention is directed to the withdrawal of the National Steam Car Company's buses from London the end of October, 1919. In a statement made on Nov. 14, 1919, by W. J. Iden, managing director of this company, it was declared that the year ended Oct.

31, 1918, had shown a loss of £5,393 in the London area. Between December, 1918, and Sept. 30, 1919, the introduction of higher wages as well as the eight-hour day had added £40,000 a year to the payroll. A further increase of 4 shillings (nominally 96 cents) a week as of Oct. 1, 1919, added £6,250 per annum, with the result that in October there was a loss of 10 cents per mile.

A significant difference between British bus and American electric railway conditions was revealed in connection with this case when a deputation asked for an audience with Sir Eric Geddes, Minister of Transport, to request resumption of service. Sir Eric stated that it would serve no purpose to receive the deputation, for when a company withdrew its vehicles on the ground that traffic was not remunerative, the Ministry could not interfere.

Casual reference has already been made to the capacity of the motor buses used by several undertakings. The largest high-mileage bus to date is the new forty-six-seater of the London General Omnibus Company. This is of the double-deck type with cross-seats top and bottom except that longitudinal corner benches seating three each are used at the doorways of the lower deck. The over-all length of this vehicle from crank handle to rear clearance is 22 ft. 6½ in. and the wheelbase is 12 ft. 10⅝ in. The lower deck is 6 ft. 10 in. wide over all, which is sufficient to permit pairs of cross-seats 2 ft. 8 in. wide and an aisle of 15 in. The platform width is 3 ft. 10 in., an increase of 10 in. made to facilitate passenger interchange. The unladen weight is 7,840 lb., or 170 lb. per seated passenger—an achievement that seems well nigh incredible. This ultra-lightness was a necessity in view of official regulations. The new bus is no heavier than the thirty-four-seater which it is replacing. The approximate unit price of these vehicles was placed at £1,200 during the London traffic inquiry hearings held the middle of 1919. This figure is close to the American costs.



SINGLE-DECK BUS WITH REAR AND FRONT DOORWAYS

The advantage of using the higher-grade metals customary in motor-bus design would appear from the circumstance that both the New York and Pittsburgh double-deck cars weigh much more per seat, despite the fact that these cars represented a great reduction over preceding types. The New York double-deck stepless car weighed 46,000 lb., or 522 lb. per seat, and the Pittsburgh double-deck car was estimated to weigh 487 lb. per seat. (See ELECTRIC RAILWAY JOURNAL for Aug. 10, 1912.) The buses' advantages of using better materials must be admitted even if allowance is made for the fact that the cars are not open-top and that the low-step feature made extra-deep girders necessary.

TYPES OF BUSES—REGULATIONS

The maximum permissible speed of motor buses in London is placed at 12 m.p.h., but the London General Omnibus Company has requested permission to go to a maximum of 16 m.p.m. It is doubtful whether any notable increase in schedule speed would be obtained except on runs with a considerable portion of open running. One can hardly expect also that the improvements in ingress and egress will offset the increased standing time from the greater number of stops incident to changing from a thirty-four-seat to a forty-six-seat vehicle. Hence, anything better than the present schedule speed of 8.5 m.p.h. is hardly to be expected. A considerable saving in platform expense should ensue from increase in capacity, if there is no loss of speed.

The Sheffield Corporation Tramways is another user of double-deck buses. The maximum carrying capacity of the Sheffield bus is given as thirty-seven, compared with seventy-six for the Sheffield car. Manager Fearnley, at the 1919 Municipal Tramways Conference, declared that this size bus was too small for Sheffield peak loads. The rougher roads of the provinces also made it impracticable to use a bus of London lightness. As against 7,840 lb. in London, a bus of 10,080 lb. would be required to stand the harder wear and tear. As previously noted, the schedule speed of the Sheffield buses is 9.97 m.p.h., owing to their large proportion of light traffic conditions.

According to a paper on "Bus Development After the War," read by Eric Cauldwell before the British Institution of Automobile Engineers, the double-deck bus is favored chiefly in London because of the need for capacity. It was possible to build a single-deck vehicle of thirty-four-seat capacity. As a matter of fact, Mr. Cauldwell's idea is borne out in the recent installation by the Birkenhead Corporation Tramways of three single-deck thirty-three-seaters which apparently are intended for pleasure and long-ride traffic, judging by the provision of a compartment for smokers. It might be added that the standard Paris bus is of single-deck type with twenty-eight seats in two compartments.

Most of the buses are made for rear entrance and exit, the one-man near-side operation of small American buses being almost unknown. However, such operation is only a matter of time.

In addition to the standard single-track and open-top double-deck buses. British tramways also operate cross-bench sightseeing type cars, known locally by the French name of char-a-bancs. Such vehicles are used for cross-country service as well as for seasonal riding.

In the London Metropolitan area motor buses and their drivers are licensed by the Metropolitan Police. Elsewhere, the councils of boroughs and other urban districts exercise the same powers. Where rural district councils have not had such powers conferred on them by the Local Government Board, licenses to ply for hire need not be taken out. Generally speaking, there have been almost no legal restrictions to bus development, even for competitive purposes, in comparison with the awkward procedure relative to tramway extension. Under the Ministry of Transport Act passed in 1919, those who are refused licenses may appeal to the Minister of Transport, who has the "power to make such order thereon as he may think fit."

The Motor Car Act, as amended down to 1909, includes the following provisions:

If the unladen weight (exclusive of water and fuel) exceeds 3 British tons (6,720 lb.). the width must not exceed 7 ft. 6 in.; otherwise a width up to 7 ft. 2 in. is specified.

A bus weighing 6,720 lb. (unladen) is restricted to a speed of 12 m.p.h., and one weighing 11,200 lb. (unladen) to 8 m.p.h. If trailers are used, the maximum speed permissible is only 5 m.p.h. (The regulations of the London Police are noted on the preceding page.)

The weight of a loaded motor bus must not exceed 12 British tons (26,880 lb.) nor must the axle weight of any axle exceed the registered axle weight of that axle. A heavy motor car whose axle weight exceeds in the aggregate 6 British tons (13,440 lb.) may not be driven upon any highway bridge when another heavy car or locomotive is on the bridge, except in the case of the Menai Bridge and bridges within London.

The duty payable on a motor omnibus when used as a hackney carriage is 15 shillings (nominally $3.60) plus 42s. ($10.85) if under 2 British tons unladen or 63s. ($15.12) if over 2 tons. Obviously, this charge is not onerous.

Petrol Taxes and Roadway Charges

The self-propelled vehicle as a source of revenue was discovered by the British government in 1910, when a tax of 6 cents a gallon was imposed upon motor spirit, which is defined as "any inflammable hydrocarbon, including any mixture of hydrocarbons, and any liquid containing hydrocarbon which is capable of being used for providing reasonably efficient motive power for a motor car." In 1915 the Government took another bite by doubling the tax to 12 cents per gallon. The actual tax for public utility operators using more than 500 gal. a year has always been one-half of these charges, so that the present rate to practically all motor-bus operators is 6 cents per gallon.

The original purpose of the Government was to apply the revenue from licenses and motor spirit taxes "for the improvement, construction and maintenance of roads in the United Kingdom, and to render financial assistance to the County Councils." To this end a Road Board was appointed under the Development and Roads Improvement Funds Act of 1909. Millions of dollars derived from the impositions named were spent upon the improvement of existing roads. By 1915, however, the war led to the suspension of such grants from the National Exchequer, since which time only the interest on the Road Board's investments have been available. The status of the matter is well expressed by the following remark of Sir Eric Geddes, Minister of Transport, before the Nov. 5, 1919, meeting of the Society of Motor Manufacturers and Traders.

"In the petrol tax," Sir Eric said, "the motor industry was contributing more than it got for the maintenance of the roads." So far as his influence could be used, he added, they would get back that tax for its original purpose of road maintenance. The Chancellor of the Exchequer has recently announced that the petrol tax is to be abolished in favor of some other form of impost less easy to evade. For example, users of coal gas, producer gas, paraffin and home-produced benzol pay no equivalent tax. Taxation on the basis of unladen weight, mileage or horse-power is now under consideration.

The motor spirit tax, however, is not the only highway tax which the motor bus will have to meet in the future. The national tax was to be devoted to help out local authorities up to 75 per cent of the net roadway cost. To be on the safe side, local authorities are showing a more and more distressing interest in making bus operators contribute directly to road upkeep at the rate of so and so much per bus-mile operated. The electric railway operator, weighed down by decades of excessive taxes for paving that he does not destroy, will smile a pitying smile when he reads a busman's hope that "any road charges on motor-bus operation should not exceed the true recoupment, and should in no circumstances extend to profit-making for the district."

The road maintenance payments vary considerably in Great Britain. The highest known is that of the Northampton County Council, which has recently granted the National Steam Car Company the right to run between Rushden and Bedford at the rate of 3d. (6 cents) per bus-mile. The next highest within the writer's knowledge is that of 4 cents per bus-mile, plus an initial fee of 1 guinea (say $5), demanded in October, 1919, by the Lancashire County Council. In sanctioning four bus routes, about the same time, the Oxfordshire County Council also demanded 4 cents per bus-mile. On this subject, the London correspondent of the ELECTRIC RAILWAY JOURNAL wrote as follows in the issue of Oct. 4, 1919:

"It is established by several private acts of Parliament that when a local authority works buses over the roads of an adjoining authority the operators pay $\frac{5}{8}$d. (1.25 cents) per mile for road maintenance. Companies can, however, run buses without statutory powers, and some of the English County Councils, before giving consent, demand 2d. (4 cents) per mile run. These powers are of recent origin."

A payment of 2d. per mile would have cost the London General Omnibus Company on the basis of the 67,197,422 miles' run in the year 1918 the ruinous sum of $2,687,896.88, and would have been equivalent to more than 13 per cent of the gross earnings per bus-mile, 15.32d., in 1918.

The Sheffield Corporation Tramways are more fortunate. They pay the road authorities only $\frac{3}{8}$d. ($\frac{3}{4}$ cent) per bus-mile. As of March 31, 1919, they made a five-year contract at this rate with the West Riding and Derbyshire County Councils following five years' experience in operating over the roads of these authorities. Since Oct. 29, 1919, the Stockton Corporation Tramways pay 1$\frac{1}{4}$d. (2$\frac{1}{2}$ cents) per bus-mile to the North Riding County Council for running over a bridge.

An example of advancing costs is that indicated by clauses of the Walsall Corporation Tramways bill for 1914 and 1919 respectively. In the 1914 act, £275 per route-mile was to be set aside for reconstruction of roads and $\frac{3}{8}$d. per bus-mile for maintenance; in 1919, the figures were £700 per route-mile for reconstruction and $\frac{3}{4}$d. per bus-mile for maintenance.

That "there's a reason" for continually higher charges for the purpose of road maintenance appears from some figures presented by Sir Eric Geddes in his talk on Nov. 5, 1919, before the Society of Motor Manufacturers and Traders. He stated that it cost £4,690 per mile to surface a 40-ft. water macadam road and £7,700 per mile to surface a tar macadam road. A high-grade asphalt road would cost £18,000 per mile, and a wood-paved road, £47,000 per mile. The Government could not build better roads without levying upon their users.

It will be evident from the foregoing that the motor bus in Great Britain is now attaining the same status from the standpoint of taxation as the tramway. Consequently, its future development promises to be even more closely than in the past in fields for which it is especially adapted and in which a higher rate of fare is permissible than is charged on city and suburban railways. Only a great decrease in the cost of fuel and in the upkeep and replacement costs of the motor bus could alter this situation.

In the following article a study will be presented of American conditions.

A. R. E. A. Convention Makes New Record

At Recent Meeting in Chicago Engineering Association Adopts New Bridge Specifications and Specifications Prohibiting Use of Twisted Bars in Concrete

THE twenty-first annual convention of the American Railway Engineering Association, held in Chicago from March 16 to 18 inclusive, surpassed the record of any previous convention both in attendance and in volume of important committee work passed upon. The attendance exceeded by more than 100 any previous convention and reports of twenty-two standing committees and two special committees were presented. A number of the reports of interest to the electric railway field were abstracted in the ELECTRIC RAILWAY JOURNAL March 27, page 652. Two reports of special importance, on stresses in railroad track and on electricity respectively, are abstracted at some length elsewhere in this issue and the remainder of the reports are abstracted briefly below.

A. R. E. A. REPORTS OF ELECTRIC RAILWAY INTEREST

Conservation of Natural Resources. In the presentation of this report the committee emphasized the necessity of salvaging all old materials removed from building, track and rolling stock and explained how this could be done. Reports of reclamation work on several railroads were given. A section of the report which was highly commended was that concerning the conservation of human life and energy. These parts of the report were received as information. Rules for the prevention of the spread of forest and field fires were given also and approved for publication in the Manual.

Economics of Railway Location. The report of this committee dealt with resistance of trains, effect of curvature on cost of maintenance of way and on maintenance of equipment, effect of train resistance on fuel consumption and effect of electric locomotives on economics of location. On the subject of curvature the committee quoted from tests made on the Canadian Pacific Railway, apparently establishing the fact that when the diameter of the outer wheels exceeds that of the inner wheels by an amount sufficient to compensate for the increased distance traveled by the outer wheels the wheels hug neither one rail nor the other, regardless of speed from 5 to 25 m.p.h.

In regard to the influence of the electric locomotive on the economics of location the committee presented two monographs on the subject. These explained the different characteristics of steam and electric locomotives and stated that net savings in fuel cost of 50, 60 and 67 per cent respectively might be expected in passenger, freight and switching service by the use of electric locomotives. Engine repairs were said to be reduced 50 per cent. The effect of rise and fall, curvature and rate of grade were explained and the results obtained on several electrified steam roads were recorded.

Iron and Steel Structures. The adoption of new steel bridge specifications presented by this committee was one of the important actions taken by the convention. A 16-ft. width for the clearance diagram was objected to by several speakers, but was adopted. This width is not required, however, in new bridges built on old masonry where extensive reconstruction would be made necessary. E-50 loading as an alternative for E-60 was suggested, but the latter was adopted. The specifications provide 90, 80 and 75 per cent of the live load, including impact, for two, three and four tracks, respectively. Clear tie spacing of 7 in. is specified, as are also rounded ends for through-plate girders. The latter are said to be important in the case of derailment of cars. Specific permission for the welding of minor defects in castings was eliminated from the specifications upon motion.

The committee's report also included a new column formula of the straight-line type, as a substitute for that of the parabolic type submitted last year. Principles for detailed design of flashing, drainage, reinforcement and protection for waterproofing purposes were given and the reasons for continuing the use of the Cooper system of live loading instead of some specific modern engine loading were dealt with.

Wooden Bridges and Trestles. This committee presented, in the nature of a progress report, specifications and classifications and grading rules for lumber and timber to be used in the construction and maintenance of way departments.

Records and Accounts. The report of the committee covered cost-keeping methods and statistical records, forms for analyzing expenditures, forms for maintenance of way and structures, for construction and for records.

Rules and Organization. Rules in considerable detail for the inspection of bridges, trestles and culverts were submitted by the committee and were adopted.

Signs, Fences and Crossings. The committee introduced a design for an approach warning sign and this was adopted. A report was made on grade elimination.

Signals and Interlocking. On the subject of ties treated with any solution which affects the length of track sections the committee recommended that as the electrical conductivity of zinc-treated ties decreases with age better results may be had by allowing the ties to season for from 2 to 6 months before using in a circuited track. Also that for best results the number of zinc-treated ties installed per year in any track circuit should not be greater than 15 per cent of the total number of ties in that circuit.

Masonry. The specifications for plain and reinforced concrete, prepared by this committee, were adopted, as also was the report on methods of depositing concrete under water. There was considerable discussion concerning the proposed specifications for billet-steel concrete reinforcement bars specifically prohibiting the use of twisted bars. It was stated that hot-twisted bars are dangerous and that cold-twisted bars give no advantage over plain or deformed bars. The specifications were adopted.

Wisconsin Utility Men Meet

Twelfth Annual Convention of Electrical Men Considers Safety Cars, Automatic Substations, Labor Welfare and Publicity at Well-Attended Two-Day Session

THE necessity and value of well-planned educational publicity and the possibilities for the improvement of labor conditions through a high-purpose development of living conditions and leisure-time occupations held the interest of a large attendance at the joint meeting of the Wisconsin Electrical Association and the Wisconsin Gas Association at the Pfister Hotel, Milwaukee, on March 24. The Gas Association had been in session on March 23, concluding its convention with the joint meeting of March 24, while the Electrical Association continued its twelfth annual convention, which began with the joint session, through March 25, President W. C. Lounsbury presiding on both days. The joint session on March 24 was concluded by a splendid banquet in the evening, at which Edward J. Dempsey, Oshkosh, Wis., was toastmaster and James H. McGillan, Green Bay, Wis.; M. H. Aylesworth and William Rainey Bennett were the speakers.

The labor welfare problem came before the joint meeting through a paper on the "Leisure-Time Factor," by William C. Knoelk, executive-secretary of the Community Service of Milwaukee. In the discussion which followed the paper several delegates spoke of the irresponsibility of unions and of the fact that it was not the eight-hour day nor entirely a question of wages that seemed to be the fundamental causes behind the present labor unrest. The representation of labor in the management of a corporation and the close contact which this afforded between management and employees were commented upon as being highly desirable. M. C. Ewing, Wausau, said that it had been his experience that trainmen do not desire an actual eight-hour day, and he cited as proof of this the fact that they continually choose the longer runs, since these pay the most money.

Concluding the discussion on his paper, Mr. Knoelk endeavored to emphasize that he was not interested in the actual eight-hour day nor the length of the working day, primarily, but rather the value of preparing and planning for the leisure time. He said that we should not become impatient if welfare work conducted along the right lines did not seem to produce immediate results; that it would take considerable time to overcome the feeling which many workmen have, regardless of what the facts may be, that they have been mistreated in the past. He explained what this feeling now is by quoting a labor leader of a striking union as saying: "Thirty years' experience has taught us how to handle the situation when we have the other side where we want it." It will take time to overcome this feeling, but a proper provision for occupation during leisure time will prove to be very effective.

Organized Publicity Plan Recommended

B. J. Mullaney, chairman Illinois committee on public utility information, addressed the joint session of the associations on the work which has been done by his committee in Illinois toward educating the public to a real understanding of the public utilities, and recommended that a similar committee be established in Wisconsin. Mr. Mullaney presented the need for publicity work generally from a new angle when he pointed out that it often happens that when a public utility commission has completed its study of a situation and is about to make an order it is confronted with an aroused public sentiment which places the commission in a very unfavorable position. He said that we are only fooling ourselves when we condemn a commission for not having the backbone to make a determined decision in the face of public criticism; that the whole question gets back to the fact that the public holds in its hands the lives of the commissioners, who in turn hold the lives of the companies. Hence we must have publicity which will educate the public to an understanding of the utility business so that commissions will not be restricted in their free and deliberate functioning. Much of the opposition of the public comes from suspicion and ignorance, so that it devolves upon the companies to dispel this ignorance of public utility affairs.

Mr. Mullaney then explained the manner in which the Illinois committee had gone about this important work of educating the public and brought out the policies which have guided the committee from the first. He told of the splendid success which had been realized in securing the publication of utility matters in the public press and gave proof of the change in public attitude resulting therefrom.

The speaker was anxious to inspire the formation of a similar organization and work in Wisconsin and urged the association to give the matter serious consideration. He quoted Charles L. Henry, Indianapolis, Ind., as saying that if the formation of the Indiana committee on public information accomplished nothing else than the co-operation between the various utilities of the State, which had already been realized in a splendid measure, the organization would be worth while.

Mr. Mullaney and the Insull interests are working toward the formation of such a committee in every state, believing that the work can be more effectively handled through state units than through the national associations of the several utility industries. He explained that later on it may be possible for such state units to come together in convention or to co-operate in some other manner to give the work a national scope. The aim of such a magnificent educational work is to make the utility business just as safe from attack as the churches and schools, the speaker explained.

Asked about the cost of carrying on this publicity work, Mr. Mullaney explained that the cost to the Illinois committee was $15,000 for the first year. He said that this was abnormally high on account of the very wide distribution, free, of nearly all of the literature got out. He said that the Indiana committee estimated that an assessment of one-fiftieth of one per cent of the gross revenue of the utility companies of the State would carry on the work for a year.

At the conclusion of Mr. Mullaney's talk the association passed a resolution giving him a vote of thanks and recommending that the new executive committee take up the consideration of his suggestions looking toward some definite plan.

President Lounsbury's Address

Upon the adjournment of the two associations the twelfth annual convention of the Electrical Association was called to order by President Lounsbury, who then read his address. In this he called attention to the fact that the Wisconsin Electrical Association now has a history to which the members can point with pride, for it has won the respect and confidence of the State governing boards and has lent a forceful influence in the betterment of service rendered the people of the State. He pointed out that one of the fundamental objects of this association was to encourage a friendly relation between companies and the public. He said this could be obtained by creating a public faith in the properties represented by the delegates, provided first that these delegates have an abounding faith in them themselves. He lamented that utility operators were inclined sometimes to make apologies for the product of their business and the rate charged for it, whereas in reality these utilities are rendering service to the communities at a cost much less than the actual value to the community. To emphasize his point, he quoted Henry L. Doherty as saying:

"In the wave of antagonism against corporations throughout the country we are the ones most likely to be reached and harmed, and we can go to greater ends in correcting this antagonism of the public toward corporations than any one else. . . . There is nothing that creates faith in the company like having the man who works for it say the company is all right and honest and straight."

Mr. Lounsbury went on to say, in regard to employees, that the policies of the utilities must be so formulated as to secure "fairness to labor, fairness to stored labor, which is capital, and fairness to the public. We must not expect our employees to stand the brunt of our trouble; they must be well paid or in the long run the industry will not carry on."

Speaking of the future work of the association, Mr. Lounsbury expressed the belief that this would be better handled by creating several active standing committees of three members each, which would report annually after study carried on through the year. In this connection, he recommended the appointment of a membership committee, a committee on taxation, a committee on accounting, a committee on legislation, a street railway committee, a commercial and sales committee, a committee on rural service extension and a committee on interconnections of power plants. These recommendations were later adopted by vote of the association.

M. A. Aylesworth, executive manager of the National Electric Light Association, addressed the association on the "Relations of the Central Stations to the Public."

Discussions on Safety Car Paper

E. M. Walker, Terre Haute, Ind., who had been invited to come to Milwaukee as the guest of the association for the purpose of presenting a paper on "Possibilities of City Street-Car Operation," was heard at the morning session on March 25. Mr. Walker's paper appears in abstract elsewhere in this issue. It was very well received, the delegates seeming to be very much interested in the possibilities of economies and increased revenue which were modestly shown to be available through the use of safety cars.

B. W. Arnold, in discussing Mr. Walker's paper, said that he was operating 100 per cent with safety cars in Oshkosh. He called attention to the mistake that had been made in placing the standard safety car, which was developed in the South for a warm climate, in Northern cities, where the temperature in winter is much lower. He had found it necessary to have his safety cars built with double flooring and with inside sheathing and head lining in order that passengers might be comfortable in winter. He said that the people of Oshkosh were all boosters for the safety cars.

F. L. Markham, American Car Company, explained that it was not the practice of the manufacturers to build a car for Wisconsin cities the same as they would for Southern cities, saying that some mistakes of this character had been made in the early installations of safety cars. Cars for Northern cities are now not only being built warmer but equipped with twelve instead of eight electric heaters, with one additional on the platform for the operator. He pointed out that many improvements have been made in the last five years in the design and equipment of the safety cars and that the manufacturers stand ready to make further changes.

Questioned as to the manner of flagging safety cars and the earnings per car-mile, Mr. Walker replied that the earnings in Terre Haute averaged a little better than 21½ cents per car-mile. He said that there were seven grade crossings in Terre Haute, five of which were trunk-line crossings, and that a ground flagman was employed at each crossing. The interurban cars also get the benefit of these crossing flagmen. He said that the cost of flagging all crossings in this manner was about 1½ per cent of the gross operating expense, which he considered a very small item when looking upon it as an insurance measure. Mr. Arnold made a rapid calculation and commented that if it were necessary to employ a flagman at every crossing in Oshkosh for the sake of using one-man cars he could put two men on each car and then save three men. He said that his operators are required to bring their cars to a stop at a safe distance from a crossing, leave the cars and flag themselves, then return and run the cars across. This procedure is now required by the Wisconsin laws. The object in making a man leave his car, he explained, is that it made sure that the car will be stopped prior to crossing.

J. P. Pulliam, after hearing Mr. Walker's paper, said that there was no question but that the street railway industry had been asleep for many years. He said there were any number of cities in Wisconsin in which the headway of the cars was the same now that it was twenty years ago. He thought that the safety car offered a way to give the service the people wanted and ought to have, and he thought railway operators should keep their ears and eyes open for new developments and be prepared to make the most of them. He said that the safety car might not be the last word in urban transportation, but that it was certainly a great improvement in the art and should be taken advantage of.

J. N. Canby, consulting engineer, Madison, in discussing a paper by Paul Stark, which was entitled "Investment or Cost of Reproduction Less Depreciation" and advocated the investment method of valuation and criticised the deduction of depreciation from capital value, said that the courts and commissions had determined that the method of fixing rates

on the depreciated value of a property was obsolete, so that it would seem Mr. Stark's paper was based on a misleading assumption. The Wisconsin Railroad Commission has defined depreciation as an operating expense of that amount which must be regularly set aside to keep a property in proper operating condition. Mr. Canby said that he was inclined to believe that the investment value of a property should be used for rate-making purposes in abnormal times, since the value on the basis of cost of reproduction new in such times would result in rates which were too high.

At the meeting on Thursday afternoon C. A. Butcher presented a paper illustrated with lantern slides on "The Development of Automatic Substation Equipment." This paper had to do mainly with the installation of automatic equipment in railway work, but the author also discussed briefly the possibilities of its application to industrial substations. His paper appeared in abstract in the issue of the ELECTRIC RAILWAY JOURNAL for March 27. This was followed by 2,000 ft. of moving pictures illustrating methods of creosoting, presented by a representative of the Barrett Company.

The following officers were elected to direct the affairs of the association during the coming year: President, W. C. Lounsbury, general manager Superior Water, Light & Power Company; first vice-president, L. N. Boisen, vice-president Ashland Light & Street Railway Company; second vice-president, Harold Geisse, vice-president Wisconsin Power & Light Company, Janesville; third vice-president, P. D. Kline, second vice-president and general manager Wisconsin-Minnesota Light & Power Company, Eau Claire, Wis.; secretary-treasurer, J. P. Pulliam, vice-president Wisconsin Securities Company, Milwaukee.

Possibilities of City Street Car Operation*

A Tribute to the One-Man, Light-Weight Car by a Manager Whose Property Will Soon Be on a 100 Per Cent Safety-Car Basis

BY E. M. WALKER
General Manager Terre Haute (Ind.) Traction & Light Company

THE effect of enlisting the popular interest in the street railways during the past few years has been at least to show that they are a necessity, and as such that they must and will be made self-supporting. Bearing this in mind, it must be contended that the industry has possibilities.

The street railway developed with the idea of selling rapid transit to people living in and near cities. As the communities grew the railway company found that it had to furnish rapid transit to an increasing number of people, hence the tendency was to increase the size of cars. With increased size, of course, came increased weight, with the other things that go along with it, namely, heavier track construction, more power and much more investment of capital. All went well for a time, though it became evident that with large cars it was increasingly expensive to move empty seats. Hence there was not much incentive to provide more frequent service, so that the needs of the people had to be met rather by the regularity than by the frequency of the schedule.

With the appearance, in numbers, of the private automobile, and then by easy and rapid stages the low-priced automobile and the jitney bus, the public began to experience the pleasure of frequency as well as regularity of service. Instead of waiting on the corner ten minutes for a car Mr. Citizen began to want to go up town "right now," and his wants either found expression in complaints as to the inadequate service of the street car company or in patronage of the jitney bus. It was manifestly impossible to improve the frequency of the service with large, heavy-weight cars at the old rate of fare, especially after war-time costs of operation had become a fact, and therefore it quite suddenly became a question of one of two things—higher fares or smaller, lighter cars, if more frequent service were to be given.

In speaking of the possibilities of street car operation I shall draw attention principally to the safety car, because its possibilities have been demonstrated so effectively in so many places and because it has furnished the means of providing quick, frequent and satisfactory street car service at a reduced cost of operation. The safety car first began to be talked of and written about in 1917, and since that time no less than 3,000 safety cars have either been delivered or are being built for early delivery for more than 125 American cities located in practically every state in the Union.

In April, 1909, it was my privilege to present a paper at the annual convention of the Iowa Street Railway Association, at Cedar Rapids, in the course of which paper the following statement appeared: "In many cases the size of cars has been reduced, as it has been found that smaller cars, operating at more frequent intervals, have made possible a vastly improved service and at the same time a reduced car-mile cost of operation." At that time there was probably but one automobile owned in the State of Iowa for every hundred now owned, so that there was no competitive force to bring out the thought. The conditions were that we were operating in a small town in eastern Iowa closed cars in the winter time weighing 14 tons each and in the summer time small six-bench open cars weighing only about half as much. One could not help being forcibly impressed with the great reduction in power required to operate in the summer time. And then, too, about 50 per cent of our annual earnings came during the period of the four or five months of the light-weight car operation.

The impression of the light-weight car was lasting. So abiding was that impression of eleven years ago that our property in Indiana now operates practically 100 per cent safety cars. It owns sixty-six standard safety cars, of which ten are still to be delivered. When they are delivered the installation will be complete. The result is, in 1919 more people rode on the cars than ever before, even with but 50 per cent safety car operation. Car-miles increased more than 30 per cent and power used on city lines increased only 4 per cent. The first quarter of 1920, with more than 90 per cent safety car operation, shows an increase in car-miles over 1919 of slightly lower than 30 per cent and an increased number of passengers riding on the cars of somewhat more than 30 per cent.

Aside from the mere statistical aspects of safety car operation, there are other phases that illustrate its bearing on the subject. An analogy to the safety car is presented in the skyscraper. Let us suppose that our problem is to design and plan the elevator service for

*Abstract of a paper presented before the Wisconsin Electrical Association, Milwaukee, March 24, 1920.

an office building of twenty stories. Having a given space at our disposal in which to build the elevators, we should not hesitate long on the question as to which would provide the more satisfactory service, a small number of large capacity cars or double the number of cars of half the capacity. At once we would decide on the larger number. And so it is with the safety car. Its function is to make possible two car-miles where there was only one before. If it will perform that function it will please the people and attract passengers. Car-miles are what we have to sell, and we must be prepared to furnish all the car-miles that the people will buy.

Occasionally comment appears in the newspapers in cities where the adoption of the safety car is suggested implying that the car is suitable only for small towns. Nothing could be farther from the truth. Making possible, as it does, a much more frequent service, it is readily adaptable to almost any condition of city street-car service. In fact, it would seem almost capable of mathematical demonstration that safety cars running on one-minute headway, seating thirty-two passengers per unit, would give a much more satisfactory service than cars weighing more than twice as much as a safety car, seating fifty people each and operating on a two-minute headway. One might easily have his doubts resolved by getting the verdict of the riding public on this point.

Some antagonism to the safety cars is often prompted by sympathy for the man who will be out of a job on account of one-man operation. It works out in practice, however, that by having cars that one man can operate more safely, more quickly and more efficiently than two men can operate the old-style car we have in fact more men to operate more cars.

There is another phase of one-man operation. As the operator is in sole charge of the car and on his own resources he accepts more responsibility and becomes more nearly a business man. As such, he can and does render more satisfactory service both to public and company. This statement has been confirmed by conversation with many of the 150 men operating safety cars in our city, and as an added confirmation, such a thing as a complaint of discourtesy or inattention on the part of a safety car operator is practically unknown. This sort of complaint used to be a very frequent source of annoyance.

Accidents Are Reduced Four to One

The safety of the car, as evidenced by the great reduction in accidents following its use, is another of the possibilities. Step accidents, which usually arise from boarding or alighting while the car is in motion, are unknown with the safety car. Personal injuries are very rare, and such as do occur are not in any sense peculiar to the type of car. Careful records extending over a period of sixteen months of safety car operation, during which this type of car has made in actual service more than 2,000,000 car-miles, have shown an accident cost which is only about one-fourth of the cost of accidents occurring with the non-safety type car operating about two-thirds of that mileage in the same period of time, expressed in terms of cost per 1,000 car-miles.

One other criticism of the safety car has to do with the life of the car. It is said that the car is so light that it cannot last very long. Analyzing this, we find that 75 per cent of the car, with proper maintenance and renewal of wearing parts, ought to last at least twenty-five years. By this is meant the truck, motors, brakes, safety devices, wiring, etc. This, then, would leave but a small portion of the car, from the standpoint of value, to be renewed during the life of the other 75 per cent. Cars of this type that have made more than 50,000 miles and have carried more than 250,000 people are coming out of the shops, overhauled and repainted, looking like new.

Down our way the people like the safety car. They frankly say that the service was never so good and that they would not willingly go back to the old system. At first a good deal of fun was made of the car on account of its size and its radical difference in appearance from the "orthodox" type of city car. But the people soon began to warm up to it, and when one now sees anything about the car in the papers, as he may occasionally, there is almost a suggestion of affection in its designation, which has become a standard with one of our papers, as "the little green car."

Wages of Employees Increased 151 Per Cent

ACCORDING to the last annual report of the Philadelphia Rapid Transit Company the average wage per employee has been increased from $622.16 per annum in 1910 to $1,581 in 1919, or 151 per cent. Greater efficiency is also evident in the 120 per cent more traffic units produced per trainman. The rides per capita have also increased in the same period 47.5 per cent. This means 288 rides per capita in 1910 as against 425 in 1919. The total wages paid to all employees in 1919 were $16,415,008 as against $7,282,995 in 1910, equivalent to an increase of 125 per cent in the payroll.

With the maximum rate of 58 cents per hour, the wages of trainmen, it is said, average $5.51 per day as against $5 per day in Cleveland and $5.10 in Detroit, where the maximum rate is 60 cents per hour.

The Dilemma of the Tramways

FROM the following editorial in a recent issue of the *Electrician*, London, the financial crisis in the electric railway business is an international one:

If we are to judge from a memorandum drawn up by a sub-committee of the Municipal Tramways Association, the municipal tramways of this country (England) are in an alarming financial state. We cannot say that we are surprised. Many municipal tramway schemes were "born out of due time" and, like many such children, have not only been weakly but have had time and money spent on them which have been denied to more healthy progeny. But all the care has done them little good. They have always been ailing and now their state is critical. "Almost every tramway system," says the memorandum, "is being carried on at a loss, which, in many cases, is more than 1d. per car-mile." Then, in addition, there is the usual demand for increased wages from the employees and the usual hostility of the public to an increase in the fares. A conference of tramway authorities is to be held in London next week (first week in March) to examine the patient, but the general secretary thinks that if the tramway industry is to be continued either the fares must be substantially increased or tramways must depend upon compulsory local rates. In other words, if the townspeople won't pay directly they must pay indirectly. Not a very happy state of affairs! But of the two we think the former more preferable, as it is essential in our opinion that the rider should pay at least the actual cost of the ride. The aim of the association should be to make each undertaking self-supporting and to get rid of subsidies as soon as possible. Some tramway systems have, however, never been in that fortunate position, owing to well-known reasons not unconnected with local politics, and it looks now as if they never will be.

The Interborough Rapid Transit Company Keeps Its Patrons Well Informed on Traction Matters

The Subway Sun — World's Safest Railroad

OCTOBER, 1919

Tax Rate and Car Fares

The Board of Estimate is faced by a budget of $316,521,427. It will be cut down; but experts agree that the tax rate will mark a new high record.

* * *

This increased tax, under present conditions, will be largely passed on to tenants, in still higher rents, and to customers in still higher prices.

Under a 5-cent fare the city gets no return on its $250,000,000 Subway investment. Therefore it must include in the budget and raise by taxation several million dollars, to pay interest on money borrowed to help build subways.

* * *

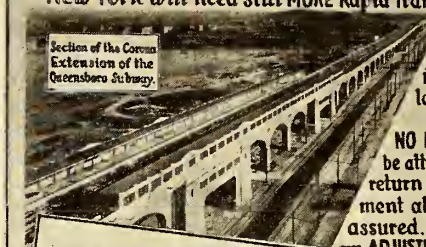
An increased fare would give the city a profit on its Subway investment, thus cutting down taxes, rents and prices.

The Subway Sun — World's Safest Railroad

DECEMBER, 1919

THE CITY'S *FUTURE*

New York will need still MORE Rapid Transit facilities.



Extensions require new investment in large amounts.

* * *

NO MORE money can be attracted unless a return upon the investment already made is assured. *This calls for an ADJUSTMENT of the fare.*

Subway Sun

INCREASING COSTS

THE SPIRIT OF THE CONTRACT

When the Subway contract was made with the City in 1913 the NICKEL had a FULL 5 CENT VALUE

Half its value has been squeezed out

The TICKET buys you a FULL-VALUE RIDE

The spirit of the contract calls for fair-play and a FULL VALUE FARE

Interborough Rapid Transit Company

Elevated Express

THEY EARN THEIR PAY

The NICKEL used to pay both hands of an employee for 10 minutes

NOW it pays for only 5 minutes

See how the pay roll has grown

1916 (actual pay roll) $ 8,308,629

This Year (for same number employees) $ 16,808,750

ONLY AN INCREASED FARE WILL MEET THIS

THINGS THAT HAVE DOUBLED IN PRICE

Elevated Express — VOL. III JANUARY 1920 NO. 2

Dealers in bread, clothing etc had to READJUST prices or quit business

It is the same with Transportation.

Wages, steel, copper, coal, lumber etc. have doubled in cost. Is it more than fair to ADJUST the fare?

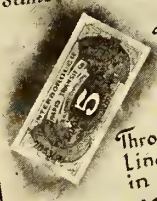
Elevated Express — VOLUME III JANUARY 1920 NUMBER 2

The TICKET costs you the same

COAL $100.00 Worth in 1913

33 Tons

RESTORING THE POWER OF THE FARE



The Job of the Car fare has grown too big for it. The cost of things for your SERVICE has doubled

$100.00 Worth in 1919

Through the Opening of New Lines the TICKET has GROWN in value

16 Tons

ADJUSTING the FARE is keeping GOOD FAITH

Interborough Rapid Transit Company

20 MILES ON THE SUBWAY FOR A NICKEL

Interborough — The Elevated Express — Always Dependable

Railroad and Subway Fares Compared

MILES		FARES
20	SUBWAY	.05
17	PATERSON	.48
11	ELIZABETH	.32
11	EAST ORANGE	.33
17	YONKERS	.44
18	NEW ROCHELLE	.50
20	GARDEN CITY	.60
18	LYNBROOK	.60
19	WESTFIELD	.59
20	PERTH AMBOY	.67

Subway Sun — World's Safest Railroad

FEBRUARY 9, 1920

THE American News Company, Inc. has informed newsdealers that The New York American will increase the price of the Sunday American, commencing February the 8th, to 10 cents retail.

We believe increased costs of labor and materials justify this. We are asking a "fair fare" for identical reasons.

INTERBOROUGH RAPID TRANSIT COMPANY.

The A. R. E. A. and Electrification

Committee on Electricity Gives Results of Study of C., M. & St. P. Electrification and Reports on Topics Having General Bearing on Application of Electricity to Heavy Traction

AT THE meeting of the American Railway Engineering Association held in Chicago, March 16 to 18 inclusive, the committee on electricity, of which Edwin B. Katté is chairman, reported on the following assignments: (1) Critical examination of subject matter in Manual. (2) Continuation of collection of statistical data relative to clearances of third rail and overhead working conductors. (3) Continuation of revision of joint specifications for transmission line crossings. (4) Report on study of electrolysis and its effect upon reinforced concrete, etc. (5) Report on study of maintenance organization and its relation to track structures. (6) Report upon utilization of water power for electric railway operation. (7) Report on recommended practice for mitigating interference with telephone and telegraph lines. (8) Co-operation with Bureau of Standards in preparation of safety codes. (9) Submit specifications for insulated wires and cables.

In the following abstract attention will be concentrated upon those topics of most immediate interest in the electric railway field. Reference has already been made to the subject of overhead crossings, the specifications for which have now been adopted by all of the associations concerned. This matter was considered in detail at the convention of the A. E. R. E. A. at Atlantic City last fall.

Co-operation with American Committee on Electrolysis

The sub-committee on electrolysis and insulation, comprising Martin Schreiber, chairman; D. J. Brumley, R. D. Coombs, E. B. Katté and F. E. Wynne, reported on the activities of the American committee on electrolysis and on a study of the effect of electrolysis on reinforced concrete.

On the first of these topics it was said that the American committee had now formed a research sub-committee, which will actively engage in technical investigations, both in the laboratory and in the field, collaborating with the United States Bureau of Standards. On this research sub-committee the A. R. E. A. is represented by Mr. Katté and the A. E. R. E. A. by R. F. Stevens and P. W. Ripple.[1]

The sub-committee will take up the study of the auto-transformer system, will join with the Bureau of Standards in the survey of conditions at Des Moines, Iowa, and will investigate pipe drainage with particular reference to drainage at joints. At a meeting of the sub-committee held on Sept. 22 a committee was appointed to investigate pipe-joint corrosion and soil corrosion, the investigation to be made in cities where large current is carried by piping systems and in cities where mains are to be uncovered during maintenance work.

A meeting of the sub-committee of the American committee on technical features of construction in operation was held on Sept. 26 to plan for a portion of the report of the main committee having to do with this topic. The work has been divided up into these sections. (1) Railways. (2) Affected structures. (3) Measures applicable to railroads. (4) Measures applicable to affected structures. (5) Joint responsibility of interests and necessity for co-operation. The first section is in charge of Prof. A. S. Richey and the last in that of Professor Richey, H. S. Warren and S. S. Wyer.

As to the effect of electrolysis on reinforced concrete the committee referred to its 1918 report, in which the conclusion was stated that the disintegration of concrete may be laid at the door of electrolytic action to a certain extent, but that it is possible so to design and install concrete work as to reduce this disintegration to an almost negligible amount. This year the committee suggested consideration of the subject along the following lines: (1) The use of copper-plated reinforcing bars. (2) The introduction of reinforcing bars made of a copper alloy. (3) The surrounding of the reinforcing bars with a rough enamel. (4) The installation of a waterproofing structure around ordinary structures in salt water, this waterproofing to consist of a plastic layer of material with petroleum asphalt as a basis, or some established waterproofing material free from electrolytes. The plastic casing should be finally protected with another layer of concrete or masonry material.

The St. Paul Electrification and its Lessons

An important report on the subject of water power for the generation of electricity for the operation of trains was made by a sub-committee consisting of George W. Kittredge, chairman; W. L. Morse, vice-chairman; A. H. Armstrong, D. J. Brumley, R. H. Ford, M. Schreiber and F. E. Wynne. It was taken up with the results of a study of the electrified section of the C., M. & St. P. Ry. between Harlowton and Deer Lodge. Electric power for this is obtained from the Montana Power Company, and several of the more important water-power developments of this company were inspected by the committee. Some high spots of the report follow:

The Montana Power Company was organized in 1912 for the purpose of consolidating and unifying the business of power systems then owned by the Butte Electric & Power Company, the Missouri River Electric & Power Company and their respective subsidiaries. Subsequently the Montana Power Company acquired the Great Falls Power Company and the Thompson Falls Power Company, and by virtue of the original consolidation proceedings the Montana Power Company became vested with title to all of the properties, rights and franchises of the system owned by the Butte Electric & Power Company, the Missouri River Electric & Power Company and their subsidiary and associated companies. The Great Falls Power Company and the Thompson Falls Power Company have been continued as separate cor-

[1] An article on the organization of the research sub-committee and on the plan and scope of its work will appear in an early issue of the ELECTRIC RAILWAY JOURNAL.—EDS.

porate entities. This has given the Montana Power Company the ownership of all the undeveloped power sites on the Missouri River in the vicinity of Great Falls, which were owned for more than twenty years by the Great Falls Power & Townsite Company, organized and owned by the late James J. Hill and his associates.

The Montana Power Company has developed and now owns twelve hydro-electric plants and four steam plants. It develops 290,000 hp. and has about 1,900 miles of high-tension lines with seventy-five substations. From five of the more important hydro-electric plants, high-tension power lines, approximately 250 miles in length, radiate to and connect with five substations of the C., M. & St. P. Ry. These five plants are: The Madison plant on the Madison River, 12,000 kw.; the Holter plant on the Missouri River, capacity 40,000 kw.; the Rainbow Falls plant on the Missouri River, capacity 35,000 kw.; the Great Falls or Volta plant on the Missouri River, capacity 60,000 kw., and the Thompson Falls plant, located at Clark's Fork, capacity 30,000 kw.

The Montana Power Company has much greater capacity than is required for the railroad, and the additional power is used for other commercial purposes.

Committee Indorses Judicious Electrification

The committee reported that the C., M. & St. P. installation has demonstrated that the transmission of railway electric power over long distances is efficient, economical and reliable at 110,000 volts. The multiple feed points at which the power company's separate lines connect to the railway lines are desirable because: (a) they secure for the railway the advantages of duplicate transmission lines with the actual construction of a single line, and (b) they permit the use of the railway lines for transferring power between the power company's lines.

Furthermore, cedar pole construction with treated-butt H-frames for the power company and single poles for the railway company, under Montana conditions, is reliable and more economical than steel towers both in first cost and annual cost. No. 00 or equivalent diameter is the minimum size of cable for avoiding corona losses at 110,000 volts in this climate at these altitudes. Satisfactory lightning protection is obtained by the use of lightning arresters at the power houses and substations with a ground wire along the transmission line. The minimum spacing of the conductors is 9 ft. apart for 110,000 volts and has proved adequate. Adjusting the tension in the conductors so that at 0 deg. F. with 1½ in. sleet coating and wind pressure of 3½ lb. per square foot the stress will be slightly below the elastic limit produces a satisfactory construction in this territory. Transposition of telephone wires every half mile and of the railroad's dispatching telephone wires every 900 ft., without transposition of paralleling power wires, gives adequate correction of interference. It is practicable to employ short cuts for the railway transmission lines by leaving the right-of-way where track curvature is great. Sectionalization of the power company's lines by switching stations fifteen miles apart provides for rapid location and correction of line failures. The sectionalization secured on the railway company's transmission line by looping it through substations, spaced approximately 32 miles apart, is sufficient. Treatment of pole butts for 8 ft. by boiling in creosote, which is allowed to cool before the poles are removed, has been found advantageous and gives about fifteen years of life.

The overhead construction in the electrified territory (438 miles) is maintained by a force of three crews located at different points on the line and provided with work trains. There are ten men in each crew as follows: One foreman, three linemen, one groundman, one engineman, one fireman, one conductor and two brakemen. Two men are assigned to the testing of rail bonds. The regular maintenance and renewal of bonds is taken care of by the track section gang.

In general the construction of the distribution line does not differ materially from that of other direct current electric traction and trolley lines aside from certain special features, as follows: (a) The catenary construction, with two trolley wires hanging side by side and supported by messengers. (b) The higher direct-current voltage. (c) The joint use of ground wire and supplemental return circuit.

The committee goes into the details of the locomotive and signal systems, largely by way of description. On the latter subject the report says that the type of trolley pole construction used prohibited the use of upper or lower right-hand quadrant semaphore signals, as either of these types would have been obstructed from view by the poles. It was necessary, therefore, to install either upper or lower left-hand quadrant signals or light signals. The latter were installed.

Comparing the initial cost of the alternating-current signals, as installed here, the cost of these was said to exceed an equivalent signal installation of direct current by approximately 35 per cent when the overhead structure is available for support of the necessary signal conductors. In general the operation cost will be considerably less in an a.c. signal installation due to the lower power cost. Climatic and other conditions being favorable, the simplicity in the apparatus of an a.c. signal system, particularly with the light type of signal, permits assigning much longer sections to a given maintenance force than is possible with d.c. systems.

As to interference between the propulsion current and communication circuits the committee reported that there has been no marked interference in the talking system. The engineers of the American Telephone & Telegraph Company had made some study on the ground and found slight interferences from so-called tooth ripples of some 1,300 cycles. Experiments have indicated that the installation of resonant shunts in the substations will remove the trouble.

As for the accident phase of the St. Paul installation, it was stated that one employee had been killed through disobedience of orders. No passengers had been killed, but some trespassers had met with accidents due to attempting to ride on top of the locomotives.

No particular changes were necessary on account of the introduction of electrification in the arrangement of buildings or tracks, but the fact that two electric locomotives could handle a 2,800-ton train necessitated the lengthening of all the passing tracks to 1,000 ft. each.

Keeping Down the Load Peaks Automatically

Under the terms of its contract with the Montana Power Company the railway considered it necessary to install a power indicating and limiting system in order automatically to prevent excessive peak demands for power and as a guide for the train dispatcher. This system is in operation over the 220 miles of the Rocky

TABLE I—COMPARISON STEAM AND ELECTRIC OPERATION — FREIGHT

	October		November		December		Total	
	Steam	Electric	Steam	Electric	Steam	Electric	Steam	Electric
1,000 ton-miles	98,512	125,522	93,228	130,848	91,122	107,717	282,862	364,087
Train-miles	60,666	65,400	58,014	63,299	58,257	57,311	176,937	186,010
Ton-miles per train-mile	1,625	1,920	1,605	2,070	1,563	1,880	1,600	1,960
Total time, hours	6,094	5,022	5,946	5,084	5,785	4,429	17,825	14,535
Number of trains	535	585	523	583	526	543	1,584	1,711
Hours per train	11.29	8.59	11.26	8.72	10.99	8.16	11.25	8.50
Minutes per 1,000 ton-miles	3.70	2.40	3.83	2.23	3.81	2.47	3.78	2.39

Mountain division, where there are five feeding-in points with the Montana Power Company.

This system was designed and installed to accomplish the following results: (1) Indicate the total power. (2) Record the total power on a curve-drawing meter. (3) Automatically take care of certain power returned to the power company's line due to the regenerative braking features on the locomotives. (4) Protect each substation against excessive overload. (5) Limit the total power demand on the power company to an adjustable predetermined amount. (6) Reduce the direct-current voltage of the substation when the load exceeds the peak limit decided upon, affecting first the substation with the greatest load, then those with less load. (7) Provide manual means by which the total resistance of the pilot-wire circuit can be easily and instantly adjusted at the dispatcher's office to compensate for the variations in resistance due to temperature changes. (8) Accomplish the purposes outlined above with power supplied to the railway's 100,000-volt transmission lines at five feeding-in points distributed along the 220-mile division.[2]

The committee reported as to certain modifications which had been made in the load-limiting system, which as yet was in operation only on the Rocky Mountain division. The system was put in operation in July, 1918, with a kilowatt setting of approximately 12,000. On April 1, 1919, this was increased to 14,000 kw. Without the limiting feature of the power indicating and limiting system the demand would probably run to not less than 20,000 kw.

A chart showing the power required for trains of different tonnages at all points in the district is posted in the train dispatcher's office to enable him to become familiar with the loads, so that he can handle them promptly and provide the proper intervals between trains, so as to avoid bringing the power-limiting features into play. The higher the power-limiting feature is set the easier it is to dispatch trains, but the power costs are correspondingly increased. With a little study of train operation and a little practice the dispatchers are able to adjust the train movements to the needs of the service.

Under the subject of comparative operating results the committee quoted from a paper by R. Beeuwkes, electrical engineer of the railway, read before the New York Railroad Club, March, 1917.[3]

Table I was reproduced in order to show the early effect of electric operation in the movement of freight. It was stated further that the same tonnage all over the Rocky Mountain division has required 22½ per cent fewer trains, 24½ per cent less average time per train has been consumed, and operating conditions have been improved, so that nearly 30 per cent more tonnage can be handled by electric operation in about 80 per cent of the time formerly required to handle the lesser tonnage by steam. This means a valuable increase in the single-track capacity of the line.

As for comparative operating expenses, attention is called to the effect of the war at this point and the very considerable correction necessary to bring steam expense prior to Jan. 1, 1917, to a proper basis of comparison with electric operation expense. Table II was, however, compiled from the annual operating statements to serve as a guide.

The committee reported that in the opinion of the roadmasters and superintendents on the electrified zone there is no more slipping of the locomotive wheels on the rail and consequently no more damage to the top of the rail under electric operation than there is with steam locomotives. There is no greater tendency for the rails to creep under regenerative braking, nor have the electric locomotives moving at a high speed tended to displace the rail on the ties or the ties in the ballast. Roadmasters agree that the electric locomotive is easier on the track than the steam locomotive because of the less rigid construction. The flange wear on curves is less, also. From figures given some years ago by Mr. Beeuwkes, it was estimated that one kilowatt-hour measured at the low-tension side of the transformer in the substations is equivalent to 7 lb. of coal on the tender of a steam locomotive.

[2]Details of this system will be given in an early issue of the ELECTRIC RAILWAY JOURNAL.—EDS.

[3]See issue of ELECTRIC RAILWAY JOURNAL for March 24, 1917, p. 540.

TABLE II—ELECTRICAL OPERATING COSTS
From Annual Reports to Stockholders

	1917 12 Months	1918 12 Months	Averages per Year 1917 and 1918
Maintenance of way and structures:			
Power substation buildings	$ 468.64	$ 622.38	$39.00 per substation
Power transmission systems	1,000.68	4,265.44	$7.10 per mile transportation line
Power distribution systems	81,944.74	73,277.70	$134.00 per mile track
Power lines poles and fixtures	14,572.92	20,810.72	$40.20 per route-mile (440)
Maintenance of equipment:			
Power substation apparatus	$10,034.37	$25,914.23	$1,284 per substation
Other locomotive repairs	220,525.76	236,906.35	0.1023 per locomotive-mile
Other locomotive depreciation	77,134.23	85,208.51	0.0363 per locomotive-mile
Transportation:			
*Yard switching power produced	$ 233.83		
*Train power produced	49,402.15	$94,580.46	$5,151.00 per substation
Yard switching power purchased	8,321.86	12,230.88	
Train power purchased	544,224.25	683,997.96	
Yard motormen	$16,007.63	$23,084.87	
Train motormen	262,177.75	346,260.32	

*Sum of these two items represents mainly substation attendance.

The committee concluded this section of its report by the following statements regarding the utilization of water power for electric operation of other railroads: (1) Transmission of electric power at 100,000 volts, with 3,000 volts on the contact wire, is practicable and

Price of Coal 2000 lb	Price of Power Cents per Kwh														
	.525	.700	.875	1.050	1.225	1.400	1.575	1.750	1.925	2.100	2.275	2.450	2.625	2.800	2.975
$8.50	176	235	294	353	412	.471	529	588	647	706	765	824	882	941	
8.00	188	250	313	375	438	500	563	625	688	750	813	875	938		1.063
7.50	200	267	333	400	467	533	600	667	733	800	867	933		1.067	1.133
7.00	214	286	357	429	500	571	643	714	786	857	929		1.071	1.143	1.214
6.50	231	308	385	462	538	615	692	769	846	923		1.077	1.154	1.231	1.308
6.00	250	333	417	500	583	667	750	833	917		1.083	1.167	1.250	1.333	1.417
5.50	273	364	455	546	636	727	818	909		1.092	1.182	1.273	1.364	1.455	1.545
5.00	300	400	500	600	700	800	900		1.100	1.200	1.300	1.400	1.500	1.600	1.700
4.50	333	444	556	667	778	889		1.111	1.222	1.333	1.444	1.556	1.667	1.778	1.889
4.00	375	500	625	750	875		1.125	1.250	1.375	1.500	1.625	1.750	1.875	2.000	2.125
3.50	429	571	714	857		1.143	1.286	1.429	1.571	1.713	1.857	2.000	2.143	2.286	2.429
3.00	500	667	833		1.167	1.333	1.500	1.667	1.867	2.000	2.167	2.333	2.500	2.667	2.833
2.50	600	800		1.200	1.400	1.600	1.800	2.000	2.200	2.400	2.600	2.800	3.000	3.200	3.400
2.00	750		1.250	1.500	1.750	2.000	2.250	2.500	2.750	3.000	3.250	3.500	3.750	4.000	4.250
1.50		1.333	1.667	2.000	2.333	2.667	3.000	3.333	3.667	4.000	4.333	4.667	5.000	5.333	5.667

Note: Diagonal Line Indicates for what Prices of Coal and Electric Power the Expense is Identical

TABLE III—RATIO OF POWER EXPENSE TO FUEL EXPENSE FOR VARIOUS PRICES OF COAL AND ELECTRICAL ENERGY, BASED ON 1 KW.-HR. OF SUBSTATION INPUT BEING EQUIVALENT TO 7 LB. COAL ON TENDER OF STEAM LOCOMOTIVE

reliable for electric railroad service for 100 miles or more of single track. (2) Such a system of electric operation will increase the capacity of a railroad from 25 to 35 per cent. (3) Such a system of electrification will probably prove economical as compared with steam operation, when the cost of reliable electric power and coal bear the relation to one another shown above the diagonal line in Table III, provided that the railroad traffic is favorable for electric operation. (4) The introduction of electric locomotives equipped with electric brakes has made possible the haulage of heavier trains at higher speeds on heavier grades, such as mountain divisions, and with greater safety and reliability under all climatic conditions.

Some Other Topics Discussed

Brief reports, in addition to the above, were made on the subjects of electrical interference and national safety codes.

On the first of these topics a committee, comprising A. H. Armstrong, chairman; H. K. Lowry, vice-chairman; R. H. Ford, J. B. Savage, M. Schreiber and F. E. Wynne, said that it had no record of existing interference of a serious nature with communication circuits by direct propulsion current carried through a third rail and track return. The interference caused by alternating current traversing an overhead trolley conductor with track return may be serious without the introduction of devices or measures which will minimize its magnitude. This may be caused partly by the static charge induced on neighboring conductors by reason of the high voltage usually employed, but is chiefly due to the magnetic effect of the current flowing in the trolley-track circuit. The most severe of these disturbances are set up at times of abnormal conditions, such as extreme overloads or short circuits.

Corrective measures and devices for alternating-current interference include: (1) Neutralizing transformers in telegraph circuits. (2) Combination of coils and condensers commonly known as "resonant shunts" in telegraph circuits. (3) Balance and insulation of telephone circuits. (4) Frequent transformer substations feeding trolleys and feeders in multiple. (5) Avoidance of stub-end feed. (6) Sectionalization of propulsion circuits. (7) Auto-transformer distribution system as installed on the New Haven Railroad. (8) Track booster transformers. (9) Current-limiting reactors. (10) Increase in the separation of telephone and telegraph wires from the propulsion circuits of the railway.

The committee quoted from an A. I. E. E. paper by H. S. Warren, of the A. T. & T. Co., to the effect that means are now known whereby alternating railway current can be kept sufficiently within control, except under abnormal conditions, to prevent substantial interference with neighboring communication lines, although there still remains the problem of obtaining a sufficient reduction of interference without incurring a cost which the railway companies consider excessive.

Interference by direct-current propulsion circuits may be occasioned by ripples caused by tooth harmonics, and a further source of disturbance may be the short circuits inevitable in electric railway practice. Tooth harmonics may be minimized and practically eliminated by proper machine design in new installations and by the introduction of resonant shunts in the substations of existing installations where tooth harmonics have caused appreciable effect on neighboring telephone circuits. The effect of short circuits may be greatly reduced by the introduction of high-speed circuit breakers.

Tests made on the C., M. & St. P. Ry. for the French Electrification Commission early in 1919 showed that there was no interference with the regular operation of the Helena-Spokane double multiplex printing telegraph circuits. The measures employed to minimize telephone and telegraph interference by direct propulsion current include: (1) The use of resonant shunts. (2) Design of generators to give negligible tooth harmonics. (3) Use of high-speed circuit breakers. (4) Reduction in the track-circuit voltage drop. (5) Balancing and insulation of telephone circuits. When such of the above means as are necessary are carefully applied no serious interference is noted.

Regarding the rules in the National Electrical Safety Code, it was suggested that in the matter of construction of galleries or rooms containing oil-filled transformers, etc., the rules should be worded to permit the construction of dams to confine the oil within small areas when no convenient means for drainage are available. Some detailed suggestions were also made regarding grounding rules and labeling of generators and motors.

A report was also made as to the getting together of the various interests with the United States Bureau of Standards in the American Engineering standards committee for the purpose of formulating consistent industrial safety codes.

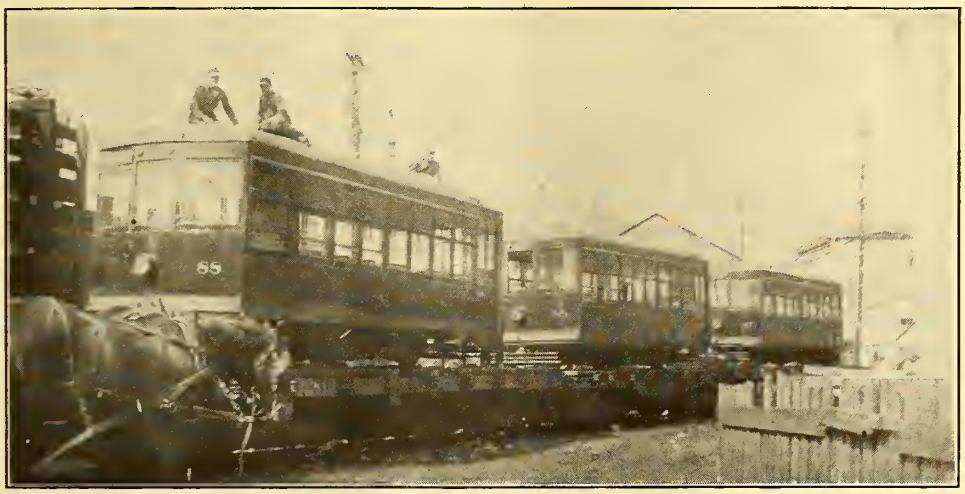
A. I. E. E. Section Discusses Automatic Railway Substations

"Automatic Railway Substations" was the topic of the evening at the Feb. 27 meeting of the San Francisco Section American Institute of Electrical Engineers. The principal paper was presented by W. T. L'Hommedieu, Westinghouse Electric & Manufacturing Company. Discussion was presented by P. J. Ost, electrical engineer for the city of San Francisco, Walter Evans, electrical engineer of the Sacramento Northern Railway, and A. V. Thompson and O. E. Shreve of the General Electric Company.

The Safety Car Next Door to the North Pole

Experience at Levis, Que., During the Winter Just Closed Has Demonstrated That Climatic and Topographical Handicaps Do Not Put Light-Weight Cars Out of the Race

BY H. E. WEYMAN
Manager Levis County Railway, Levis, Que., Canada



ARRIVAL OF THE FIRST BIRNEY SAFETY CARS IN CANADA

SOME operators have believed that the lightweight safety car cannot be operated satisfactorily under extremely severe winter conditions. Actual demonstration, however, with a dozen Birney cars at Levis this past winter has demonstrated that this idea is false. The first instalment of our cars arrived early in September, 1919, and the remainder about the end of November. All of them have since been in service.

To enable the reader to understand the severe operating conditions in this locality it will be necessary to give some of its topographical and meteorological features.

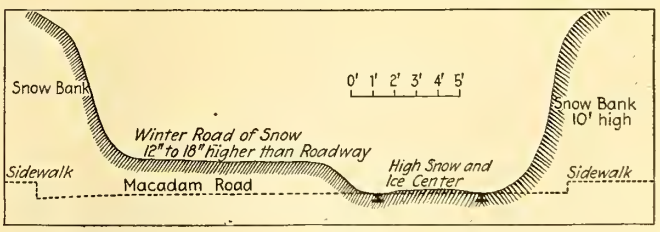
Levis and the adjoining municipalities which are served by this railway are situated on the south shore of the St. Lawrence River, Levis being opposite Quebec city and connected with it by a ferry line. This ferry is the only approach to Quebec from the south shore, for while the famous Quebec Bridge is in service only two or three trains pass over it each day and no provision is made for vehicles and pedestrians. Furthermore, the bridge is eight miles above Quebec, too far to be of service if facilities had been provided.

The severity of winter is much greater in Levis than in Quebec, which is protected by the heights to the north. On the other hand, Levis could not be more fully exposed, particularly because the valley between the Laurentian Mountains and the Island of Orleans forms a huge gully through which northeast and east winds sweep, hitting the land point at Levis. On a fine winter day, with a 30-mile west wind blowing, one finds Quebec city quite comfortable, while over at Levis a cloud of snow is driving down the streets, forming drifts from 3 to 10 ft. high. On a stormy day conditions in Quebec are bad enough, but across the river it is impossible even to face the storm and the houses are invisible from the center of the street. A double-broom sweeper may be passed over the track at one moment and five minutes thereafter the track may be buried under 5 ft. of snow.

The streets in this locality are very narrow, averaging 24 ft. between sidewalks, with some streets as narrow as 12 ft. Thus car tracks must be on one side of the street, and as no sidewalks are cleaned of snow a bank is formed on the sidewalk next to the track 5 to 10 ft. or more in height. This bank is responsible for much of the difficulty experienced in the operation of the railway.

IN WINTER AT LEAST THE RAILWAY MEN IN LEVIS EARN THEIR PAY

Levis is situated near the center of the "snow district" of Canada. Snow arrives to stay about Nov. 20, without fail, and remains until April. From November until March the sun is not powerful enough to melt the snow, so that whatever snow falls remains until March



CROSS-SECTION OF STREET SHOWING WINTER ROAD CONDITIONS IN LEVIS, QUE.

and disappears finally only at the end of April. In January and February, the months of heaviest snow, the average is 34 in. each, with a total snowfall for the winter of 140 in. This sometimes goes as high as 160 in.

Extreme cold is also experienced from November to March, but, provided the temperature is not much below zero and no heavy wind drifts the snow, the cold is of

advantage in operation, as it keeps the streets and tracks free of water and ice. The temperature from November until March averages below zero, and as a rule the changes in temperature are very sudden. The following table shows a meteorological record for a typical storm:

A TYPICAL STORM AT LEVIS, QUE.

		Wind, Direction	Wind Velocity, m p.h.	Temperature, Deg.
7.00 a.m.	Dull	N.E.	15	Zero
10.00 a.m.	Dull	N.E.	25	5
12.00 m.	Snow	N.E.	30	10
2.00 p.m.	Snow	N.E.	40	12
4.00 p.m.	Snow	N. E.	40	15
11.00 p.m.	Snow	N.E.	40	15
7.00 a.m.	Snow	N.E.	40	15
11.50 a.m.	Snow	N.E.	20	15
12.30 p.m.	Sun	N.W.	30	Zero
1.00 p.m.	Sun	N.W.	40	—5
2.00 p.m.	Sun	N.W.	40	—10
3.00 p.m.	Sun	N.W.	40	—10
6.00 p.m.	Sun	N.W.	20	—12
9.00 p.m.	Sun	N.W.	20	—15
11.00 p.m.	Sun	N.W.	20	—20
4.00 a.m.	Sun	N.W.	5	—25

Occasionally the temperature will rise to 25 deg. during a storm and two hours after the wind will change, the snow will stop and the temperature will drop to 15 deg. below zero. The table below is a record of what we have been through this winter:

WEATHER REPORT FOR WINTER OF 1919–1920

Date	Description	Wind, Direction	Wind Velocity, m.p.h.	Thermometer, Deg.
Dec. 14	Snow	E.	20	20
Dec. 15	Snow	E.	30	— 6
Dec. 16	Fine	N.W.	40	—21
Dec. 17	Fine and drifting	N.W.	20	—30
Dec. 18	Fine and drifting	N.W.	40	—32
Dec. 19	Fine and cold	N.W.	10	—15
Dec. 20	Snow	E.	2	— 2
Dec. 21	Fine and cold	N.	15	—15
Dec. 22	Snow	N.E.	1	10
Dec. 23	Mild	S.W.	1	28
Dec. 24	Snow	S.E.	10	25
Dec. 25	Fine	W.	10	— 6
Dec. 26	Snow	N.E.	20	—10
Dec. 27	Fine and mild	S.W.	10	25
Dec. 28	Snow	N.E.	20	— 3
Dec. 29	Fine and cold, drifting	N.	25	— 8
Dec. 30	Fine and cold, drifting	N.	28	— 6
Dec. 31	Dull and cold	N.E.	5	— 0
Jan. 1	Blizzard	N.E.	40	— 6
Jan. 2	Cold and drifting	N.	40	—15
Jan. 3	Cold and drifting	N.	35	—15
Jan. 4	Fine	N.W.	5	—10
Jan. 5	Fine and cold	N.W.	15	—18
Jan. 6	Snow	E.	5	10
Jan. 7	Snow	E.	2	20
Jan. 8	Snow	E.	5	25
Jan. 9	Fine	N.W.	15	0
Jan. 10	Fine	N.W.	10	0
Jan. 11	Snow	N.E.	2	18
Jan. 12	Fine	N.W.	10	— 6
Jan. 13	Fine and cold	N.	12	—10
Jan. 14	Snow	N.E.	6	—15
Jan. 15	Fine and cold	N.W.	15	—15
Jan. 16	Snow	N.E.	10	—12
Jan. 17	Blizzard	N.E.	35	— 2
Jan. 18	Cold and drifting	N.W.	45	—15
Jan. 19	Cold and drifting	N.	30	—30
Jan. 20	Fine and cold	N.	10	—25
Jan. 21	Heavy snow	E.	20	—15
Jan. 22	Fine and cold	N.W.	15	—10
Jan. 23	Snow	N.E.	10	— 5
Jan. 24	Cold and drifting	N.	40	—15
Jan. 25	Cold and drifting	N.	35	—15
Jan. 26	Cold and drifting	N.	10	—25
Jan. 27	Snow	N.E.	15	— 1
Jan. 28	Fine	N.W.	10	— 3
Jan. 29	Cold	N.W.	5	—10
Jan. 30	Snow and drifting	N.E.	30	—20
Jan. 31	Cold and drifting	N.	35	—35

It will be readily understood that the operation of a railway under conditions prevailing here requires the use of meteorological instruments and good judgment as to weather probabilities. If the snow sweepers go out a half hour late the cars will be stalled, and this in turn means more or less burnt-out equipment. On the occurrence of a blizzard failure to order the cars into the carhouses at the right time has the same result and seriously complicates the opening up of the railway after the blizzard is over. If passenger cars and sweepers try to fight their way back to the carhouses they leave bad rail for the plows to operate upon and much valuable time is lost and derailments are caused.

The snow at Levis is of a fine nature due to the cold, being similar to a good grade of table salt. Under wind pressure it will sift through even the smallest cracks. If equipment is left out the motors are filled with snow, and the drifting and sifting of snow of this kind at 10 deg. below zero produces one of the worst conditions of the rail under which cars must operate. Such are the conditions with which the safety cars have had to contend on this property.

An accompanying cross-section of a street in winter is given to enable the reader to visualize the operating conditions. There are no sidewalks in winter, because cleaning them would mean a very heavy expense to the taxpayer. The track is therefore used as a walkway, particularly after a storm. The railway has to cut the roads for the vehicles with plows and sweepers and the city of Levis and the other municipalities pay three-quarters of the cost of snow removal. Owing to the location of the tracks on one side of the street special snow-fighting machinery is used, including rotary plows. Nose plows are useless.

The snow-fighting work is done by men especially trained to handle the equipment and they must be on their machines as soon as the snow begins to fall.

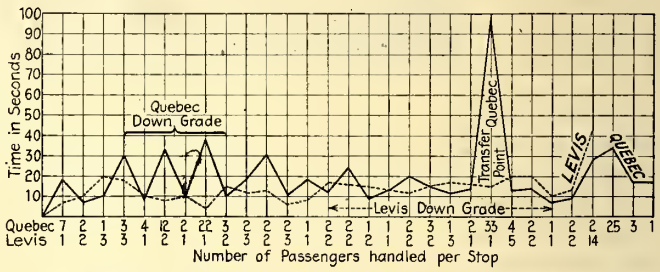


CHART SHOWING TIME IN SECONDS CONSUMED IN STOPPING AND STARTING CARS

Quebec Railway, Light, Heat & Power Company's double-truck car between Upper Town and Limoilou and return, round trip thirty-eight minutes. Birney safety car at Levis between Bienville Junction and uptown terminus, round trip twenty-six minutes. Both runs made during the winter of 1919-20.

Sweepers are first sent out, but if there is danger that the storm will become a blizzard all cars are ordered in. As soon as the storm shows signs of abating the rotary plows are put to work, each accompanied by a sweeper. As soon as the plows have completed their work and the track is swept the wing levelers are used, leveling off and pushing back the snow on the road. In some places the drifts have to be cut out by hand. It is urgent that this work be done before the temperature falls and the road traffic has much chance to harden the road. Otherwise the roads will build up several feet high, endangering road traffic and interfering with the operation of the sweepers.

After the roads are cut one of the rotary plows having a square nose and small extended wings is sent out to cut more of the banks on the sidewalk side. This is accompanied by a sweeper. This completes the operation unless the track centers are high, in which case a special ice cutter attached under a construction flat car is sent out, accompanied by a sweeper.

Few Cities Can Match These Operating Conditions

The Levis County Railway consists of 12 miles of single track with the usual turnouts or meeting points. It is divided into three divisions, one west 7½ miles, one

east 2¾ miles and one south, or Upper Town, 2½ miles, all radiating from the center of traffic at the Quebec Ferry. The eastern division is on 15-minute headway with three cars and three-quarters of an hour for the round trip. It takes care of the large drydocks and shipbuilding yards. There are four extras put on morning and night to take care of the workers on the docks, two of which go to Upper Town and two to Quebec Bridge.

The western division follows the river at the foot of the cliff, with many curves, but only two serious grades of 7½ per cent, 500 to 600 ft. long. It serves approximately 10,000 people and there are two fare zones on this line.

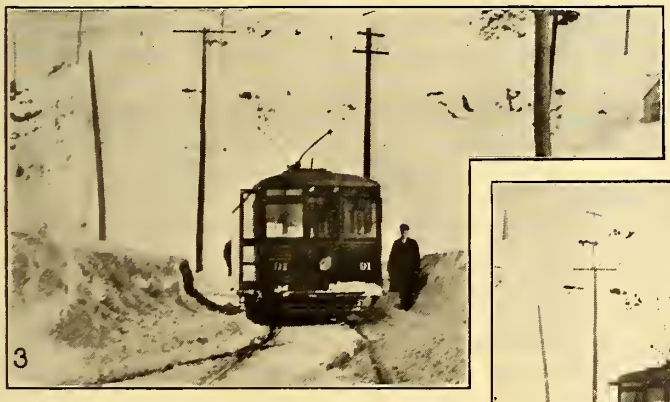
The eastern division serves 8,000 people about the docks already mentioned and has a very heavy grade of 13½ per cent for 400 ft. with two curves on it, and two other grades of 6 per cent 1,200 ft. long each. The track is largely tangent on this division.

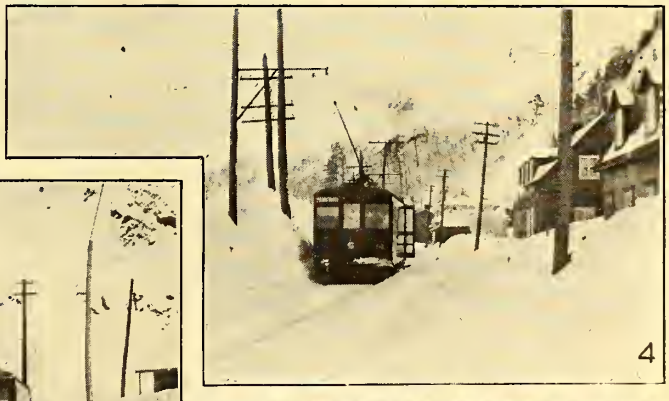
The Upper Town division is nothing but grades and curves, the worst being 13½ per cent for 400 ft. with two curves and 11½ per cent for 1,200 ft., also with two curves. This division rises 320 ft. in 2⅛ miles, the grade averaging 6 per cent. It serves 7,000 people.

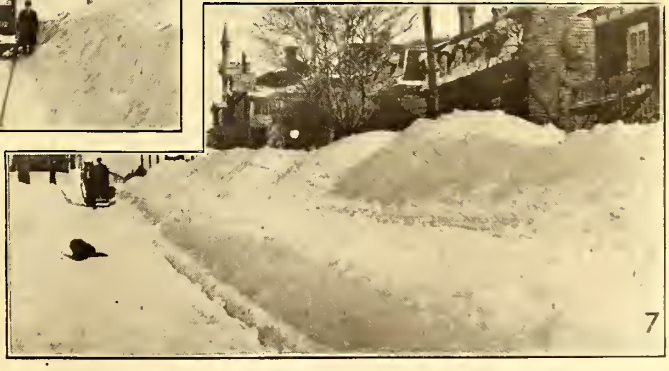
Between the eastern division and Upper Town there is quite an interchange of traffic. The density of traffic is controlled by the ferry, which is on fifteen-minute schedule in summer and half-hour schedule in winter. There is thus a congestion every fifteen minutes in summer, intensified in winter by the longer headway. In winter 300 to 400 passengers have to be handled by the cars every half hour.

As early as 1916 the company decided to try out one-man car operation and converted an old single-truck car for this purpose. The success of this car was such that it was decided to apply the Birney type of car, especially fitted up for Canadian climate. The difference from the usual standard features was as follows:

Car Body	Double-lined throughout. Double floor. Storm windows or sashes on all windows. Ventilators capable of being closed as required. All vestibule windows permanently fixed except center window being drop sash.







No. 1—Uptown terminus, Levis, at the peak of a cold wave. Note windows partly frosted.
No. 2—Wolf Street uptown, Levis. 10 deg. below zero and 40-mile wind.
No. 3—Point Levi. A Birney in the snow.
No. 4—In Hudlow Cove near Levis.
No. 5—Point Levi, one mile from ferry, Quebec Bridge division. Note snowbank at top of cliff ready to slide down.
No. 6—In one of the river coves, Quebec Bridge division. Note height of winter snow road at left.
No. 7—Fraser Street uptown, just after storm. Rotary plow just passed, sweeper has to follow. Tracks only route for team.

Air Equipment	Especially installed with the proper amount of radiating pipe to prevent freezing of air and moisture accumulation from the cold.
Motors, GE-258	To have covers for closing up the ventilating ducts in winter to prevent snow accumulation inside.
Trucks	26-in. wheels to give maximum clearance on account of high centers, due to snow and ice.
Heaters	12 single coil heaters.

These cars were highly satisfactory. It was found, however, that the motor drain holes had to be covered up and some other minor details required attention.

THE SAFETIES QUICKLY ADAPTED THEMSELVES TO CONDITIONS

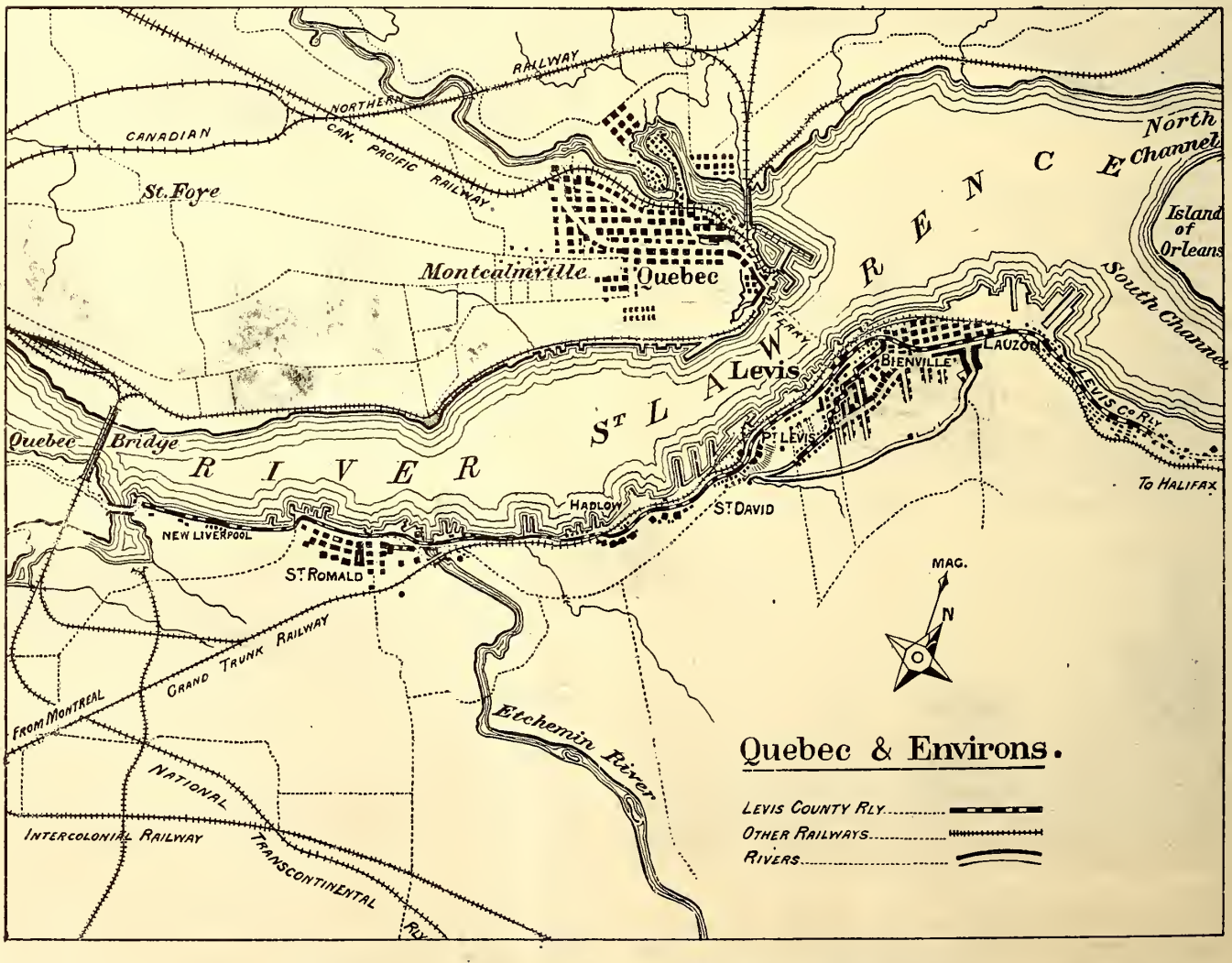
When the safety cars were installed they had to face not only the weather conditions already described, but also heavy congestion at the ferry, which had caused the double-truck cars to be full to overflowing. The first three new cars placed in service on the Upper Town line early in September replaced four old single-truck two-man cars. They ran on the same headway, but were only allowed three-quarters of an hour for the round trip. The new cars made good from the start, producing a 30-per cent increase in traffic.

When the ferry service went to half-hour headway on Nov. 25 the traffic still held up and the cars were considerably overloaded in the rush hours, running from eighty-eight to ninety-three passengers each, all going up hill. Two extra Birneys were put on during the rush hours, running as double-headers, and even then both cars carried many straphangers.

The remaining eight cars arrived early in December and three were used to replace three double-truck cars on the Quebec Bridge division under the same operating conditions, the former double-truck cars having been operated by one man each. The new cars were able to handle the traffic except in rush hours, when two extra Birneys were put on with a turnback at the three-mile point. This gave double-headers every half hour from the ferry, which handled the traffic nicely, although it had taxed the capacity of the double-truck cars. The public has been much pleased with the change. This is a suburban traffic and no increase was looked for, but a slight one has resulted. The snow conditions on this line are severe, but the new car has proved equal to them. It must be understood, however, that the cars are not allowed to buck snow, because we have found that it pays to let snow-fighting equipment do this and save the passenger equipment.

The eastern division is still being operated with old converted one-man cars, much to the disgust of the public. When new cars are put on this division they will certainly bring a 30 per cent increase in traffic because the traffic density is greatest here. Snow conditions are better on this line than on the others. The dock workers here are handled by means of the discarded one-man cars.

A comparison test has just been made between a double-truck open-platform P.A.Y.E. car of the latest type, but without folding doors and steps, used on the



ROUTE OF THE LEVIS COUNTY RAILWAY AND OTHER LINES

Limoilou division in Quebec City and the Birney car on the Upper Town line in Levis, to show the time consumed per stop. Omitting passengers who boarded or alighted from the Quebec car while it was in motion, the time taken per passenger to alight was practically the same in the two cases. The time taken in boarding per passenger was two seconds greater for Levis, which can be explained by the large platform of the Quebec car and the fact that the car can be in motion before the passengers have paid their fare. However, the more rapid acceleration and braking on the Levis car made up for this difference. The graph on page 700 illustrates this comparison.

In this study stops or traffic holdups are not included. Attention is directed to the fact that the grades encountered by the Levis car are much greater than those in Quebec.

VERY FEW MAINTENANCE DIFFICULTIES HAVE BEEN EXPERIENCED

The Levis safety cars have been operated all during the past winter without any snow scrapers or flangers, but a small light scraper would be of some benefit and would not overload the motors any more than would 6 in. or more of snow on the rail.

We have found one unavoidable trouble with all types of cars in that the passengers bring in a lot of snow on their feet, which melts and keeps the floor wet. This water has percolated into the sand traps and register foot valves, interfering with their operation. The sand-trap trouble has been remedied, but the air-register foot valves will have to be relocated and improved. The water seeps down into the valves and freezes up, putting the whole air system out of commission.

There is no doubt that the additional equipment of the Birney car increases maintenance, but this is more than offset in other ways. Executives must remember that additional equipment requires care and must make the necessary allowances. All around, however, the maintenance on the safety cars compares favorably with that on the old cars, provided they are not neglected.

I have said nothing so far about accidents. We have had a few collisions. In a head-on collision between two Birney cars, in which one was making 12 m.p.h. and the other had started to back up at 2 m.p.h., the shock was taken at the buffer beams, which were not damaged. The main quarter-elliptic spring truck bolt was sheared clean off, the shock evidently passing right through the underframe of the car to the truck. Another head-on collision occurred between a Birney and an old single-truck car with 33-in. wheels, the buffer beam of the old car being almost on the level with the headlight of the Birney. The vestibule of the Birney was smashed in, but the repairs cost only $35.50, for when the sheathing was passed through a set of rollers it was as good as new. The heaviest cost was for painting. In collisions with vehicles the buffer beam has taken the brunt of the blow, one or two having been bent. The buffer beams held up just as well as those on the old type of car.

With regard to the interior seating arrangement, we use the cross seats all the way to the front. It has been suggested that the two front cross seats should be removed and short longitudinal seats installed, forming a well for standing passengers. Our experience indicates that it is easier to get the patrons to go to the rear when the cross seats are used in the front than when there is a well, because the operator can see better whether there is room at the rear and can urge his passengers to go back. The Levis cars are for double-end operation and are so wired that the car cannot move unless the proper trolley pole is on the wire. These cars were the first to be wired in this way.

Swiss Install Automatic Substation

Brown-Boveri Substation Operates by Clockwork of Simple Construction, but Does Emergency Switching Automatically

THAT the automatic substation has invaded continental Europe is indicated by Brown, Boveri & Company in their December, 1919, *Mitteilungen*. The automatic features are, however, not the same as those employed in this country where the station is caused to operate and furnish power intermittently as may be required by load variations. The Swiss station is operated by clockwork, which causes it to start at a given time and operate continuously until another given time, when the clock mechanism stops it.

Stephen Q. Hayes, switchboard engineering department, Westinghouse Electric & Manufacturing Company, mentioned this substation at the Pittsburgh meeting of the American Institute of Electrical Engineers. He has since furnished the ELECTRIC RAILWAY JOURNAL with the following abstract of the description of this substation, which appeared in the B., B. & Co. publication:

Full automatic installations of machinery are now recognized more and more as being necessary for many kinds of installations to secure economical and advantageous operating conditions. The increase in wages of labor, together with the shorter hours that labor works, has increased considerably the expenses of operation and maintenance. For these reasons it is desirable that future small, separately located substations, for which steady and dependable labor is difficult to secure, should be made automatic. These are principally rotary converter stations for tramway, railway or factory operation. Standard transformer stations as a rule require less superintendence and do not need constant inspection.

Brown, Boveri & Company, recognizing the future importance of automatic substations, have for some time studied such installations and have conducted experiments with a full automatic rotary converter substation with satisfactory results. Such a station is in operation at Riehen, near Basle, in Switzerland, and serves as a feeder for the Basle-Lorrach Railway. This is, so far as we know, the first automatic rotary converter substation on the old continent, although in America during the last few years substations have been erected. However, they operate on a different principle than that employed by the Brown-Boveri Company.

The functions of the automatic substation at Riehen consist of automatic starting in the morning and automatic shutting down in the evening, as well as temporary opening and reclosing in case of temporary open circuit in the source of supply or overload or short circuit on the direct-current end. Furthermore, in case of a period of long duration of open circuit of the source of supply an alarm is given at the central point regarding the interruption of power. The different combinations for securing these results are secured in our equipment by a combination of relays and contactors which control different switches. The automatic starting in the morning and automatic shutting down in the evening are accomplished by a time-clock of simple construction.

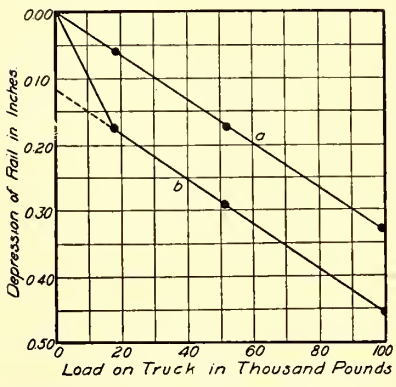
With the Brown-Boveri system present substations can quickly be changed over to the automatic type without interrupting the operation of the system during the change-over. Naturally, such changing over of old installations requires that a part of the old apparatus must be changed or replaced by new. Even then the automatic substation pays for itself after making an allowance for cost of new apparatus plus 15 per cent for insurance and depreciation. Still more economical is the up-keep of new installations, where original costs are almost the same as for substations with attendants.

Stresses in Railway Track Analyzed

Report of Joint A. R. E. A. and A. S. C. E. Committee Deals With Tie Bending as Related to Tamping and With Distribution of Ballast Pressure

IMPORTANT data applicable to electric railway track and forming a valuable addition to existing knowledge on track mechanics are included in the second progress report of the American Railway Engineering Association's committee on stresses in railway track, presented at the recent convention in Chicago. This was a joint committee with the American Society of Civil Engineers.

The first report of the committee, presented in March, 1918, recorded the following conclusions: The stress in the rail under a train or any other load is determined by the general track depression, with little regard to tie spacing. The roadbed acts as an elastic structure except for certain looseness or play absorbed in the first stage of the depression. Heavy rail, hard ballast and deep ballast make stronger track by reducing the track depression. Thorough tamping of track also reduces depression and rail stress. It was also found that a train produces larger stresses when running at speed than when standing, and although the increase could not then be measured satisfactorily, it would seem to be of considerable amount. Transverse bending of the rails was observed, arising from conditions not fully explained; in some cases the ratio of stress in outer flange of the rail base to stress in inner flange is greater than 3 to 1.



TYPICAL LOAD DEPRESSION DIAGRAM. (a) TRACK IN BEST CONDITION, (b) SPACE OR PLAY UNDER TIE

The investigations covered by the second report indicate that:

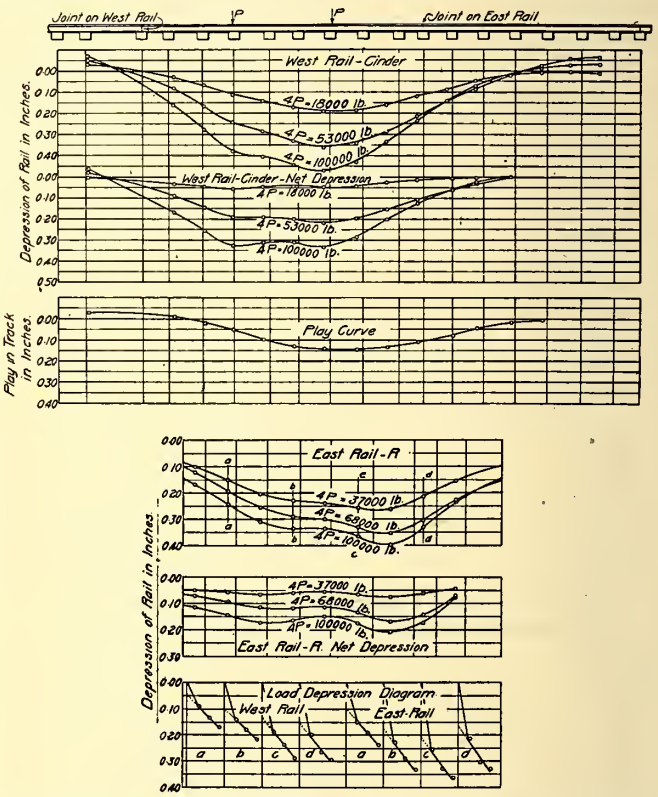
(1) There is a large speed effect. This is roughly proportional to the speed and may equal or exceed one-half the static stress.

(2) Wheel loads are distributed to the several ties in the same ratio for large as for small loads. The depression of any tie is proportional to its load, except that there is an initial irregularity of deflection chargeable to soft bearing or to slight play between rail and ballast. The maximum tie reaction under a four-wheel truck ranges from 13 to 16 per cent of the truck load, agreeing with theory.

(3) Most track is distinctly center-bound before tamping. The endbound condition produced by tamping rapidly disappears, but the bending moment in the tie is greater directly under the rail than at mid-length. The critical bending moments in the tie range from 2 to 6 lb.-in. per pound of tie load, but should not exceed 2 to 2½ for first-class track well maintained.

(4) Transmission of pressure in ballast follows laws deductible from theoretical considerations. At any level below the tie the lateral distribution of load follows the "error curve." In this respect sand, gravel and broken-stone ballast behave alike. The pressure decreases downward according to an exponential or logarithmic law. The pressure of tie on ballast is greater at the middle of the width of the tie and least at the edges, due to the friction between ballast and tie, as the ballast tends to flow out laterally.

(5) About 4 in. below the tie the ballast pressure is equal to or greater than that just at the tie. At 6 in. depth the load begins to spread, and at a depth equal to the tie spacing the pressure is nearly uniformly distributed.



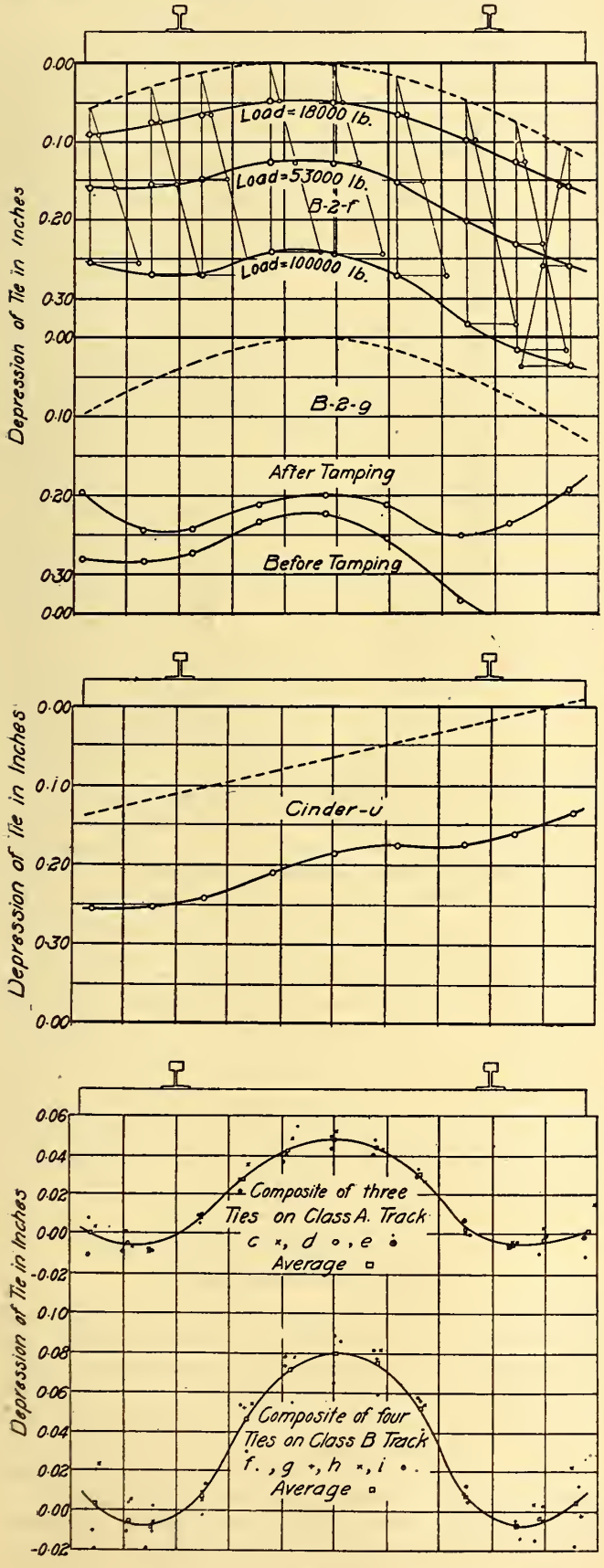
TRACK DEPRESSION PROFILES. LOAD APPLIED TO FOUR-WHEEL TRUCK AT ONE END OF CAR. WHEEL BASE 5 FT. 6 IN. (UPPER DIAGRAMS) SAWED OAK TIES, CINDER BALLAST, 85-LB. RAIL, (LOWER DIAGRAMS) HEWN SOFT WOOD TIES, GRAVEL BALLAST, 75-LB. RAIL

Distribution of Load to Ties

New measurements of track depressions under known loads not only confirmed the former deduction that track is elastic but also provided data for computing the load on the individual ties.

A leveling bar was used to measure the depressions and plots were made of depressions under a four-wheel truck loaded to different total loads. When the depressions at any one point were plotted on a base of load a straight line resulted, demonstrating elastic action, but in the early stage of the depressions there was a divergence from the straight line, indicating the equivalent

of a slight looseness or play in the track before solid bearing was reached and elastic action began. Taking from these plots the amounts of play for different points along the track a play curve was obtained. Deducting the amounts of play from the depressions curves of net or elastic depression were obtained.



TYPICAL TIE FLEXURE DIAGRAMS

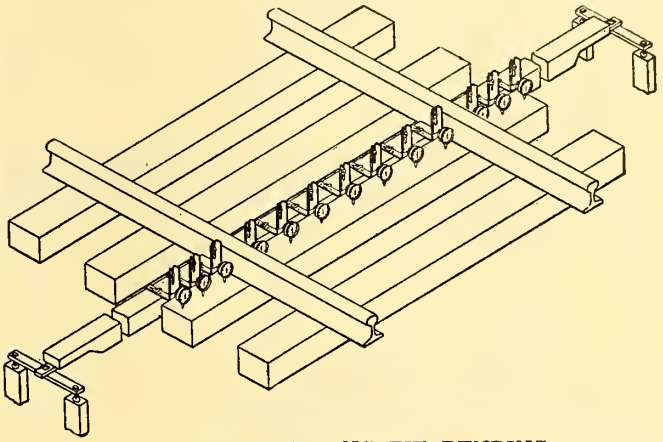
From such net curves the depressions of all the ties affected were summed and equated to a total load. Simple division thus yielded the value of load required to depress one tie one inch, and this value multiplied by the depressions of the individual ties gave the loads borne by them. The load on a tie directly under an axle generally amounted to 13 to 16 per cent of the two-axle truck load; midway between wheels the tie reaction was as much as 1½ per cent more.

TIE REACTIONS IN TERMS OF LOAD ON FOUR-WHEEL TRUCK

(Typical results of tests for 7 x 8-in. ties on 36-in. gravel ballast. First three lines refer to main-line track with 100-lb. rail; last two lines to branch-line track with 75-lb. rail.)

Tie 1	Tie 2	Tie 3	Tie 4 (Under Wheel)	Tie 5	Tie 6	Tie 7 (Under Wheel)	Tie 8	Tie 9	Tie 10
0.08	0.09	0.10	0.11	0.11	0.10	0.11	0.11	0.10	0.07
0.04	0.08	0.11	0.13	0.13	0.13	0.12	0.12	0.09	0.05
0.03	0.07	0.11	0.15	0.15	0.15	0.14	0.11	0.07	0.02
0.06	0.08	0.10	0.10	0.10	0.11	0.14	0.13	0.10	0.07
0.06	0.09	0.13	0.14	0.13	0.13	0.12	0.10	0.06	0.03

Measurements of the flexure of the tie were considered the best means of studying tie action. A gage bar was supported on stakes at either side of the track



BAR FOR MEASURING TIE BENDING

and thirteen Ames dials attached to the bar bore each on a line at the middle of the width of the tie. A two-axle truck with 18,000 to 100,000-lb. load was placed on the track so that the leading axle was directly over the tie under test. The ties sawed ranged from 7 in. x 8 in. x 8½ ft. to 6 in. x 8 in. x 8 ft.

Many curves of tie flexure were obtained, of which an accompanying illustration gives examples. The upper part of the upper diagram shows how the several bending curves on any given tie were utilized for determining the "play" or looseness of the tie. At various points along the bending curve the loads for the respective curves were plotted as abscissas, with the deflections as ordinates, and load-deflection curves were drawn as straight lines through the resulting points; the zero points of these load-deflection lines were taken to represent the initial solid bearing. By this means the dotted lines shown in the illustration above the observed tie-flexure curves were obtained, these dotted lines representing in effect the profile of the tie at the moment it reached solid bearing.

Net deflections, reckoned from the curves of solid bearing, were plotted in the two composite tie-flexure curves constituting the lower diagram of the same illustration. It will be seen that the net deflections showed fairly similar action in different ties, although the gross deflections varied greatly.

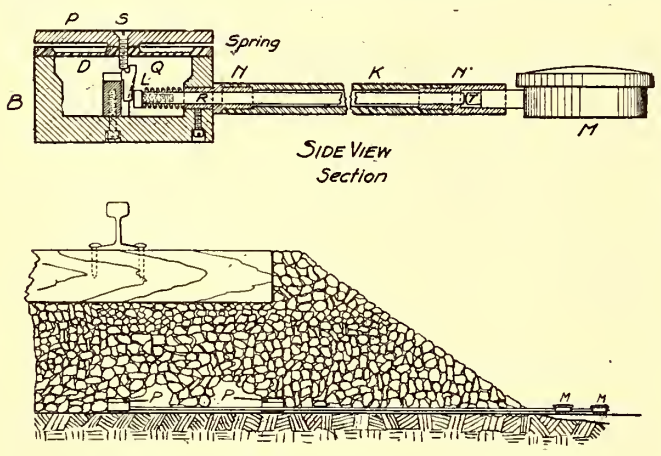
From the flexure curves the bending moments in the ties were computed, based on average moduli of elasticity found by bending tests of ties in a testing machine (oak ties, 1,250,000 lb. per square inch; soft wood ties, 800,000 lb. per square inch). The committee concluded that in first-class track a center moment of 2 *W* and a reverse moment at the center of 1 *W* is to be expected, and a moment under the rail of 2.5 *W*.

Comparing the bending moments with those which would result from various distributions of bearing pressure on the lower face of the tie, the committee concludes that "the maximum bearing pressure per unit of length of tie under static loading will not ordinarily exceed twice the average bearing pressure over the length of the tie, and for track in good condition the maximum will be less than one and one-half times the average."

PRESSURES IN BALLAST

To measure the pressure in the ballast at various depths below the tie special gages were constructed. In the gage the deflection of a steel diaphragm plate protected by a faceplate is measured by a small lever whose motion is transmitted to the plunger of an indicating-dial micrometer. The faceplate has an exposed area of 5 sq.in.

The test rig consisted of a reinforced concrete slab



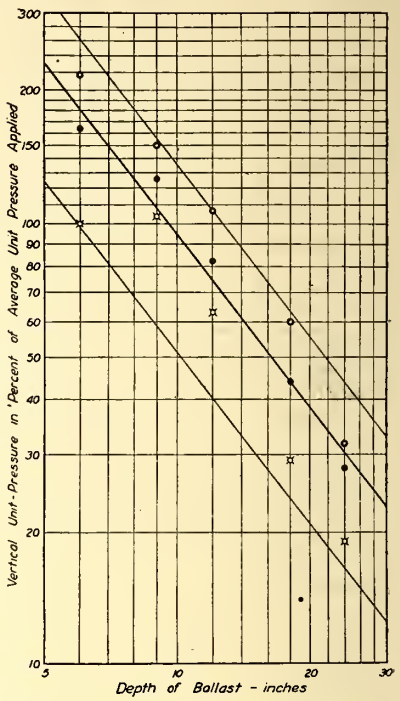
PRESSURE CAPSULE AND LOCATION IN BALLAST

16 ft. x 19 ft. x 12 in. thick, on which the ballast was carried, and over this slab a reaction frame was anchored to it by tie rods to serve as abutment for a jack by which loads could be applied to one or more ties resting on the ballast. The jack load was measured by a calibrated steel spring. Measured pressure obtained with this apparatus confirmed the deduction that at any horizontal plane in the ballast the vertical pressures are distributed laterally in proportion to the ordinates of a probability or error curve, which curve spreads out wider and has a lower middle ordinate as the depth below the concentrated load is increased.

From a single-tie test it was found that the distribution of pressure laterally followed a law very similar to the probability law. This pressure distribution flattens out with increasing depths below the tie. The effect of several ties whose zones of influence overlap is in close agreement with a curve obtained by adding the separate effects of the individual ties. In stone ballast the pressure distribution is somewhat less regular than in fine ballast, but the same general laws are evidently effective for both types of construction.

The committee concludes that "the laws of distribution of pressure through ballast are practically the same for the various kinds of ballast." From contours of equal vertical unit pressures in ballast it is concluded that "in general the vertical pressures become nearly constant at a depth equal to the tie spacing."

In regard to the effect of friction between the bottom of the tie and the ballast, tending to crowd out from under the tie, it was concluded that "there is a concentration of pressure a short distance below the tie, say at 3 to 4 in., and the intensity of pressure in the ballast at such a depth is greater than exists at the bottom of the tie. For the tie of ordinary width the intensity of pressure at a depth of 6 in. and the distribution of vertical pressure over a horizontal plane at this depth do not differ greatly from those existing immediately under the tie. The directions of the pressure are not the same. At or below this depth the distribution of pressure laterally begins."



VARIATION OF BALLAST PRESSURE WITH DEPTH

Also, the committee says "for the ordinary width of tie the effect of the pressure transmitted from the adjacent tie to points midway between ties is noticeable at a depth equal to about half of the usual tie spacing. At a depth of three-fourths of the ordinary tie spacing the pressure immediately under the center of the tie is about one and one-half times that resulting from a uniform distribution over the horizontal plane. At a depth equal to the ordinary tie spacing the lateral distribution has become such that the variation in intensity of pressure from tie to tie is small. The variation in intensity of pressure in the ballast lengthwise of the tie becomes less and less with increase in depth and it may be expected that the variations will be smoothed out at a depth equal to the ordinary tie spacing or a few inches below, where there will be a fairly uniform pressure over the horizontal plane."

New Signal Service on Boston Elevated Railway

PLANS have been prepared by the Boston Elevated Railway Company for the installation of a new signal service on a portion of the rapid-transit lines. It is planned to install a three-light system on about 1.14 miles of line in the Washington Street subway, in addition to installations at the north and south approaches. Under the new system there will be a total of thirty-three blocks equipped with these signals, operating under an alternating-current service, with the exception of the automatic stops, which will be of the pneumatic type of control.

Speeding Kansas City's Traffic

The Third Beeler Report Is Devoted to Main Street, the City's Greatest Traffic Artery—It Urges Island Platforms, More Extended Use of Prepayment and Some Rerouting—More Strict Regulation of Automobiles Also Recommended

THE third Beeler report on Kansas City, recently issued, is devoted largely to traffic conditions on Main Street. This street is the main artery for north and south traffic, and throughout the business district it is densely lined with retail stores and shops. It also forms the most direct connecting link between the business and hotel district and the new Union Station, through which all trains enter and leave the city.

The average width of the roadway through the congested section is 46 ft. Double tracks, 10 ft. center to center, occupy the middle of the street. The clearance between the street cars and the curbing is 13½ ft., which is more than sufficient for the passage of a single line of vehicles, but lacks by 1½ ft. to 2½ ft. enough clearance for a double row of vehicles, standing or moving.

Three important car lines run on Main Street for the greater part of its length and furnish service between the business section and the southern residential district. In addition, the Main Street tracks are used for several blocks by a number of other lines which turn onto or off between Fifth and Nineteenth Streets. The number of through cars scheduled both northbound and southbound on Main Street is but fifty-two, but this number is increased to ninety-two northbound between Ninth and Tenth and to sixty-two southbound between Eighteenth and Nineteenth.

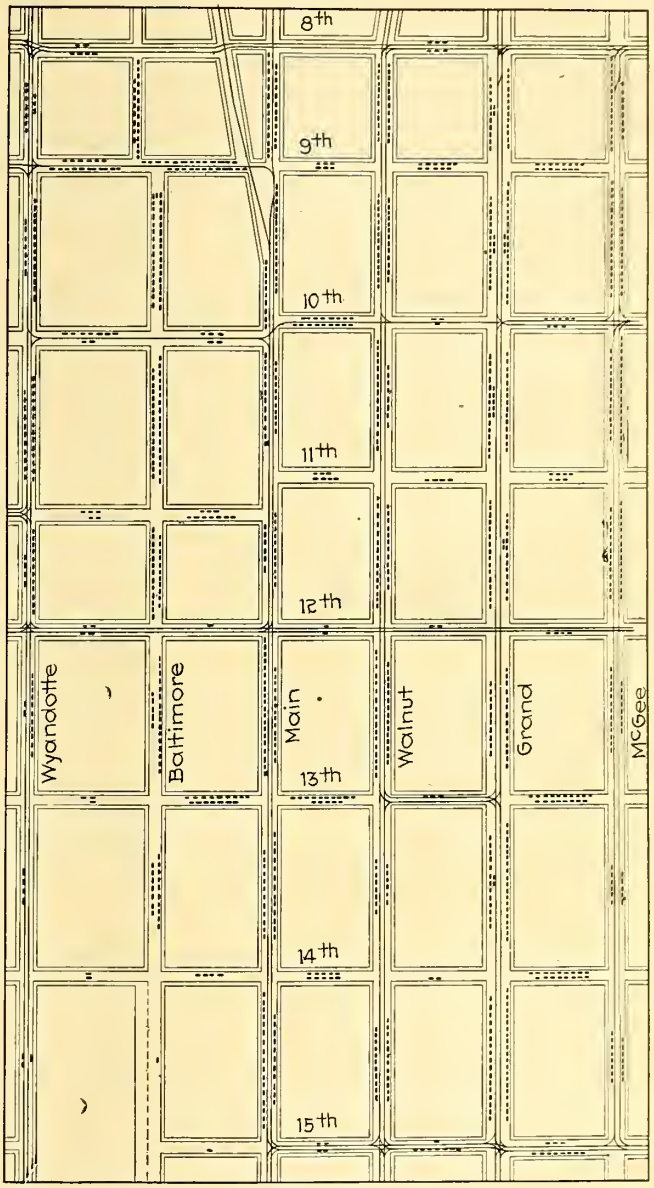
Twelfth Street is the heavy intersection with 183 cars an hour scheduled to go through during the rush. Other busy intersections are scheduled to pass 161 cars, 144 cars and 132 cars respectively during the same period.

The improvements suggested in the previous reports have been effective in bettering car operation. A total of forty-nine more cars are now passed through the intersection of Main and Twelfth Streets during the rush hour, or more by 40 per cent, than were passed previously. Nevertheless, the intersection is still vacant practically 60 per cent of the time as far as car movements are concerned. Double-berthing, according to Mr. Beeler, has been a great factor for good. It is also a fact that by giving precedence to the street cars and by co-ordinating the movements of all other traffic with those of the street cars the traffic officers have been able to put all traffic through with greater dispatch. At other intersections, where there is much left-hand turning, rerouting is suggested.

Car Speeds on Main Street

From 5 to 6 p.m. the average speed of the cars on Main Street, southbound, or in the direction of the heaviest traffic, is but 5.83 m.p.h. all the way from Ninth to Twenty-fourth Street. From Ninth to Tenth Street it is 4.34 m.p.h. and from Tenth to Twelfth Street it drops to 2.51 m.p.h. Cars have been observed making less than 2 m.p.h. in this district.

At other points the speeds are low. The frequency of passenger and positive stops, the lack of double-berthing at heavy boarding points, and slow loading are all contributing factors to these abnormally slow car movements.



THIS CHART SHOWS HOW PARKED VEHICLES BLOCK TRAFFIC IN KANSAS CITY'S BUSINESS DISTRICT. THIS COUNT REPRESENTS CONDITIONS AT 2 P. M. ON NOV. 15, 1919

The amount of vehicular traffic on Main Street is illustrated by a count made at the principal intersection, Twelfth Street, on Nov. 15, 1919. Between 4:45 and 6:15 p.m. on that day 736 vehicles, one-fourth of which were jitneys, passed either north or south on Main Street, while 245 passed east or west on Twelfth Street. On Nov. 20 a count between 4 p.m. and 6 p.m. showed the following division of traffic:

Type	Number	Per Cent
Automobiles	795	58
Jitneys	324	24
Trucks	224	16
Wagons	20	2
Total	1,363	100

A vehicular passenger count showed that the 795 passenger automobiles carried 1,547 persons including driver or an average of 1.9 persons per car. The 324 jitneys transported 1,349 passengers or an average of but 4.2 per vehicle not including the driver. The small number of people transported by each jitney, and the consequent high ratio of man-power employed, 1 to 4.2, according to Mr. Beeler, shows the extremely wasteful methods required by this form of transportation. Additional street cars at the rate of only nine per hour would have cared for this number of patrons. This would save the necessity of passing 324 jitneys over this crowded thoroughfare and through its congested intersections, thus reducing the vehicular traffic movements 24 per cent. The fact that the private automobile carries less than two persons per car shows the necessity of giving the street cars precedence if the people are to be transported expeditiously.

Two charts were prepared, of which one is reproduced showing typical morning and afternoon parking conditions in the business district. They demonstrate that all streets in the business section are used extensively for parking purposes throughout the entire day. During the rush hours, especially the evening rush, conditions are still further aggravated by the jitneys and the automobiles which enter the business district and sometimes even park in double rows while waiting for passengers.

Mr. Beeler declared that this parking interfered greatly with rapid car movement in numerous ways, as it prevented the cars from pulling into the berths, hampered car movements, bunched the cars and filled the streets with waiting patrons. This prevents traffic officers from properly co-ordinating the movements of vehicles with those of the street cars, which is the secret of expediting traffic movements.

Measures for Relief Recommended

In addition to employing the measures previously recommended, such as restricting the number of stops in the congested district, giving precedence to street cars, double-berthing, limiting parking and keeping vehicles off the car tracks, Mr. Beeler recommended the following:

1. Use raised loading platforms in the streets at the most important passenger stops in the congested district.

2. Prohibit jitneys from using Main Street within the congested district.

3. Employ prepayment method of fare collection at Union Station Plaza.

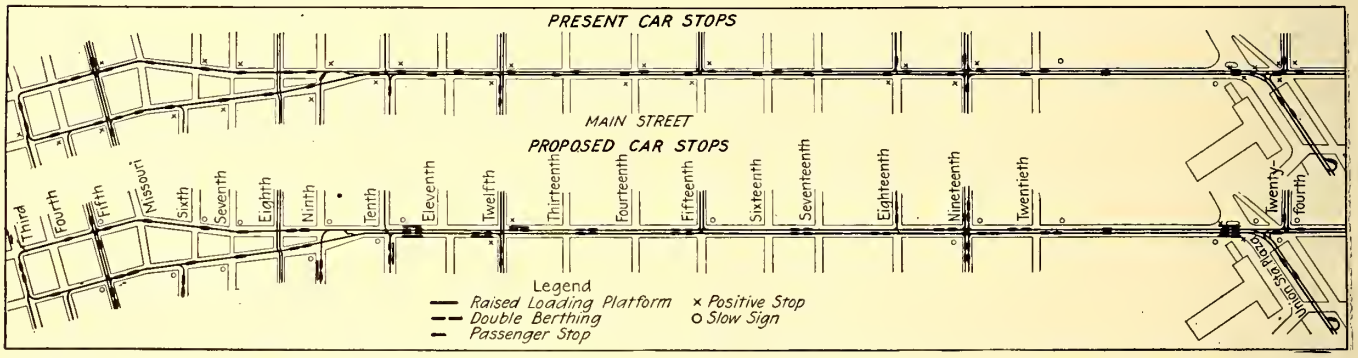
4. Reroute some of the car lines so as to reduce the number turning into and out of Main Street at congested points.

Loading Platforms to Be Installed

The loading platforms recommended by Mr. Beeler and subsequently built were installed at three passenger stops northbound on Main Street, three southbound on Main Street, one eastbound on Tenth Street and one westbound on Ninth Street.

The platforms recommended were to be approximately 100 ft. long, 4 ft. 6 in. wide, and 9 in. above the top of the rail in height, and the inside edge was to be 26 in. from outer rail. This would allow a space 9 ft. wide for vehicular traffic between the platform and the street curb. As laid out, these loading platforms occupy what was actually waste space in the roadway.

Mr. Beeler believed that these platforms, by concentrating the passengers just opposite the car entrances, would materially assist in quickly loading the cars and thus speed up the car movements. He also recommended that vehicles should not be permitted to park at any time between the curb and loading platforms nor along the curb for a distance of 50 ft. from the end of any platform. Neither may vehicles use the car tracks at these points. A rigid enforcement of these rules, Mr. Beeler says, will reduce street accidents as well as increase the capacity of the streets very materially.



PRESENT AND PROPOSED CAR STOPS ON MAIN STREET. THE LOWER DRAWING ALSO SHOWS THE LOCATION OF THE PROPOSED ISLAND PLATFORMS

At present, in order to secure early relief, these platforms should be built of wood. Afterward they may be replaced with more permanent construction of stone and cement. At night they should be red-lighted at each end.

Banish Jitneys from Main Street

While the traffic from jitneys amounts to 25 per cent of the total vehicular movements on Main Street, their proportionate value as transportation carriers is so low that they should not be allowed to congest so important a thoroughfare, at least between Fifteenth and Eighth Streets. If jitney operation is considered necessary to supplement the street car service in Kansas City, Mr. Beeler says that their downtown operations should be confined to Grand Avenue, which is a wider street, and to Baltimore Avenue, which is free from car tracks.

It is recommended that the prepayment method of fare collection be employed at the Union Station passenger stop, at least in the northbound direction.

Prepayment is a great convenience to patrons, especially where such large numbers of strangers and others, mostly burdened with grips and parcels, board cars as they do here in the northbound direction. Southbound, the passengers are leaving the cars and comparatively few are boarding, consequently prepayment in this direction would be of little value. At other heavy loading points street collectors are recommended. Where used, standard cars should be loaded at the front end and safety cars at the rear end. Collectors should have a key by which they can open the rear door of the safety cars from the outside.

Parking Regulation

Strong emphasis is laid on the importance of a rigid enforcement of the anti-parking ordinances in view of the fact that the average auto transports less than two persons including the driver during the evening rush. "How long," Mr. Beeler asks, "will the taxpayers continue to provide $10,000 worth of improved street to park a vehicle that has an average transportation value of less than two persons per trip? Assuming every one in the business district used this method of transportation where would the automobiles be kept? A principle that must be adopted and adhered to is that the streets of the city are its arteries and must be reserved for moving traffic and not for storage purposes."

Electric Railway Notes from Italy

Electric Railway Expert Sizes Up the Present Situation with Regard to Heavy and Light Electric Traction

By Ferdinando C. Cusani
Milan, Italy

ALTHOUGH the commission appointed by Minister of Transportation De Vito has not submitted as yet its decisions about the system of electric traction to be adopted for the 3,120 miles of Italian State Railways lines, which will have to be electrified in accordance with the decision of the Italian Parliament, the State Railways management is actively pushing the electrification of about 375 miles of track in the northwestern part of the country. The several routes connecting Turin with Genoa are being provided with aërial lines, power feeders and substations for a total of 250 miles. The work is being done directly by the electric traction service of the State Railways.

At the same time private contractors are equipping the Turin-Milan and Voghera-Milan lines, totaling 125 miles. Both of these groups of lines will be operated on the three-phase system, as they are simply links connecting the three existing groups of three-phase lines, namely, the Genoa-Riviera-Giovi tunnel group, the Modane-Frejus tunnel (Moncenis)-Bussoleno-Turin group, and the Monza-Lecco-Colico-Sondrio and Colico-Chiavenna (Valtellina) group. It is hoped that electric traction on these two projects will be started within this year, and in the meantime arrangements are being made with electric power companies to supply the railroads' demands.

Electric power companies of Central Italy (Aemilia, Tuscany and Umbria) have already arranged with the State Railways for the supplying of power for the electrification of the trunk lines crossing their zone. Two power stations, which will supply about 20,000 kw., and will burn lignite directly as it is brought out of the mines, will be erected at Tavernelle di Perugia and Torre del Lago. These stations have been planned in such a way that, as soon as the output of the lignite mines increases, their capacity will be augmented accordingly. It is the intention to use as much as possible of the lignite, which is a rather low-grade fuel, directly in specially designed boilers, where it can be much better utilized than under the present practice of mixing it with coal and burning it in locomotive fireboxes.

In this respect it is interesting to note that the State Railways, after very careful experiments, have decided to convert as many engines as possible from coal to crude-oil burning. The reason given is that, although both fuels have to be imported, it has been found that it costs much less to handle oil, which, although more costly at the point of origin, can be most easily transshipped from tank steamers to reservoirs ashore and from these, through pipe lines and tank cars, to the locomotives themselves. Moreover, the adoption of liquid fuel is certainly going to improve the conditions under which the locomotive crews are laboring in the south, especially during the torrid summer season, and to make working conditions less exacting on the mountain divisions.

As for the private railroad companies, it may be stated that although many projects of electrification have been started, they are generally lagging behind on account of the very difficult conditions of the materials market, and on account of the most prohibitive exchange rates, which positively enjoin the use of foreign materials and machinery.

New Electrification Will Probably Be 1,200-Volt Direct Current

The Torino-Ciriè-Lanzo Railway is being electrified, the contract having been awarded to a Swiss firm which has been hitherto known as the strongest advocate of three-phase traction. It is said that this line will operate on high-tension direct current at a voltage over 1,000 and, although this is an interurban line, according to the American point of view it is probable that locomotive operation will be resorted to.

Construction of the Rome-Ostia-Harbor of Rome electric high-speed line, which will be operated by the Rome Municipal Corporation, is being pushed forward, while at the same time the Roman Tramway & Omnibus Company, which has surrendered operation of all its city lines except two to the Municipal Corporation, has been reincorporated under the name of Italian Railways Company (Società Ferroviaria Italiana) and will engage in the construction and operation of an electric line from Civitavecchia to Orte and eventually to Terni, the steel city.

The Lombard Electric Traction Company (Società Trazione Elettrica Lombarda) has been definitely incorporated as the successor of the Italian Edison General Electric Company, and has already taken possession of the lines formerly operated by that company around Milan and of the lines which were controlled by that company. It has also acquired control, through ownership of a major part of the shares, of the Milan Northern Railways, and it appears that a merger will be made with the Brescia Electric Company (Società Elettrica Brescianna), operating some hundreds of kilometers of 1,200-volt direct-current interurban electric railways. This will mean that, apart from the city lines generally owned and operated by municipal cor-

porations, and from a few narrow-gage interurbans, all the electric railways not operated by the State Administration and all the steam tramways in Lombardy will be owned by this new corporation.

Large Mileage Will Be Electrified

It appears that electrification work and new electric construction planned by different private companies throughout Italy will amount to about 2,500 to 3,000 miles, thus bringing the total of planned electrification to more than 6,200 miles.

Electric street railways are laboring under very heavy difficulties just now, the most important one being the lack of rolling stock and the inability of local manufacturers, who are overburdened with repair and construction work for the State Railways, to supply even a small part of their requirements. And as similar conditions seem to prevail in other countries, no relief can be sought through the importation of rolling stock. The abnormally and unjustifiedly high exchange rate makes it almost impossible to think about ordering cars in the United States, although some companies appear to have given serious thought to the matter.

Owl service, which was hitherto unknown in this country, is being started in a number of cities. Beginning on Feb. 23, the Milan Corporation Tramways has been giving hourly service between 1 a.m. and 6 a.m. on twelve of its lines, giving access to all of the different sectons of the city. The rate is 1 lira per ride, that is four times the common fare (25 centessimi) and ten times the morning reduced fare (10 centessimi). Conductors of the owl cars on leaving the carhouses are each supplied with a regulation army revolver, which they have to turn in with the money collected when they reach the carhouses after 6 o'clock. It is hoped that the owl service will be appreciated by the public, the hack service having been seriously cut down during the war and taxicab service being both costly and uncertain due to the lack of gasoline. It appears that other cities will soon follow the lead of Milan in giving such service.

Recent Snows Shop Many Cars

THAT the snows of the past two months have placed an exceptionally heavy load on the repair shops in New England is shown by the Connecticut company's experience. For example, the records since Feb. 4 show that the minimum number of cars per day which have been in the repair shops has been ninety-one, and on many days the number has risen to as high as 110. These figures are for the lines centering at New Haven and operating with about 800 cars. Normally, not more than forty cars are in the shops.

There are two chief causes for these high numbers. One is that the icy nature of the snow and the impossibility of keeping sweepers going all the time were conducive to the formation of high ice centers, until many motors dragged on these high centers with consequent damage. The second difficulty which caused many failures was that there have been several periods of thaw with no possibility of the water running off to sewers. This has caused many wet motors and wet leads, which in turn have caused cars to go to repair shops.

The additional travel due to snow-blocked automobile roadways, all thrown on this reduced equipment along with the regular travel, would tax the energies of any operating force.

Why Do Car Fares Differ?

Cincinnati City Council Receives Report Showing Reasons for Difference in Cincinnati and Cleveland—Local and Contractual Conditions Affect Comparison of Fares

THE reason that street car transportation costs more and therefore demands a higher fare in Cincinnati than in Cleveland is shown in a well-presented analysis of the relative situations in the two cities, which was recently made for the Cincinnati City Council by W. C. Culkins, Director of Street Railroads for the city of Cincinnati. Cincinnati patrons pay a 7-cent fare, while their cousins in Cleveland can secure six rides for 25 cents. Evidently desirous of being sure of their grounds in case they should make any demand upon the local street railway system, the members of the Council requested the Director of Street Railroads to make an investigation into the reason for the difference. That which follows is largely a digest of the report which Mr. Culkins has made, with the significant figures contained in his report set up in a table to show the comparative statistics.

In both cities the companies are operating under service-at-cost franchises based upon the same fundamental principles, but the method of applying these principles differs materially. To secure a fair period of comparison, the first eleven months of 1919 were taken. Primarily it must be borne in mind that street car service is a commodity, and like sugar, coal and other articles its price in one city cannot be fairly compared with that in another without taking into consideration the quality and cost of production and all other conditions affecting it.

Considering first the characteristics of the two cities, Cleveland has wide streets, flat surface and a gridiron layout of its principal sections, while Cincinnati has narrow streets and a hilly country, with a limited number of highways from the business center to the residential districts. In brief, Cleveland is almost an ideal city for street railway operation, while Cincinnati presents problems not found anywhere else in the country. Cleveland is a compact city, and long open spaces traversed by street cars in which little or no population is found, so characteristic of Cincinnati, do not exist in Cleveland. As a result, more miles of track are required in Cincinnati. From figures for the period mentioned, Cincinnati has 55.80 per cent more miles of track for the same number of passengers than has Cleveland. Longer car trips are necessary and earnings per mile of track are less in Cincinnati.

Effect of Traffic Density and Transfers

The natural rate of fare in any city is determined by the cost of furnishing the service per car-mile divided by the number of passengers per car-mile. For example, if the company carries eight passengers per car-mile at a cost of 40 cents, the fare should be 5 cents; if only five passengers per car-mile are carried, the fare should be 8 cents. Under the service-at-cost plan, an increase in the number of passengers or a reduction in the number of car-miles by operating fewer cars with the same number of passengers will reduce fares, and conversely. The car rider pays for what he gets in proportion to the number paying. The figures indicate a much higher traffic density in Cleveland and a consequent lower cost.

But there are other reasons for lower fare possibilities in Cleveland. For example, in Cleveland a charge of one cent for a transfer is made and a second one is not given except on cross-town lines. In all other cases a passenger must pay a second fare. In Cincinnati transfers are free; over 18 per cent of the transfers are double transfers, 5 per cent are triple transfers and sometimes four transfers are allowed. If the same transfer charges had been applied in Cincinnati, $528,789.98 would have been realized in the eleven-month period. Cleveland car routes call for more transfers, as is evidenced by the fact that 37.49 per cent of the Cleveland riders took transfers and paid for them, while in Cincinnati, with free transfers, only 33.35 per cent took transfers.

Other important items are the fact that Cleveland has no half fare for children, whereas in Cincinnati the half rate amounts to $32,000 per annum; the Cleveland Railway Company pays no franchise tax, while in Cincinnati the company pays $350,000 per year; the skip-stop plan is in full operation in Cleveland, allowing higher schedule speeds, more trips per car and consequently fewer cars; in fact, Cleveland cars run 40 per cent faster than Cincinnati cars. Traffic regulations also affect cost of operation, and in Cleveland the superior rights of the street car rider are recognized because of his greater preponderance, the street car is given right of way and other regulations assist street car traffic. Cleveland operates on what is known as the "split run" method, splitting the platform man's hours into morning, afternoon and evening hours. This eliminates much overtime and permits a much lower proportion of regular to extra cars. This is impracticable in Cincinnati.

ANALYSIS OF COMPARATIVE STATISTICS INDICATING REASONS FOR FARE DIFFERENCES IN CINCINNATI AND CLEVELAND

	Cleveland	Cincinnati
Population	905,000	401,000
Area square miles	58.7	72
Density (population per square mile)	15,000	5,570
Revenue passengers per mile of track (eleven months)	894,900	405,900
Total passengers per mile of track (eleven months)	1,235,000	545,900
Average trip (car-miles, eleven months)	5.18	11.02
Passenger earnings per mile (eleven months)	$46,700	$24,100
Total revenue passengers (eleven months)	264,589,945	107,160,088
Total car-miles operated (eleven months)	32,736,697	19,342,223
Density of traffic, passengers per car-mile (eleven months)	8.08	5.54
Density of traffic, car-miles per 100 passengers (eleven months)	12.38	18.05
Total cost of service (November, 1919)	$1,339,099.10	$682,549.97
Total cost of service per car-mile (November, 1919)	45.33	39.26
Density of traffic, passengers per car-mile (November, 1919)	8.73	5.59
Cost per car-mile per revenue passenger (November, 1919), cents	5.22	7.02
Operating cost per car-mile (eleven months), cents	30.05	24.54
Sinking fund requirement (annual)	0.0	$82,445
City tax (annual)	0.0	$350,000
Base fare, cents	4.167	7.0
First transfer charge, cents	1.0	0.0
Second transfer charge, cents	4.167	0.0
Third transfer charge, cents	1.0	0.0

Operating Costs, Valuation and Rate of Return

That higher fares are not the result of high operating costs is shown by the fact that the cost per car-mile is higher in Cleveland than in Cincinnati. In fact, in every detail item except power cost the cost per car-mile was higher in Cleveland during the eleven-month period.

Overcapitalization of the Cincinnati system has been blamed for high fares, but Cleveland, even by scaling down to the lowest valuation per mile of track of any city in the country, realized little benefit. To quote Peter Witt, formerly Street Railroad Commissioner of Cleveland: "Yes, the 'water' was squeezed out, but the statement that its squeezing out has had a material effect on the rates of fare charged is far from the truth. . . . The outstanding stock and bond obligation . . . was reduced from $34,000,000 to $24,000,000. . . . Assume that . . . the $10,000,000 had not been squeezed out. . . . They (the car riders) would have been called upon to pay . . . $600,000 more than they did pay. . . . But with three hundred million riders the increase in the rate of fare, had the 'water' remained, would have been one-fifth of a cent." Similarly in Cincinnati, even taking the Cleveland valuation per mile of track, and eliminating the sinking fund payment, the reduction in fare would amount to only one-fifth of a cent in fare.

Another point is that in Cleveland it has been agreed, after arbitration, to allow 7 per cent on the Cleveland stock, while, under the Cincinnati ordinance, only 5.619 per cent is allowed and the return can be increased only as a reward for reducing fares.

If Cleveland conditions were established in Cincinnati—reduce cars until the density is eight passengers per car mile, eliminate taxes and sinking fund payment, introduce the skip-stop, add a similar transfer charge, eliminate half fares—the cost would be 4.99 cents per revenue passenger. But, in fairness, it should be said that it is not practicable to reduce service to eight passengers per car mile. However, elimination of city tax, introduction of the skip-stop, transfer charges, proper traffic regulation and similar moves would lower fares if Cincinnati wants it. There is no idea of criticising Cleveland service. The people there are satisfied with it.

But Cleveland cannot be regarded as typical of our American cities generally. This is shown by the fact that more than a hundred cities have higher fares than in Cincinnati and in fifty-nine of these the rate is 10 cents; 118 have a 7-cent fare and by reason of the zone system and charges of from 1 to 2 cents for transfers a ride costs more in a number of cities to a great number of the passengers.

In the few cities where the fares have been continued at the old rate there are conditions that must be considered. In New York the Public Utilities Commission has decided that the rate on the surface line should be 8 cents, but a political situation has held up the increase, 78 miles of track have been abandoned, and 700 miles of track are in the hands of the receivers. In Philadelphia, where much publicity has been given to the 5-cent fare, 70 per cent of the passengers must purchase a 3-cent exchange ticket and it is stated by public officials that the average fare is actually 7½ cents. Detroit has a density of traffic almost as great as Cleveland and hauls three times as many passengers as are hauled in Cincinnati on about the same number of miles of track.

These instances are given to further demonstrate the necessity of an inclusion of local and contractual conditions in any study of comparison of fares in different cities.

In the 6½ years since the National Safety Council was formed, with fourteen members, the number of industrial concerns and public utilities on the rolls had increased to 3,854 by March 1, 1920. The increase in 1919 was 253, and the annual rate in the first two months of 1920 was over 700.

Service at Cost in Memphis

Commission Recommends Plan with Several Novel Features — Accepted by City and Company — Fare Begins at 6 Cents

A DECISION which virtually established a service-at-cost plan for the Memphis Street Railway was rendered on March 15 by the Railroad Public Utilities Commission of the State of Tennessee.

The commission issued an order on June 12, 1919, authorizing the receivers of the company to establish a 6-cent emergency rate of fare, and further provided for an examination into the amounts invested in the property of the company upon which it or its receivers were entitled to a reasonable rate of return. This appraisal, as has been noted in these columns, was made jointly by Albert S. Richey of Worcester, Mass., representing the commission; J. H. Perkins of Birmingham, Ala., representing the receivers, and Ross W. Harris of Madison, Wis., representing the city of Memphis. Reports of the appraising engineers were filed with the commission on Dec. 13, 1919, and the commission held hearings on the rate case during January and February. The commission decided that the rate base should be $11,846,034, which was practically the amount found by Mr. Richey, the engineer for the commission. The commission further found that $7,600,000 represented the cost of the renewable property and that 3 per cent of that amount for the present should be set aside out of earnings for a renewal and replacement reserve.

As to the rate of return, the commission decided that it should be not less than 6½ per cent nor more than 7½ per cent on the rate base, as noted above. Taking into account estimates of operating expenses, as prepared by Mr. Harris, the city's engineer, and Mr. Tutwiler, one of the receivers and former president of the company, as well as renewal and replacement accrual and rate of return as stated, the commission determined that the proper present rate of fare should be 7 cents cash or 6½ cents by ticket, the latter to be sold in lots of ten for 65 cents.

The skip-stop plan of operation was retained, as it was shown that the cost of providing the same standard of service was reduced about $100,000 per annum thereby, but it was directed that the company should confer with the city as to modifications of it that might lessen the inconvenience without materially reducing economy.

Outline of Plan Is Published

During the progress of the hearings the service-at-cost plan was mentioned in the course of the testimony both of Mr. Richey and Mr. Harris, and this plan meeting with the approval of the city authorities, as well as of the receivers of the company, the commission's order provides for its adoption, in brief as follows:

The cost of service is first defined as including operating expenses, with such allowances for a renewal and replacement reserve as is later described, as well as taxes and a return on the investment.

It is provided that the accounts of the company shall be kept in accordance with the Interstate Commerce Commission's classification.

The standard of service which shall be provided by the company is, of course, subject at all times to the control of the commission. In this order the commission specifies that until such time as it may make further order the company shall provide not less than 0.155 nor more than 0.185 passenger car-miles for each revenue passenger carried. (NOTE.—This corresponds approximately to 6½ and 5½ revenue passengers per car-mile.)

The investment upon which a return is to be allowed as a part of the cost of service is as stated $11,846,034, as of July 1, 1919, plus or minus such amounts as have been or may be added or deducted since that date with the approval of the commission.

A renewal and replacement reserve is provided for, consisting of such amounts as have been or may be credited to such reserve after July 1, 1919, with future credits and charges as provided for in the current order. It is provided that the renewal and replacement reserve shall be credited monthly at the rate of 3 per cent of the investment in depreciable property until the balance in this reserve shall have reached the amount of $500,000; thereafter, whenever the balance in this reserve is more than $300,000 and less than $500,000, the monthly credit shall be at the rate of 3 per cent. Whenever the balance is more than $500,000 the monthly credit shall be at the rate of 2 per cent, and whenever the balance is less than $300,000 the monthly credit shall be at the rate of 4 per cent of the depreciable property. As stated above, the investment in depreciable property is taken as $7,600,000, as of July 1, 1919, plus or minus such amounts as have been or may be added or deducted after that date with the approval of the commission. The credits to this reserve, as above provided, are to be charged to operating expenses and considered as a part of service, and the amounts in this reserve are to be used for the sole purpose of providing renewals and replacements (other than ordinary maintenance) due to depreciation, obsolescence or abandonment, as may be approved by the commission from time to time.

The rate of return on investment is to be considered as a part of the cost of service and is to be allowed monthly at a rate per annum to be determined as follows: Whenever the "fare index fund" balance (surplus) is less than $60,000, the return is to be at the rate of 6½ per cent; whenever this balance is above $60,000, the return may be at any rate between 6½ and 7½ per cent which the company may be able to pay out of the current revenue after paying operating expenses, charges to reserves and tax accruals, but without decreasing the fare index fund balance below $60,000. It is further provided that if the earnings for any month, plus the balance then in the fare index fund, be insufficient to pay the minimum return, then such deficit in return payments are to be paid from the earnings of succeeding months, plus accrued interest at 6½ per cent per annum, before any amounts are added to the fare index fund.

The "fare index fund" is simply another name for "surplus" and is maintained by crediting to it monthly all revenues after the cost of service has been paid. It

is provided that the fare index fund shall be used to pay such deficits as may occur between revenues and the cost of service, and that it also shall serve to determine the rate of return on the investment, as above described, as well as the rate of fare as follows: Whenever on Jan. 1 or July 1 of any year the balance in the fare index fund shall be greater than $200,000 and shall have been increasing during the preceding two months the rate of fare shall be reduced to the next lower in the following list, but if on such dates the balance in this fund shall be less than $60,000 and shall have been decreasing during the preceding two months the rate of fare shall be increased to the next higher. It is further provided that in the event that the fare index fund continues to increase for the next two months after a decrease in fare or if it continues to decrease for two succeeding months after an increase in fare an emergency change in the rate of fare can be made to the next lower or higher, as the case may be, without waiting for the next succeeding Jan. 1 or July 1, but such emergency changes may be made only with the specific approval of the commission.

The rates of fare which automatically may be in effect in accordance with the operations of the fare index fund under this order are listed as follows:

1. 8 cents cash
2. 8 cents cash, with ten tickets for 75 cents
3. 7 cents cash
4. 7 cents cash, with ten tickets for 65 cents
5. 6 cents cash
6. 6 cents cash, with ten tickets for 55 cents
7. 5 cents cash

It is further provided that whenever fare No. 2 or fare No. 6, as listed above, shall go into effect the commission will extend this list either upward or downward, as may be necessary, and will make further additions from time to time, so that the list may always contain two rates of fare above and two below the rate of fare in effect at the time.

The order also provides that the company shall furnish detailed monthly statements of the results of its operation to the commission and provides for any special investigation which may be desired by the commission at any time. Specifically relative to the latter, the commission provides that inasmuch as the city of Memphis has expressed the desire to have a traffic survey made to determine whether or not as satisfactory service may be provided at less cost than at present the company is directed to co-operate with the city in making such a survey and one-half of the cost of it is to be paid by the company and charged to current operating expenses. The company is also directed to confer with the city authorities concerning possible modifications of the skip-stop plan which may be made without a material reduction in present economy of operation.

Company Will Start with 6-Cent Fare

After the order, as described above, had been determined upon by the commission and its principal features had been made known to the company and city officials the latter made strenuous objections to the initial rate of fare which was provided therein, viz., 7 cents cash, with ten tickets for 65 cents, and appealed to Judge McCall of the United States District Court, under whose direction the receivers are now operating the property. Judge McCall suggested to the receivers that they consent to an addendum to the proposed order of the commission to the effect that instead of beginning at the proposed initial fare the present fare of 6 cents be continued as a test fare for a period of three months from the date of putting the plan into operation. If at the end of three months the 6-cent fare shall not provide enough revenue to meet the cost of service, as described in the order of the commission, then the rate of fare automatically shall go to the initial rate provided for in the commission's order, and if at the end of the second three months this rate of fare shall not produce sufficient revenue, then the order as written by the commission shall go into full force and effect until changed by the commission or by a court or other tribunal having jurisdiction. It was suggested that the results at the end of both the first and second three months period be submitted to Judge McCall by sworn reports of the receivers at the end of such periods and that he should determine whether or not such results shall require a change in the rate of fare.

This suggestion was made by Judge McCall only on the understanding that the Mayor and Commissioners of the city of Memphis would co-operate with the receivers of the company in giving the new plan a fair trial. The Memphis City Commissioners accepted this suggestion of Judge McCall and the receivers also agreed to it, and these facts having been brought to the commission an addendum was added to the order of the commission providing for initial three months test periods with the initial rate of fare 6 cents.

The order of the commission was a majority one, one member (Commissioner Welch) dissenting as to the rate base (placing it at $10,236,646 instead of $11,846,034) and as to the initial rate of fare (placing it at 6 cents). All three members of the commission agreed as to the other features of the order, including the service-at-cost plan, requirements for renewals and replacement reserve, rate of return and fare scale.

Receivers Issue Statement

The receivers in a statement to the public, issued with the announcement of the commission, say:

As receivers of the Memphis Street Railway Company we have been and are officers of the court appointing us, and as such have impartially represented, as it has been our duty to do, the public, the creditors of the company and the owners of the property.

We have appeared before the state commission by order of the court, after the company had vainly appealed to the preceding city commission for relief, to insure proper service in Memphis and the restoration of solvency to the company, so that new capital may be available as extensions and additions to the property may become necessary.

We have contended for a fair valuation of the property, a fair rate of return, a necessary renewal and replacement reserve and a proper standard of service and revenue enough, but no more than enough, to insure service for the public and fair treatment of those who own the property. There is not a doubt in our minds about the absolute integrity of the members of the state commission who subscribed to its opinion, nor about their ability and their singleness of purpose and desire to reach just conclusions upon all issues.

As receivers we are quite willing to have the test of a 6-cent fare made as agreed upon. We hope it will prove unnecessary ever to make effective any higher fare and that even a lower fare may be eventually possible, but this will depend upon future volume of traffic and trend of operating expenses. It will of course be our purpose to do all possible to get the best results in service and net returns during the test period.

In conclusion we appeal to the city officials, the press and the public generally to remember that the street railway is a city essential, that those now in charge of it are entitled to co-operate in efforts to make it serve adequately those who must use it and that the investment in this property is legitimate and those interested financially are entitled to the fairest treatment.

Our action in agreeing to the further test of the 6-cent fare is not intended in any degree as an abandonment of the contentions made before the state commission nor as a criticism of its action, but is taken in pursuit of a desire to dispose of and settle a controversy which has been precipitated as to the sufficiency of a 6-cent fare in Memphis.

The date at which the ordinance was to go into effect was set as April 1, 1920.

Letter to the Editor

Concrete Stringer Track Good If Many Conditions Could Be Met

THE DENVER TRAMWAY COMPANY
DENVER, COL., March 27, 1920.

To the Editors:

We have taken a lively interest here in the tieless concrete track described in a recent issue of the JOURNAL. A number of years ago the Denver Tramway experimented with a concrete beam substructure designed to eliminate wood ties. This held up very well for a while, but later on it was necessary to remove it and go back to wood ties and ballast, the reason being that at the very outset it was difficult for the construction forces to obtain a uniform grade and alignment. The gradient particularly caused trouble. A rolling load, constantly encountering resistance due to the presence of foreign matter on the tracks, sets up a vibration in the foundation upon which it rolls. This in time disintegrates the foundation unless its mass is so great that the vibration is damped down to the point where it results only in abrasive stresses on the rail head. The construction used by us did not have sufficient depth of beam properly to withstand the vibration shock.

We are not in a position to criticise Mr. Taylor's concrete street railway track support as used in Anderson, but we have had some experience with concrete bents approximately 5 ft. high, spaced on 10 ft. centers and connected by a reinforced concrete beam approximately 18 in. thick, on which a standard 100-lb. T-section rail had been fastened by bolts through the beam. After a number of years the concrete surrounding the reinforcing rods became separated from the rods and fell off. In a concrete paving job done by this company a number of years ago chicken wire mesh was used for reinforceing the slab. We found in time that the pounding of horses' hoofs and the passage of heavy vehicles broke through the cement and exposed this wire mesh. In making joint repairs we found this mesh a nuisance.

This entire matter is just the old controversy of "rigid track structure" versus "resilient." There still is a great difference of opinion in regard to what is best and what will last the longest. We have some rigid track construction here that has stood up well. However, we have other rigid track structures, under heavy traffic, which have developed corrugation to a very marked degree. The following thoughts come to me regarding Mr. Taylor's structure:

Strains: I cannot see the need for wire mesh reinforcement through the slab. The strains are mostly compression, and there is very little tension.

Joints: I would gather that Mr. Taylor constructed his track with the idea that "the life of the joint is the life of the track." The use of a 42-in. channel under the joints seems heavy to us here.

Rigidity: The rigid construction necessitates the greatest care in having the track lines absolutely level and to a uniform gradient in order to prevent corrugation. The article did not state the method used to hold track to surface and line prior to and during the pouring of concrete.

Support: The placing of the 8-in. longitudinal bearing plates in the concrete form in such shape and in such manner as to insure the track being to gage, alignment and grade after the concrete has set must require a very careful and painstaking supervision, which, in the case of the labor we deal with, would be exceedingly difficult and expensive. I wonder if it would not be cheaper instead of using the 8-in. longitudinal plate and $\frac{5}{8}$-in. hook bolts 14 in. long to substitute a light-weight continuous I-beam or T-section, which would afford a rigid bearing plate for the base of the rail. In the case of the concrete foundations experimented with by this company, the greatest difficulty resulted from the absence of a wearing plate next to the concrete.

Trench: I can see some saving in the amount of excavation necessary, or rather not necessary, with Mr. Taylor's structure as compared with ordinary track construction. However, if forms are used, then the fabricating and placing of these would, it seems to me, offset the amount saved in excavation.

Time Required: The statement in the article that concrete has been found to "wear better when it has been given plenty of time to harden" is very much to the point. In the case cited the concrete was allowed to cure for twenty-eight days. This length of time would be prohibitive on many of the larger systems, unless the construction program for a brand new piece of track permitted this much time to be taken. In this particular, the management of the street railway company is more often than not the victim of circumstances not of its initiation or control. The "city dads" and public opinion regulate the length of time that a street car company can keep a street to itself. It is my opinion, however, that the value of Mr. Taylor's structure would be greatly enhanced and its life prolonged by a long period of "cure" or "set."

General: With minor changes, Mr. Taylor's concrete track support should be approved by maintenance of way engineers generally. For permanence it should replace ballasted wood tie construction. With a heavy rail head and cars not of over-weight, his track should outlast that of any other type. Any company that can have all the time it needs to let the concrete cure should be able to construct according to the Taylor plan at less initial cost and with guarantee of greater permanence than by following any other plan, providing the expense incident to proper surfacing and alignment does not offset these advantages.

EDWARD A. WEST,
General Superintendent.

The Iowa Railway & Light Company, Cedar Rapids, Iowa, will adopt aluminum conductors for use on all transmission lines operating at 6,600 volts or more. The company already has 700 miles of aluminum conductors in use. The engineers have selected this construction believing that a stranded aluminum conductor with a steel core, if purchased to give equal conductivity with copper, will have greater strength and give lighter loading on the poles than copper wire.

Recent Happenings in Great Britain

The Need for Increased Fares Is the Principal Theme Underlying These Notes from Abroad

From Our Regular Correspondent

During February there was much lamentation among British electric traction undertakings over the present and prospective financial position, owing to the ever-growing cost of operation. This applied both as regards the tramways of the country and the London underground railways. As to the former, the gist of the matter was put in a memorandum by the Municipal Tramways Association, published on Feb. 21 as a preliminary to conferences of all British tramway authorities held in the end of the month to consider the present financial position.

Operating Expenses 20 Per Cent Higher

The statement says almost every tramway system is now being carried on at a loss. Yet the association is confronted with a further application for an increase of wages of 10s. per week, making the pay 44s. a week above pre-war rates. Either the fares must be substantially increased or tramways must depend on compulsory local rates. It is pointed out that more than 20 per cent of the municipally owned tramways in Great Britain are a charge on the local rates. The increase in the working costs has been 20 per cent higher than the increase of revenue. No proper provision can be made for renewals.

Preliminary to consideration by the joint industrial council for the tramway industry of renewed application by employees for increase of wages, the meetings above mentioned were held on Feb. 25 and 26 of the Municipal Tramways Association and of representatives of tramway companies respectively. The joint industrial council (which consists of representatives of employers and employed) met on Feb. 26. The application, which was presented to it by the National Transport Workers' Federation, was for an addition to wages such as would bring the total earnings up to 44s. per week per man above pre-war rates. At the close of the sitting it was announced that the employers' representatives had asked for an adjournment for a fortnight so that further facts might be elicited regarding the increases of wages in comparable industries and that statistics relating to the increase in the cost of living and the financial position of the tramway undertakings might be put in. A committee was appointed to make the necessary investigations and the council adjourned till March 11.

Underground Group Suffering

As to the financial condition of the underground railways group, including four railway companies and the London General Omnibus Company, it was voiced by Lord Ashfield when presiding at the annual meetings in February. He had a tale to tell of greatly increased gross revenue, but of correspondingly increased expenditure. Moreover, as some of the advances in wages or shortening of hours only came into force near the end of the year little of their effect is shown in the accounts for 1919. It is not possible here to go into details of the figures, but generally it may be said that by means of government subvention to the Metropolitan District Railway (which is the only one of the group under government control and guarantee) and with the aid and the operation of the common fund of five companies it was possible to pay dividends for the year at reduced, and for the most part at little more than nominal, rates. The omnibus company used to do best. It is now doing the worst. After providing for working expenses, fixed charges and reserve fund there was a debit balance of £424,000. The biggest credit balance was that of the District Railway, namely, £781,000, including the government subsidy of £566,000. Lord Ashfield stated at the meeting of the District company that on each passenger carried last year by the five undertakings there had been an actual loss of 0.07d. If regard had been given to the necessity of making adequate allowance for depreciation and a return to the shareholders of only 4 per cent had been assumed then the loss would have been 0.38d. per passenger.

Return of Less Than 3 Per Cent

In his address to the shareholders of the City & South London Railway Lord Ashfield focussed the whole position thus: The gross earnings of five companies for last year amounted to £10,240,469 and the expenses absorbed £9,744,082, which left a balance of only £496,387. This was the whole sum available for the payment of dividends on a capital totaling more than £20,000,000 and secured a return of less than 2½ per cent. Omitting the government subsidy and making an allowance for depreciation the companies were working at an actual loss. In view of these facts and of the fact that expenses are still going up the companies are promoting a bill in Parliament to enable them to charge higher fares and to abolish workmen's fares.

The opposition which the London County Council is offering to the bill of the underground railway companies is of a somewhat qualified kind. This was only to be expected, seeing that the County Council has already greatly increased the fares on its own tramways and is contemplating another increase. At a meeting of the Council on Feb. 10 it was resolved that the opposition should be directed so as to secure that only such fares were authorized and charged on the railways as were reasonably necessary. Another aspect came up in a report presented to the Council by the highways committee on Feb. 17. It said that one effect of the abolition of workmen's fares on the railways might be to throw an undue strain on the Council's tramways during the rush hours. The committee considered that whatever alterations in fares might be sanctioned the railway companies should be required to provide adequate accommodations for passengers during the heavy traffic hours. The committee also considered that any financial advantages granted to the railways should not be used to assist the allied omnibus companies in competing with the Council's tramways.

Drastic Action Necessary

A fresh move was made by the highways committee and the finance committee of the London County Council early in March when they issued reports recommending drastic action for dealing with the deficit on the working of the Council's tramways. The former committee proposed a further increase in ordinary fares based on 1.2 miles for a penny (1d. a mile is the statutory maximum), instead of 1.5 miles for a penny as at present and 1.8 miles for a penny prior to the last increase. The scheme provides for 2.4 miles for 2d., 3.6 miles for 3d., and for any longer distance there is a flat charge of 4d. The latter for long rides is the same as at present. Workmen's reduced return fares are to be abolished and their single fares are to be 1d., 2d. and 3d., according to distance. These changes are expected to reduce the estimated deficit for the year 1920-21 from £760,000 to £601,000. The next step suggested is to make application to the Ministry of Transport under the Statutory Undertakings (Temporary Increase of Charges) Act for sanction to increase the statutory maximum fare from 1d. a mile up to a limit of 50 per cent. The finance committee on its part proposes that provision for repayment of outstanding capital debt on the cumulative annuity system (3½ per cent table) should be made instead of on the instalment system as at present, and that for twelve years half the cost of renewals of track be charged to capital account, repayable within 12 years. This, with the aid of a heavy draft on the renewals fund, would meet the deficit for the current year.

Covered Buses to Be Tried

Considerable interest attaches to the fact that omnibuses with top-deck covers are about to be tried in Bradford and Liverpool. This is the first occasion on which the government has allowed the use of a roof to the upper deck of an omnibus. The Bradford vehicle is a trackless electric trolley car, while the Liverpool one is driven by petrol. The Liverpool vehicle is also fitted with a life-guard for the front wheels. No design of the sort has hitherto proved practicable for omnibuses. The Bradford bus seats fifty-one passengers and the Liverpool one fifty-five. They are thus more spacious than the usual London type.

News of the Electric Railways

FINANCIAL AND CORPORATE • TRAFFIC AND TRANSPORTATION

PERSONAL MENTION

Subway Meetings Begin

Campaign Opened to Secure $15,000,000 to Start Cleveland Underground Construction

The initial meeting in preparation for the campaign in favor of the issue of $15,000,000 of bonds for the construction of the proposed subway system in Cleveland, Ohio, was held in the office of Mayor Harry L. Davis on March 26. In addition to city officials, representatives of a number of civic and other organizations were present.

Cleveland Must Be Shown

While no direct opposition developed, questions that were asked indicated that the need of the subway must be shown if its backers are to secure the support of some of the larger organizations. Suggestions pointing to other means of relieving congestion on the streets were made by some of those present, and the advisability of eliminating automobile parking on the streets was discussed as one of the principal means to this end.

C. A. Dykstra, secretary of the Civic League, who represented a special committee of that organization, stated that until a report had been made to the organization and its attitude toward the matter determined it would be embarrassing to him and his colleagues to be placed upon a boosting committee. While it was the desire of the backers of the project to form such a committee at this meeting, it was finally decided to call another meeting for April 5, in order to give the representatives of all organizations an opportunity to make reports and receive instructions.

Mayor Harry L. Davis urged favorable action on the proposed bond issue at this time and argued that the city must have improved means of transportation as soon as possible if it is to escape many limitations in growth and retain its importance as an industrial point. He was supported by Fielder Sanders, Street Railway Commissioner, who is struggling with problems of carrying the people and preventing congestion.

Mr. Brinckerhoff Summarizes Matter

Henry M. Brinckerhoff, of Parsons, Klapp, Brinckerhoff & Douglas, who prepared the subway plans, spoke at length on the proposition and answered many questions. The chief points made by him are as follows:

Cities that have subways commenced to develop rapid transit systems when the population was around 1,000,000.

Cleveland has an advantage over other rapid transit cities in that the Tayler franchise plan enables it to have a unified transportation development. This probably will keep the per capita cost down to around $70, as compared with $100 or more in cities like New York, Brooklyn, Boston, Philadelphia and Chicago.

The function of a transportation system is to take people from where they live to where they work and back again. Cleveland's is largely a rush-hour problem. Cleveland has 48 per cent of walkers as compared with 28 per cent in Chicago and 24 per cent in Detroit. That is due largely to continuous employment in the same factory.

The Public Square has been made the transfer point in the system because nearly one-half of the traffic is involved in that central point. The future rapid transit trunk line, because of the trend of traffic, must go through the Public Square.

The first step in rapid transit should be the establishment of a central terminal point from which the city can develop its system as the trend of population and business determines.

Cleveland should not tie itself up by attempting construction of any considerable length of rapid transit tubes, by committing itself to a beforehand guess at which way the city will grow.

The present plans provide for through routes east, west and south and looping to prevent unprofitable car mileage.

The necessity of making provision now is indicated by an increase of 19 per cent in the number of car riders last winter, sufficient, if maintained, to double the traffic in about five years.

It will take three years to build the subways. Cleveland can save $25 to $30 per capita by building its subways as a start for rapid transit now.

A day or two later Mr. Brinckerhoff announced the cost of the different branches of the proposed subway, based upon the present cost of labor and price of materials. The portion between the Public Square and the new high-level bridge on Superior Avenue, N. W., including the two loops necessary at the square, will cost $4,400,000. To place Euclid Avenue cars in a subway between East Twenty-second Street and the Public Square and build loop No. 3, thus establishing through connection between the east and west sides, the estimated cost will be $5,500,000. The Ontario Street subway will cost $2,500,000 and the St. Clair Avenue portion $2,400,000.

Kansas Plan Regarded as Unworkable

Herbert C. Hoover is not provincial. Because he is not provincial he has come out openly against the new Kansas labor law. He decries the law and predicts that the difficulties in labor compulsion in Australia will be repeated here. Mr. Hoover looms large on the political horizon at this time. His opinions are of considerable import at any time, but extraordinary importance attaches to them just now. In an address before the Chamber of Commerce of Boston on March 24 he discussed the relationship of employer and employee as considered by the National Industrial Conference, of which he is a member, and the difference in viewpoint of the conference and the Kansas legislation for the judicial settlement of labor disputes.

Will Unify Voltages

Indiana Company Proposes to Make Important Line and Power Changes

It is proposed to eliminate the two voltages on the system of the Interstate Public Service Company, Indianapolis, Ind. This will greatly enhance the flexibility of operation of both freight and passenger service. The Interstate Public Service Company took over the Indianapolis & Louisville Traction Railway in June, 1918. This is a 1,200-volt line.

Through Operation Limited

As a result of this purchase, the Indianapolis & Louisville has been limited to those cars which are equipped for both 600-volt and 1,200-volt operation. This limiting feature is now to be removed by changing over the 1,200-volt section between Seymour and Sellersburg, Ohio, for 600-volt operation. Work is expected to be completed by June 1, 1920.

This section of the line was formerly equipped with one substation in which there were installed two pairs of 500-kw., 600-volt converters which operated in series to produce the 1,200-volt trolley current. This substation will be replaced with five new substations, of which one at Langsdon will be of the automatic type. The others will be manually operated, since they will be located at points where there is a station agent or other employee who can also be utilized as the substation operator.

New Rolling Stock Purchased

The company has purchased eight new 62-ft. all steel passenger cars on which delivery is expected early in June. These will be equipped with four 150-hp. motors each and will be used to haul from one to three trailers. During the summer months, heretofore, the company has been forced to operate the passenger trains in sections, sometimes as many as five sections being required to handle the traffic. With the new equipment it is planned to utilize trailers largely, rather than to operate the trains in sections.

The Interstate company is also planning to buy two combination dining and parlor cars like those furnished the Chicago, North Shore & Milwaukee Railroad by the Cincinnati Car Company. They will be used on the through limited trains between Indianapolis and Louisville which make the run in four hours.

The Interstate Public Service Company operates 62 miles of line. It is headed by Harry Reid of Indianapolis.

British Electrification Projects

Reports of Chairmen at Annual Meetings Show Plans for Increases in Electrical Working Provided Funds Can Be Obtained

At the recent annual meetings of British steam railway companies the chairmen of several of the companies made references to electrification schemes. An abstract of these is given below, along with explanatory notes.

LONDON & NORTH WESTERN RAILWAY. —Sir Gilbert Claughton said that the statement of capital expenditure required for the year 1920 included £150,000 for the widening of the line between Chalk Farm and Willesden for the electric service and it was in the interest of the railway that this work should be completed as early as possible for the increased traffic which the company might certainly expect in the future. Another large item was for new electric trains, without which the company could not establish its full service between London and Watford. In connection with the electrification of the company's London suburban lines, the government restriction during the war on the works necessary to complete the last section had been withdrawn. The works were now actively in progress. [Note.—The electrification of all London & North Western suburban lines was begun before the war and, the delay being removed, the work should soon be completed. The scheme embraces also the North London Railway, an allied line. The through connection between Watford, some 20 miles out, and Baker Street and Waterloo underground railway is working regularly.]

TREMENDOUS INCREASE IN TRAFFIC

LONDON & SOUTH WESTERN RAILWAY. —Brig.-Gen. H. W. Drummond said that in 1913 the number of local passengers carried on the company's suburban lines which had been electrified was 25,000,000. Last year the company carried over those sections just under 48,000,000, an increase of 70,000 per day as compared with 1915, in the end of which year the first section began working electrically. The original electrification scheme, submitted in 1913, had to be cut because of the war. In June last the directors ordered the conversion of additional coaches so as to permit of the operation of trains of eight cars instead of six, but the conversion has been delayed by the molders' strike. Regarding the company's Waterloo & City underground line, the board had decided to supersede the present electrical equipment, which was out of date, by modern equipment and to extend the length of the trains. The estimated cost of this, including the necessary coaches, was about £750,000, or three times what it would have cost at prewar prices. Nothwithstanding all this, the advantages were so pronounced the directors have ordered the work to proceed.

GREAT EASTERN RAILWAY.—Sir A. E. Fellowes (deputy chairman) said that with a view to meeting the increasing demands made on the railway, the board had instructed General Manager Sir Henry Thornton to prepare a scheme of electrification. In Sir Henry's opinion the suburban area served by the Great Eastern Railway lent itself readily to electrification. The investigation had not proceeded far enough to permit prediction as to the financial results. [Note.—The Great Eastern Railway has for years had the largest suburban passenger traffic of any of the main lines running out of London. This electrification is long overdue.]

HOPES TO PROCEED WITH WORK SOON

LONDON, BRIGHTON & SOUTH COAST RAILWAY. — The Earl of Bessborough said that at the rush hours the number of trains into the company's London termini, Victoria and London Bridge, was so large, and the railway between London and Croydon was so congested, that it was not possible in existing circumstances to squeeze in another train. The great hope was in electrification. The relief obtained by the quicker working of electric trains in and out of the termini and the advantages those services showed over steam services in stopping and starting were so considerable that if they could only carry out the program laid down before the war to extend the electrical services throughout the whole of the suburban area the road could unquestionably improve the traveling facilities very much. The attention the government was giving to the matter encouraged the directors to hope that at an early date the road might be authorized to proceed with the work. [Note.—The inner suburban lines of this company have been worked electrically for some years.]

LANCASHIRE & YORKSHIRE RAILWAY. — E. B. Fielden said that the directors were satisfied with the results of the electrification of the company's lines, both in the Liverpool district and between Manchester and Bury, and they recommended an extension between Manchester and Oldham and on to Shaw and Royton. This would require an increase in power facilities. The traffic on the electrified lines in the neighborhood of Liverpool continued to grow. Touching on the financial prospects, the chairman said that, unless the government was prepared to find the capital, the proposed improvements would have to remain in abeyance.

GREAT WESTERN RAILWAY.—Viscount Churchill said that one of the principal works which the company had in hand at present was the electrification of the Ealing & Shepherd's Bush Railway. The line was completed in 1917 for steam trains, but it had only recently been possible to obtain contracts for its equipment for electric traction. The directors were hopeful that this work would be carried through in the course of a few months. [Note.—The line referred to is a junction railway some 3 miles long connecting the main line of the Great Western at Ealing with the western terminus of the Central London Railway. The only other electric railway belonging to the Great Western is a spur line of about the same length in the west of London connecting with the Metropolitan Railway (Inner Circle).]

NORTH EASTERN RAILWAY. — Lord Knaresborough said that the directors had for some time had under consideration and had provisionally sanctioned a scheme for the electrification of the main line between York and Newcastle (a distance of 80 miles), the details of which had been worked out by Sir Vincent Raven, the chief mechanical engineer, in consultation with the traffic officers of the company, and Messrs. Merz & McLellan, consulting electrical engineers to the company. On this part of the railway is a very heavy and varied traffic. [Note: Hitherto the experience of the company with electric traction had been confined to a multiple-unit passenger service between Newcastle, North Shields, Tynemouth and Whitley Bay, and the hauling of coal trains by electric locomotives between Shildon and Newport, Middlesbrough.]

Economic Necessity Their Compelling Motive

The employees of the Interborough Rapid Transit Company, New York, N. Y., have resumed their agitation for an increase in pay. P. J. Connelly, vice-president of the Brotherhood of Interborough Employees, headed a delegation named by the organization to wait upon the city authorities and endeavor to enlist their sympathies. The delegation called at the City Hall recently and in the absence of Mayor Hylan talked with F. H. La Guardia, president of the Board of Aldermen and acting Mayor.

A few weeks ago a similar delegation conferred with Frank Hedley, the president of the Interborough company. They asked for an increase of 25 per cent in their wages, and contended that the increase was promised them when they relinquished their fight for an increase of 50 per cent last August and accepted half the amount demanded.

After the conference with Mr. La Guardia, Mr. Connelly said:

> The acting Mayor told my committee that the city's investigation of the company was practically finished. He gave us the impression that the figures relating to the financial situation of the Interborough, as developed by the investigation, would be ready in a week or so. This was one of the things we went to see him about. The Interborough has been telling us that to grant another wage increase would force it into bankruptcy. The men are indifferent whether they work for the present management of the Interborough or for a receiver. They insist that they are entitled to live decently, and they don't care where the money for more wages comes from.

In Its Concluding Phase

Detroit on Eve of Election in Which City Seeks $15,000,000 to Build Railway

The Detroit (Mich.) United Railway's own ordinance must be approved as to form by Corporation Counsel Wilcox, according to an order in a writ of mandamus signed by Circuit Judges Webster, Mandell and Dingeman. If this decision is sustained the railway may proceed to obtain signatures to the petition for the ordinance, and after the proper number of signatures are obtained the ordinance will be submitted to the City Clerk, who must forward the measure with the signatures to the City Council within ten days. If passed by the City Council the ordinance will then go to the people for ratification, but if the Council fails to pass it within thirty days the measure will go to the people for decision.

City Will Appeal Ruling

Three questions raised in the application for a mandamus by Frank W. Brooks were reviewed by the judges in the joint decision. It was held, first, that the fact that the ordinance was submitted to the Corporation Counsel by a corporation and not by a qualified voter did not impair its standing.

The second question, as to the necessity of submitting a formal initiatory petition together with the form of the ordinance, was decided negatively. The third point, or the question as to whether or not the proposed ordinance was in proper form, was dwelt upon most fully by the judges. It was held that of the thirty-nine reasons advanced by Corporation Counsel Wilcox for refusing to approve the ordinance as to form only two, namely, that the title of the ordinance was defective and that the ordinance in question was a contract or franchise, related to the form.

In answering the contention that the proposed ordinance in question is also a contract or franchise, it was pointed out that the railway rights in Detroit have usually, if not invariably, in the past fifty years been granted by ordinance.

The ruling of the three judges will not be accepted as final by the Corporation Counsel, but an appeal to the State Supreme Court will be made for a review of the case, since the Corporation Counsel holds that the question involved is too far reaching to be left without a final ruling.

Problems to Be Overcome

In answering questions raised by the citizens' committee regarding the Couzens plan, Mr. Wilcox stated that in drafting the municipal ownership ordinance a contract to purchase the 34.25 miles of Detroit United Railway "day-to-day agreement" lines was not included in order that the city might be free to order those tracks torn up and be replaced by city-built lines.

It was claimed that it was impossible to present an ordinance divided into sections in which the construction features were separated from the purchase phase of the plan, since some voters who favored the construction of lines by the city might object to a purchase plan, or those who approved a purchase plan might not wish to approve a construction plan. The Corporation Counsel holds that the city may find it cheaper and more expedient to order the company to remove its tracks from the streets now operated as day-to-day lines and build the tracks itself.

These statements were made by Mr. Wilcox in answer to questions asked by the citizens' committee on street railway service, an organization formed by Detroit business men and others for the purpose of studying the Couzens plan and the Detroit United Railway proposal by comparison and analysis and to aid the voters in solving the problem now before the city. The committee asserts that the railway question ought to be settled by cool heads and accurate analysis rather than in any spirit of partisanship and selfishness.

The Mayor and his supporters contend that under the Couzens plan the public will get twice the amount of service it now gets, for the municipal lines not only will supply service with 101 miles of new track and 550 additional cars—half what the Detroit United Railway has for the whole city—but it will force the Detroit United Railway to give the best service it is able.

George Engel, former City Controller and present Commissioner of Public Works, points out that Detroit is in a better position to finance the construction of a railway than is the Detroit United Railway. Detroit municipal bonds are sought by investors at 4½ per cent, Detroit having the lowest bonded indebtedness of any city in the country in proportion to its wealth, while the Detroit United Railway would probably have to pay 8 per cent for the money necessary for it to finance its own program, if the company were to compete for funds in the open market.

In a final plea to the voters to defeat the Couzens plan on April 5 the Detroit United Railway supporters claim that the Mayor's plan means:

Two railway systems and double and triple fares with no fixed rate of fare on the municipal line.

Duplication of plant and fewer cars per mile of track than are operated now.

Years of litigation as to the price to be paid for lines taken over by the city.

Delay in building extensions, as all bonds must be voted. The $15,000,000 is only the start of the expenditures, as the A and B lines or the first lines to be built cannot be equipped for less than $10,000,000 more than the bond issue. No allowance for the C lines and no organization to carry on the work.

Curtailing water and lighting extensions, as such come out of the same utility bonds as any city car system, and these bonds cannot exceed 2 per cent of the assessed valuation.

It is maintained that the Detroit United Railway service-at-cost plan means:

One system with one fare and free transfers, and the extension of one fare to all the city, including territory that may be added. Twenty million dollars in extensions and equipment will be extended now when needed.

Service controlled by the Common Council and operated by experienced railway men and engineers, with the city reserving the right to purchase or lease the property, all franchises, some perpetual, to be canceled. Company agrees to equip and operate subways and elevated when constructed. Separation of city from interurban accounts by forming of new company. Construction work to begin immediately with material the company now has on hand.

Wages Become a Problem in Toledo

City Faces Another Shutdown of Its Railway Unless Satisfactory Temporary Fare Is Installed

Seven-cent fares with 2-cent transfers or nine tickets for 60 cents appeared to be the latest development in the Toledo railway situation during the week ended April 3. The present fare is 6 cents with 2 cents for each transfer. City, company and labor union officials have been in conference for several days attempting to justify the increased fare with the wage demands of the men. Mayor Schreiber is contending for a scheme to lower fares to workingmen and transfer passengers, making the "straight" riders pay the increase.

The company officials, who proposed the 7 and 2 cent rate, say they will lose $90,000 annually and not be able to increase the wages over 54, 56 and 58 cents an hour. At present the men are getting 42, 44 and 46 cents an hour. They asked for 55, 57 and 60 cents an hour.

The Mayor has tried to get the company to agree to free transfers during rush hours on a 7 and 1 cent basis all day.

The wage agreements expired on April 1 and the men declare they will strike if their minimum is not granted. They have set the minimum at 10 cents lower than the original demand. Whatever agreement is reached in conferences will have to be submitted to the Council for ratification as an amendment to the ordinance repealing the famous "ouster" ordinance.

Company and union officials have agreed on all the working clauses and wage scales of the electrical workers. The men were granted an increase as a compromise. This increase was not enough to affect the operating costs of the railways to a very large extent.

If any scheme of tickets is decided upon the company has said that it will adopt the metal token plan in order to continue the use of the automatic fare register boxes it installed a few months ago. Toledo has not had car tickets for more than three years.

Henry L. Doherty has decided to tackle only one problem at a time in disposing of the wage question, the

demand of the Municipal Ownership Commission for a cash price for the Toledo railway property and in the submission of corrections and substitutions for the cost-of-service ordinance.

MANY CORRECTIONS TO BE SUBMITTED

Dewey C. Bailey, counsel for Mr. Doherty, has been working with the objections to the cost-of-service measure. As it was submitted to the company there were more than a hundred added features placed into the ordinance after Mr. Doherty's representatives left the sessions of the commission.

Mr. Doherty declared that the many corrections necessary would be made and submitted to the commission before the time limit of April 3 set by Federal Judge Killits.

Mr. Doherty has pointed out the impossibility of his acceptance of many of the propositions contained in the ordinance by reference to the clause governing the regulation of interurbans. He maintains that the interurbans are not made a party to the contract and do not have to abide by any agreements arrived at through arbitration. Whenever there is a disagreement between the operating company and the interurbans the ordinance provides that the city and interurbans shall have representatives on the board of arbitrators, but that the company shall not be represented. Whatever decision is reached cannot be enforced against the interurbans because they are not parties to the contract. Mr. Doherty declares there are many such provisions which make it impossible for him to operate under the cost-of-service plan as drafted by the commission.

The commission may change the measure drastically after Mr. Doherty's objections are received. However, Mr. Doherty has decided that he is about ready to bargain with the Municipal Ownership Commission. It has asked him for a "cash" price. But he is withholding this matter till the wage propositions and other matters are cleared away.

MR. DOHERTY ASKING $11,000,000

The price set upon the lines by Mr. Doherty is $11,000,000, of which 20 per cent will be cash and the remainder in lien bonds on the property. The valuation set upon the property by the city service director, David Goodwillie, and his assistants was $12,000.000 at present invoices, but $7,110,000 as a "fair" price. This latter valuation was the one taken by the cost-of-service commission in its franchise draft.

Mr. Doherty has said he will give the city a discount for the entire purchase if made in cash.

The decision of the Supreme Court which allows to the city the right to issue general credit bonds for the purchase of a transportation system has the limitation of the debt-contracting power held over against unlimited bonding.

County Auditor Gabe Cooper, who is also a member of the Municipal Ownership Commission, has given it out that the city's total limit of indebtedness would be approximately $20,000,000. The present indebtedness is $14,000,000 gross, but the net is about $9,000,000. This would allow the city to bond itself for approximately $11,000,000 for the purchase of the lines. The difference between the gross and net debt is accounted for by the self-sustaining waterworks and other properties and sinking fund accounts.

The general impression that the city could not raise more than $8,000,000 caused this inquiry into the debt-contracting limitations of the city.

Mr. Doherty expressed great surprise when he was told that the city would be able to issue bonds for the entire price which he had set.

The Municipal Ownership Commission conferred with Mayor James Couzens at Detroit last week in an effort to make a study of his methods of dealing with his street railway problem.

Chairman Henry W. Ashley of the commission will be sent to New York City to study transportation problems there. Mr. Ashley and Commissioner John B. Merrell are working with the law director of the city in drafting an ordinance providing for public ownership of the street railway.

Mr. Hanson Has Learned by Experience

Business leaders and workingmen of Toledo, Ohio, were addressed several times during the week ended March 13 by former Mayor Ole Hanson of Seattle, who told them the dangers that he had encountered in a municipally operated railway in his city. It was under Mr. Hanson that municipal ownership was brought about.

The Toledo men were advised to vote against any measure which would mortgage the property owned by taxpayers in order to buy the Toledo railway system. Mr. Hanson said:

> Don't let them tell you that everything is bad about municipal ownership or don't let the advocates of the proposition tell you that all you have to do is to buy the lines. It's a different story and a large part of it is in the management.

In a graphic story of his career as Mayor of Seattle he pointed out these weaknesses in the public ownership and management of the railway system there:

> 1. Low-priced managers put the business amounting to millions of dollars annually into the hands of wornout old employees or young apprentices in electric railway operation.
> 2. Laboring men consider the treasury of a street railway system a perpetual "Christmas tree."
> 3 The whole matter becomes a "political football" which is kicked about at every municipal election with higher wages as the goal.
> 4. Disloyalty is promoted by making workers, dissatisfied with any refusal of demands, enemies of the government.
> 5. By preventing improvements operation is made uneconomical. City Councils can very seldom see the effect of cost-cutting measures.

Mr. Hanson also declared that few cities realize the service of expert engineers with sufficient salary to keep a good man on the job any length of time.

Seattle Shake-Up Started

New Seattle Official Begins His Career With an Attack on the Municipal Railway

Since Mayor Hugh M. Caldwell of Seattle, Wash., took office, on March 15, fourteen positions in the Municipal Street Railway Department have been abolished and three heads of departments have resigned. Mayor Caldwell's initial movement, upon assuming his position as head of the city government, was to request City Comptroller Harry W. Carroll to furnish him with a statement showing complete financial operations of the railway department during 1919.

THREE PLACES ABOLISHED

The three resignations and the abolition of fourteen other positions means a reduction, it is claimed, of approximately $2,885 a month or $34,620 a year in salaries in the department.

The three resignations, which according to reports were desired by the Administration, were from Glenn Hoover, supervisor of publicity; H. M. Nuzum, service and equipment inspector, and George Walsh, real estate appraiser.

The positions abolished were general electric foreman, held by Glen Dunbar; assistant superintendent of equipment, occupied by A. B. Flannagan; junior accountant, head storekeeper, two instructors in power saving, one transportation inspector and six clerks and stenographers.

Mayor Caldwell is still undecided as to the appointment of a permanent head in the Public Utilities Department, saying the temporary appointments of E. D. O'Brien as acting superintendent of the Utilities Department and D. W. Henderson as superintendent of the Municipal Railway will continue in effect until he has decided definitely on what is to be done with the department.

Meanwhile Mayor Caldwell has instructed Corporation Counsel Walter F. Meier to prepare an ordinance creating the division of Municipal Street Railways. The members of the City Council have approved such an ordinance and it will be introduced at a special meeting of the Council to be held at an early date.

MAYOR DEMANDS THE FACTS

In his letter to Comptroller Carroll asking for a financial statement Mayor Caldwell said there are discrepancies in reports that have come to him regarding the finances of the Municipal Street Railway and he asks the official municipal bookkeeper to prepare a statement that will show actual conditions. The Mayor's communication follows in part:

> Some time last fall I read in the papers that the Municipal Street Railway had made a profit of more than $7,000, and only recently I read also in the daily papers a purported statement from the then superintendent of public utilities to the effect that the lines had lost about $18,000 during the same period. There is a discrepancy here of some $25,000.
>
> I should like to have a detailed statement so that I may know whether or not the Municipal Railway was operated at a profit or loss during the balance of 1919, after the lines were taken over by the city.

Ten-Cent Wage Advance

Denver Tramway Says City Must Now Provide Some Means by Which Company Can Meet Arbitration Finding

The arbitration proceedings in the wage controversy between the Denver (Col.) Tramway and Division 746 of the Amalgamated Association were brought to a close on March 18 with the handing down of an award by a majority of the board of arbitrators. One arbitrator filed a dissenting opinion.

Company Arbitrator Dissents

The trainmen were granted a flat increase of 10 cents an hour over the National War Labor Board scale previously effective. This makes the new wage schedule 53 cents for the first three months, 56 cents for the next nine months and 58 cents thereafter with time and one-half for overtime. The guarantee for extra trainmen was increased from $85 to $100 a month. Demands for an eight-hour day were denied.

The wages of male employees in the mechanical, track and bridge and building departments were increased by the same percentage that the maximum of the wage scale paid trainmen was increased. Employees in the carhouses were granted a wage scale of 52½ cents an hour for the first three months, 55½ cents for the next nine months, with 57½ cents an hour thereafter. A minimum wage of 52½ cents an hour was established for adult male employees.

The arbitrator for the company in the dissenting opinion which he filed stated that he did not concur in the award as it fixed a rate of pay higher than is required to provide a reasonable living wage and imposed such an excessive additional operating expense upon the railway that the company will be unable from its present revenues to render adequate public service, maintain its property and meet its obligations to investors. The dissenting opinion goes on to state that the maximum rate of pay for trainmen as fixed by the award is an increase of more than 20 per cent in the maximum award made by the National War Labor Board and an increase of more than 93 per cent in the maximum wage in effect when the world war began, and further that it is much higher than the average minimum wage paid trainmen in the employ of railways in cities having from 100,000 to 300,000 inhabitants.

Controversy Many Months Old

Attention is also drawn to the fact that in compliance with the provisions of the agreement under which the arbitration proceeded it was incumbent upon the Board of Arbitrators to give consideration not only to the question of reasonable compensation for the employees but to the maintenance of the public service and to the fair return which the owners of the property are entitled to upon the actual value of their property devoted to the public service.

The beginning of this controversy dates back to July of last year when the employees' union presented demands for an increase in the wage scale for trainmen to 60 cents the first three months, 65 cents the next nine months, with 70 cents thereafter; also for overtime pay and changes in working conditions. These demands were made following the action of the municipal authorities in reducing the rate of fare from 6 cents to 5 cents and the decision of the Colorado Supreme Court vesting in the municipal authorities jurisdiction over the rates of utilities operating in Denver and other home rule cities in Colorado. The reduction in the rate of fare necessitated a reduction in the wage scales which precipitated a four days' strike and brought about the higher wage demands. The strike was ended by the municipal authorities agreeing to restore the 6-cent fare and the employees agreeing to return to work on the National War Labor Board scale of wages with the understanding that their demands would be taken up and disposed of within a period of six months.

Arbitration Started Last November

Under the agreement of Sept. 4, 1919, between the company and the union the questions at issue were submitted on Nov. 19, 1919, to a board of arbitration consisting of William G. Evans, former president of the Denver Tramway, appointed by the company, and William C. Thornton, an insurance agent and a member of the Bookbinders' Union, appointed by the employees. Hamilton Armstrong, chief of police of Denver, was selected as the third arbitrator on Jan. 13, 1920.

The data filed by the company with the board of arbitrators brought out that on the basis of the October, 1919, earnings on the National War Labor Board scale the average annual compensation of its trainmen employees would be $1,578 for that year with an average of $1,836 for the 10 per cent of the men who earned the highest wages and $1,247 for the 10 per cent of the men who earned the lowest wages. Average annual earnings for shopmen were shown at $1,522 with a maximum of $1,992 and a minimum of $1,143, while the trackmen would average $1,325 with a maximum of $1,694 and a minimum of $1,134.

Comparisons made with other occupations in Denver showed that the annual average compensation of truck drivers is $1,125; retail grocery clerks, $1,026; express company employees, $1,170; mail carriers and clerks, $1,250; skilled mechanics, $1,500; carpenters, $1,100; bricklayers, $1,028. Sworn statements made by representatives of various labor unions before the Colorado Industrial Commission were submitted by the company in substantiation of its data.

Despite the authoritative and undisputed data filed by the company, one of the most important factors which influenced the decision of the two arbitrators who signed the award was undoubtedly the wage scales of 60 cents an hour and in excess thereof which had been agreed to in other cities.

The company has placed upon the municipal authorities the entire responsibility for solving the problem. In short, the company said:

> Thus the solution of the problem rests entirely with the city; either the 7-cent fare with the 58-cent scale of wages now made effective, or the 6-cent fare with the National War Labor Board scale of wages.
>
> The tramway is definitely out of politics and will make no campaign for or against either policy, but pledges its utmost efforts to give the best possible service permitted by the revenues, whatever may be the decision of the city. The problem presented is purely a question of business and sound economics. It is not a political question and should not be made a political issue.

Rochester Men Demand 100 Per Cent More

Wage increases of nearly 100 per cent, an eight-hour day and a six-day week are asked by the motormen, conductors and other employees of the New York State Railways. The demands, if accepted, will go into effect on May 1, when the present agreement with the union will expire. This scale also has been agreed upon by the union divisions in Syracuse and Utica.

In detail the compensation asked is 81, 83 and 85 cents an hour for motormen and conductors on city cars and 90 cents an hour for those on interurban lines. The scale now in effect fixes the men's compensation at 41, 43 and 45 cents an hour for city work and 47 cents an hour for interurban runs. The agreement which the Amalgamated has with the company virtually assures the settlement of differences between the company and the union by arbitration.

If the company were to meet the maximum demands of its employees on the Rochester lines it would mean an increase in the annual payroll of the New York State Railways of $2,120,000, according to James F. Hamilton, president of the company. Testimony which was presented at the recent hearings of the Public Service Commission indicated that the railway would need a 7-cent fare to operate its lines properly. If that is true, granting the maximum demands of the men would probably make a fare of 9 or 10 cents necessary. Each cent an hour the wages of the men are advanced will add $53,000 to the cost of operation of the Rochester lines, according to Mr. Hamilton. Mr. Hamilton said:

> It will be impossible for the company to meet the demands of its employees. A conference is to be called with the employees of the company within the next few weeks and I feel quite certain that when we sit around the table a fair and amicable adjustment will be made. I do not expect any trouble, for I am confident that the men will be fair and just and that the public of Rochester will not be inconvenienced.

M. O. Vote on April 6

Madison, Wis., Will Decide on That Day Whether It Will Take Over Local Railway

The electors of Madison, Wis., will vote on April 6 on the question of municipal ownership of the railway system. After a five-hour debate, the Common Council by a vote of ten to seven decided to submit to a referendum at the municipal election the question:

Shall the city of Madison acquire property actually used and useful for the convenience of the public of the Madison Railway Company?

This settled nearly a year of debate over municipal ownership in the Council and was the result of a majority and minority report of a special committee of the Common Council and citizens appointed to study the local situation. The railway contended it could not improve the service with its present 6-cent fare.

The majority report of the special committee recommended that the company be permitted to pay its indebtedness to the city of more than $36,000 for paving between its tracks in ten annual instalments; that the city assume the cost of such pavement in the future; that the use of one-man cars now permitted on one line be extended to other lines.

The minority report opposed all recommendations of the majority.

The fight for municipal ownership has been led by City Attorney William Ryan, who drafted the bill passed by the Legislature at the last session permitting the municipal ownership of railways upon referendum vote of the electors. The recent primary campaign for Mayor of Madison was waged on the referendum question. Blied and Kittleson, who favored the immediate referendum, defeated Mayor Sayles, who opposed the vote until the public had secured more information.

Not a Wheel Has Turned in Thirty Days at Dubuque

The trainmen of the Dubuque (Iowa) Electric Company went on strike on March 1 for a wage increase from 42 cents to 60 cents an hour. The company has not operated a car since that time. It offered the men a compromise wage of 50 cents an hour, with 5 cents extra for operating safety cars if these are later installed. The men rejected this.

There is no particular quarrel between the company and the men. The company continues to deal with the union and has told both the city authorities and the employees that it is willing to pay the men the wages they ask if any one can show them where the money is to come from. The net earnings for last year would be more than exceeded by the increase asked by the men.

The City Council passed an ordinance recently directing the company to begin operation of its cars within twenty-four hours, but the franchise which the company holds has a provision which protects it in case the cars are not operated because of a strike. The company officials have asked the union for suggestions as to what it thinks should be done. Meantime the company's attitude is that it is losing less money by permitting the cars to stand in the carhouse than by operating them at the increased wage.

Railways Escaped Serious Damage

Apparently the electric railways escaped the worst of the storm in the Central West. At least this was the trend of the information which the Chicago office of the ELECTRIC RAILWAY JOURNAL had been able to obtain up to March 31.

The Chicago Surface Lines lost forty poles on the Milwaukee Avenue line extension, so that about 4,000 ft. of trolley wire and feeder were dropped to the ground. The trolley wire and feeder were undamaged, however, and were put back in place on new poles. The cross-arms were destroyed for the most part.

The Aurora, Elgin & Chicago Railroad had some trouble in Elgin, where a few poles and some trolley lines were blown down. The building next door to the terminal station in Elgin was almost completely demolished and the débris blocked the entrance to the interurban station, but the station itself was not badly damaged.

The Chicago, North Shore & Milwaukee Railroad was tied up for about two and one-half hours through the blowing down of some trolley wire and some high tension line and poles. The center of this trouble was in Wilmette. The crossing gateman at Wilmette Avenue suffered a broken arm and other injuries when he was picked up with his shanty and stove and carried across the street.

The Chicago & West Towns Railway, Oak Park, had about 400 ft. of trolley wire blown down.

The tornado approached Toledo from the west, divided in the Maumee Valley and swept toward Lake Erie parallel to the river, avoiding Toledo by 15 miles on either side.

At Genoa part of the city was swept away and the Northwestern Ohio and the Lake Shore Electric suffered damage in poles blown over and service was interrupted for a period of nearly twelve hours.

On the west the Toledo & Western service was interrupted for three days when whole miles of trolley poles and high tension were swept away. The Toledo & Indiana suffered a similar loss and the town of Swanton, on its lines, was almost completely devastated. The Toledo, Bowling Green & Southern, the Toledo, Fostoria & Findlay and the Ohio Electric Railway were held up for several hours on Monday as a result of damage to lines.

In the city of Toledo telephone poles and electric lines were torn down along Summit Street.

News Notes

Property Damage Recovered in Strike Suit.—The International Railway, Buffalo, N. Y., will receive $3,317 from the county of Erie to cancel the judgment obtained as the result of the suit for damages resulting from the railway strike in 1913. The company has agreed to stop further litigation. The company sued for loss of revenue through alleged inadequate police protection. The verdict is only for actual property damage.

Toronto Will Extend Civic Line.—By a vote of fourteen to ten the City Council of Toronto, Ont., in committee, has decided in favor of the construction and equipment of the Mount Pleasant road civic car-line, at an estimated cost of $1,060,000, by using $117,060 remaining to the credit of By-law No. 7,629 and applying for a private bill to raise the balance of $943,000 by issuing debentures without the consent of the ratepayers.

Wheeling Men Prepare Wage Demands.—At a meeting of the executive board of the union of the electric railway workers of the Wheeling and Eastern Ohio districts, held during the week ended March 27, plans were completed to present the new wage scale to the railway officials of the Wheeling district. The old scale expires on April 30. A communication was read by Clyde E. Bartlebaugh, president of the union, stating that all the men of the Pittsburgh district had been granted a 10 per cent increase.

Buffalo Men Ask Increase.—Platform men and shopmen employed on the Buffalo, Niagara Falls and Lockport lines of the International Railway, Buffalo, N. Y., who are affiliated with the Buffalo local of the Amalgamated Association, have presented demands for a wage increase of approximately 60 per cent. The present agreement expires on May 1. The new scale of pay will be close to 90 cents an hour. An eight-hour day and a six-day week are also demanded by the men. The men are now receiving from 41 to 48 cents an hour.

Mr. Dempsey Being Tried Again.—The second trial of John J. Dempsey, former vice-president of the New York Consolidate Railroad (Brooklyn Rapid Transit System), charged with culpable negligence amounting to manslaughter in the second degree, began with the work of selecting a jury in the Supreme Court at Mineola on March 29. The charge grows out of the Malbone Street tunnel disaster in Brooklyn, which occurred in November, 1918, and in which ninety-two persons lost their lives and scores were injured. Mr. Dempsey was tried on similar charges last December, but the jury disagreed.

Financial and Corporate

Revenues Outstrip Expenses

Statistics for December Show Greater Comparative Increase in Revenues Than Operating Costs

A very favorable showing for December, 1919, is made by the electric railways reporting their monthly operating statistics to the information bureau of the American Electric Railway Association. In the first four of the eight accompanying tables a comparison of these returns is made with those of December, 1918, and the improvement made is brought out strikingly.

A Promising Showing Made

The feature of the tables is probably the relative increase per car-mile in the operating revenues and operating expenses. In all sections of the country the revenues are apparently increasing more rapidly than the expenses, a condition which has not existed since before the war, and which, if it really indicates the trend of permanent operating conditions, promises better times for the traction industry. However, too much importance should not be attached to the showing for one month; it is promising, but until the same trend can be established over a period of several months at least it is a promise which should be scrutinized warily. Meanwhile the details of the situation may be examined and studied.

Taking the country as a whole, the total railway operating revenues of the companies reporting increased from 40.14 cents to 47.00 cents per car-mile, or 17.09 per cent. The operating expenses increased from 34.51 cents to 35.60 cents per car-mile, an increase of only 3.16 per cent. This produced an increase in the net operating revenue of 102.48 per cent., the amount rising from 5.63 cents per car-mile in 1918 to 11.40 cents in 1919.

Large Increase in Net in West

Much of this large increase is due to conditions in the West, where the net operating revenue increased 343.49 per cent. In the East, where the bulk of the companies reporting operate, revenues increased 17.75 per cent while expenses were increasing 11.07 per cent per car-mile, producing an increase in the net operating revenue of 53.07 per cent per car-mile. In the South revenues increased 14.77 per cent per car-mile, expenses increased 6.38 per cent and net operating revenue 34.62 per cent.

The principal cause of this favorable showing is probably the large number of fare increases which has been in effect for a long time. These increases have now come to be accepted by the public as a matter of course. Whatever loss of riding occurred when the early increases went into effect has long since been made up and the normal increase in the number of passengers carried takes place from year to year under the new fares as it did under the old. Furthermore, the increases which have already been obtained have paved the way for additional increases, and now, when companies which have managed to struggle along on their original fares decide at last that they must go to a higher rate, the resentment against the advance is not as marked as that manifested toward the pioneer increases. In consequence there is not so great a falling off in the riding habit. In short, the fetich of the 5-cent fare is losing its potency.

Explanations Offered

The showing in the West is, of course, abnormal. It is probably due in part, at least, to the lingering effects of the influenza epidemic in 1918. It will be remembered that the epidemic occurred later in the West than in the other sections of the country and lingered there long after it had disappeared elsewhere.

Another cause of this showing in the West is that a number of the companies conducted extensive repairs and improvements in their roadbed and tracks in December, 1918, and as a consequence their expenses for way and structures were abnormally heavy and several times as great as in December, 1919, thus producing an effect of falling off in expenses for the latter month.

As in the past, the returns from both city and interurban companies have been classified according to the following geographic grouping: Eastern District—east of the Mississippi River and north of the Ohio River; Southern District—south of the Ohio River and east of the Mississippi River; Western District—west of the Mississippi River.

Ohio Road May Be Abandoned

That the Toledo & Western Railroad, which operates between Toledo and Pioneer, Ohio, with a branch to Adrian, Mich., may be abandoned because it does not pay was the information given to members of the Morenci, Mich., Chamber of Commerce recently by business men and railroad officials.

Frank Coates, president, and party had inspected the lines and were being entertained by Morenci business men. He told them that the motor truck and motor passenger business had cut into the revenue of the line enormously at a time when costs were advancing and fares remaining low.

Cars have been removed to cut down the cost of operation, but the road still shows a deficit. The roadbed and the equipment are in need of repair, but Mr. Coates said there was no money available to do the work.

Morenci would lose its largest industry and Pioneer would be without rail communication if the line is abandoned. The road is a Doherty property.

Puget Sound Company Changes Its Name

At a special meeting of the stockholders of the Puget Sound Traction, Light & Power Company, Seattle, Wash., on March 23 the stockholders voted to authorize the issue of $10,000,000 of 7 per cent cumulative prior preferred stock and to change the name of the company to Puget Sound Power & Light Company. The authorization of this issue of stock puts the company in a better position to finance its requirements, both as to the liquidation of its floating debt and as to financing expenditures required to take care of new business. The position of the present outstanding 6 per cent preferred stock is materially strengthened by this method of financing, which should advance the prospects of the resumption of the full dividend rate of 6 per cent.

A circular about the change issued in anticipation of the meeting explained matters as follows:

> Since the refunding of the short-term notes in June, 1918, it has been necessary to spend very considerable sums for construction purposes to keep pace with general development stimulated by the war and to bring into full use those portions of its plant, mainly water powers, which were not then fully loaded, not only to cover war necessities but also to improve the net earnings.
>
> The outlay has been amply justified by the improving net earnings, but it has made necessary borrowing from banks, the floating debt now amounting to $1,838,000. Additional funds will be needed from time to time to finance for like expenditures. Existing conditions require that bank borrowings should be kept at a minimum and also preclude the sale of more of the present 6 per cent preferred or common stock.
>
> Your directors believe that it would be highly undesirable if not impossible to finance all of the requirements by further increases in the funded debt, and they therefore recommend the issue of $10,000,000 of 7 per cent cumulative "prior preference stock," which it is their intention to dispose of from time to time as market conditions permit and requirements make desirable. The sale of stock not only will make it possible to maintain a more conservative balance between the debt and capital stock, but also will enable permanent borrowing on a more economical basis if it appears wise to resort to such borrowing.
>
> The company has sold to the city of Seattle its street railway system in that city for $15,000,000 of utility bonds which are held under the mortgages in substitution for the property sold. Our capital expenditures, therefore, will be largely devoted to the development of the electric light and power business, making advisable a change of name to Puget Sound Power & Light Company.

Much Financing Being Done

Corporate financing in March was on a large scale, the total issue of railroad, industrial and public utility bonds amounting to $251,336,000. Public utility financing accounted for $38,639,000.

TABLE I—INCOME STATEMENT OF THIRTY ELECTRIC RAILWAYS FOR DECEMBER, 1919, COMPARED WITH DECEMBER, 1918

	United States		East		South		West	
	1919	1918	1919	1918	1919	1918	1919	1918
Railway operating revenues	$3,841,224	$3,247,654	$2,504,587	$2,102,128	$147,673	$136,546	$1,188,964	$1,008,980
Railway operating expenses	2,908,943	2,792,050	1,987,168	1,767,600	96,252	95,982	825,523	928,468
Net operating revenue	932,281	455,604	517,419	334,528	51,423	40,564	363,441	80,512
Net revenue: Auxiliary operations	201,986	180,896	167,571	137,749	22,941	43,147	11,474	.....
Taxes	245,800	218,002	150,334	143,425	12,350	12,550	83,116	62,027
Operating income	888,467	418,498	534,656	328,852	62,014	71,161	291,797	18,485
Non-operating income	53,279	54,696	47,198	39,663	469	8,167	5,612	6,866
Gross income	941,746	473,194	581,854	368,515	62,483	79,328	297,409	25,351
Deductions from gross income	648,956	623,255	415,175	375,524	38,401	43,381	195,380	204,350
Net income	292,790	*150,061*	166,679	*7,009*	24,082	35,947	102,029	178,999
Operating ratio (per cent)	75.73	85.97	79.24	84 08	65.18	70 29	69 43	92 02
Car-miles operated	8,172,039	8,091,106	5,325,627	5,263,027	421,338	447,113	2,425,074	2,380,966

TABLE II—INCOME STATEMENT IN CENTS PER CAR-MILE OF THIRTY ELECTRIC RAILWAYS IN TABLE I, COMPARING DECEMBER, 1919, WITH DECEMBER, 1918

	United States			East			South			West		
	1919	1918	Per Cent Increase	1919	1918	Per Cent Increase	1919	1918	Per Cent Increase	1919	1918	Per Cent. Increase
Railway operating revenue	47.00	40.14	17.09	47.03	39.94	17.75	35.05	30.54	14.77	49.03	42.38	15 69
Railway operating expenses	35.60	34.51	3.16	37.31	33.59	11.07	22.84	21.47	6.38	34.04	39.00	*12.72*
Net operating revenue	11.40	5.63	102.48	9.72	6.35	53.07	12.21	9.07	34.62	14.99	3.38	343 49
Net revenue: Auxiliary operations	2.47	2.24	10.26	3.15	2.62	20.22	5.44	9.65	*43.63*	0.47	.....	.....
Taxes	3.01	2.69	11.80	2.82	2.72	3.67	2.93	2.81	4.27	3.43	2.61	31.42
Operating income	10.86	5.18	109.65	10.05	6.25	60.80	14.72	15.91	*7.48*	12.03	0.77	1,462.33
Non-operating income	0.65	0.68	*4.41*	0.89	0.75	18.66	0.11	1.83	*93.99*	0.23	0.29	*20.69*
Gross income	11.51	5.86	96.41	10.94	7.00	56.28	14.83	17.74	*16.40*	12.26	1.06	1,056.60
Deductions from gross income	7.94	7.70	3.12	7.80	7.13	9.40	9.11	9.70	*6.09*	8.06	8.58	*6.06*
Net income	3.57	*1.84*	.....	3.14	*0.13*	.....	5.72	8.04	*28.86*	4.20	7.52	.....
Operating ratio (per cent)	75.73	85.97	.....	79.24	84.08	.....	65.18	70.29	.....	69 43	92.02	.....
Car-miles operated	8,172,039	8,091,106	6.13	5,325,627	5,263,027	1.19	421,338	447,113	*5.76*	2,425,074	2,380,966	1.85

TABLE III—OPERATING EXPENSES OF *FORTY-TWO ELECTRIC RAILWAYS FOR DECEMBER, 1919, COMPARED WITH DECEMBER, 1918

	United States		East		South		West	
	1919	1918	1919	1918	1919	1918	1919	1918
Operating expenses	[1]$3,399,166	[2]$3,311,691	[3]$2,405,176	[4]$2,253,773	[4]$331,772	$275,966	$662,218	$781,952
Way and structures	412,300	552,448	322,393	321,436	26,119	25,490	63,788	205,522
Equipment	409,199	382,489	263,791	278,906	44,579	31,771	100,829	71,812
Power	594,599	597,289	499,092	462,759	16,713	16,328	78,794	118,202
Conducting transportation	1,469,387	1,276,160	959,733	832,556	192,512	155,760	317,142	287,844
Traffic	18,630	24,700	13,972	17,667	1,076	1,303	3,582	5,730
General and miscellaneous	468,752	454,706	319,896	316,550	50,773	45,314	98,083	92,842
Car-miles operated	10,859,756	10,619,575	6,677,745	6,561,715	1,459,358	1,367,617	2,722,653	2,690,243

* NOTE—This table includes the expenses of the thirty companies shown in Tables I and II, and in addition twelve other companies, which are not included in Tables I and II, because of the fact that they do a power and light business and do not separate their railway taxes and fixed charges of their other business.

[1]Includes $25,299 express charges. [2]Includes $23,899 express charges. [3]Includes $26,299 express charges. [4]Includes $23,899 express charges.

TABLE IV—OPERATING EXPENSES OF FORTY-TWO COMPANIES APPEARING IN TABLE III, SHOWING THE AMOUNTS IN CENTS PER CAR-MILE FOR DECEMBER, 1919, COMPARED WITH DECEMBER, 1918

	United States			East			South			West		
	1919	1918	Per Cent Increase	1919	1918	Per Cent Increase	1919	1918	Per Cent Increase	1919	1918	Per Cent Increase
Operating expenses	131.31	231.17	0.45	[3]36.01	[4]34.34	*4.86*	22.73	20.17	12.69	24.32	29 07	*16.34*
Way and structures	3 8	5 20	*26.93*	4.83	4.90	*1.43*	1.79	1.86	*3.76*	2.34	7.64	69.37
Equipment	3.77	3.60	4.72	3.95	4.25	*7.06*	3.05	2.33	30.90	3.71	2.67	38.90
Power	5.48	5.62	*2.49*	7.47	7.05	5.96	1.15	1.19	*3.37*	2.89	4.39	*34.17*
Conducting transportation	13.53	12.02	12.56	14.37	12.69	13.23	13.19	11.39	15.80	11.65	10.70	8.87
Traffic	0.17	0.23	*26.09*	0.21	0.27	*22.23*	0 07	0.09	*22.23*	0.13	0 22	*40.91*
General and miscellaneous	4 32	4.28	0.93	4.79	4 82	*0.62*	3.48	8.31	5.13	3.60	3.45	4.34
Car-miles operated	10,859,756	10,619,575	2.26	6,677,745	6,561,715	1.77	1,459,358	1,367,617	6.71	2,722,653	2,690,243	1.20

[1]Includes 0.24 cents per car-mile. [2]Includes 0.22 cents per car-mile. [3]Includes 0.39 cents per car-mile. [4]Includes 0.35 cents per car-mile.

TABLE V—COMBINED INCOME STATEMENT OF *SEVENTY-THREE ELECTRIC RAILWAYS FOR DECEMBER, 1919

	United States	East	South	West
Railway operating revenue	$8,762,710	$5,583,231	$918,187	$2,261,292
Railway operating expenses	6,598,474	4,404,507	615,251	1,578,716
Net operating income	2,164,236	1,178,724	302,936	682,576
Net revenue: Auxiliary operations	541,330	445,982	22,941	72,407
Taxes	541,273	303,447	96,487	141,339
Operating income	2,164,293	1,321,259	229,390	613,644
Non-operating income	514,208	133,492	239,019	141,697
Gross income	2,678,501	1,454,751	468,409	755,341
Deductions from gross income	1,835,134	1,075,345	231,121	528,668
Net income	843,367	379,406	237,288	226,673
Operating ratio (per cent)	75 29	78.91	67 02	69.81
Car-miles operated	20,039,523	12,014,931	2,599,138	5,425,454

* Includes the companies shown in Tables I to IV and others for which the 1918 figures are not available.

TABLE VI—COMBINED INCOME STATMENT OF TABLE V, SHOWING THE AMOUNTS IN CENTS PER CAR-MILE

	United States	East	South	West
Railway operating revenue	43.72	46.46	35 32	41.68
Railway operating expenses	32.92	36.66	23.67	29.10
Net operating income	10.80	9.80	11.65	12.58
Net revenue: Auxiliary operations	2.70	3.72	0.88	1.33
Taxes	2.70	2.53	3.71	2.61
Operating income	10.80	10.99	8.82	11.30
Non-operating income	2.57	1.11	9.20	2.61
Gross income	13.37	12.10	18.02	13.91
Deductions from gross income	9.16	8.95	8.89	9.74
Net income	4.21	3.15	9.13	4.17
Operating ratio (per cent)	75.29	78.91	67.02	69.81
Car-miles operated	20,039,523	12,014,931	2,599,138	5,425,454

TABLE VII—DETAILED STATEMENT OF THE OPERATING EXPENSES OF *NINETY-THREE ELECTRIC RAILWAYS FOR DECEMBER, 1919

	United States	East	South	West
Operating expenses	[1]$8,415,990	[2]$5,926,190	$890,790	$1,599,010
Way and structures	1,000,185	731,801	87,339	181,045
Equipment	1,063,046	743,990	109,387	209,669
Power	1,270,432	974,904	57,918	237,610
Conducting transportation	3,701,608	2,494,681	496,113	710,814
Traffic	34,888	25,676	1,803	7,409
General and miscellaneous	1,313,787	923,094	138,230	252,463
Car-miles operated	26,625,524	17,040,687	3,818,699	5,766,138

* This table includes the expenses of the seventy-three companies shown in Tables V and VI, and in addition twenty other companies which are not included in Tables V and VI because of the fact that they do a power and light business and do not separate their railway taxes and fixed charges from the taxes and fixed charges of their other business.

[1] Includes $32,044 express charges.
[2] Includes $32,044 express charges.

TABLE VIII—DETAILED STATEMENT OF THE OPERATING EXPENSES OF THE NINETY-THREE COMPANIES APPEARING IN TABLE VII, SHOWING THE AMOUNTS IN CENTS PER CAR-MILE

	United States	East	South	West
Operating expenses	[1]31.60	[2]34 76	23 32	27.73
Way and structures	3.76	4.29	2.29	3.14
Equipment	3.99	4.36	2.85	3.64
Power	4.77	5.72	1.52	4 12
Conducting transportation	13.90	14.63	12 99	12 32
Traffic	0.13	0.15	0 05	0 13
General and miscellaneous	4.93	5.42	3.61	4 38
Car-miles operated	26,625,524	17,040,687	3,818,699	5,766,138

[1] Includes 0.12 cent per car-mile for express charges.
[2] Includes 0.19 cent per car-mile for express charges.

Seattle Municipal Railway Lost $517,173

Apparent Profit of Line There Turned Into Deficit When Proper Allowance Is Made for Depreciation

According to a statement prepared by City Comptroller Harry W. Carroll, Seattle's municipal railway during the year ended Dec. 31, 1919, operated at a net loss of $517,173. This statement takes into consideration the depreciation of the railway property since the city of Seattle purchased the lines last April. The depreciation figure is given as $499,173.

The total expense of operation of the railway, including the depreciation item, was shown to be $4,675,326; total operating revenue for the period was $4,158,153. Regarding the item of depreciation, which was estimated by A. F. Whalley, of the State Bureau of Inspection and Supervision of Public Offices, in conjunction with Comptroller Carroll, Mayor Hugh M. Caldwell issued the following explanatory statement:

The item of $499,173 depreciation of road and equipment is taken from the figures just completed by the State Bureau of Inspection and Supervision of Public Offices. Mr. Whalley of this department has been working on the accounts for the last two months.

The depreciation figure has been segregated by him on the various units of plant according to the classification of plant accounts by the Interstate Commerce Commission, ranging from one-half of 1 per cent on units such as grading and ballast, to 20 per cent on miscellaneous equipment (automobiles, etc.).

On the lines purchased from the Puget Sound Traction, Light & Power Company the ledger value of $15,000,000 was taken, from which was deducted lands and other undepreciable property aggregating $647,719. In other words, the depreciation has been figured on the valuation of the lines taken over from the Traction Company of $14,352,281, representing the full purchase price of depreciable assets; in other words, the $499,173 depreciation charged is approximately 4 per cent of the total depreciable assets.

The State of New York Public Service Commission, Second District, advises in its classification adopted Aug. 20, 1918, that its experience shows in the operation of electric railways the depreciation on way and structures should not be less than 2 per cent nor more than 5 per cent per annum; that the depreciation on equipment should not be less than 2 per cent nor more than 10 per cent per annum on the average total cost of such assets. Applying the average or mean of these rates to the assets of the street railways of the Seattle Municipal Railway a figure is arrived at approximating very closely the amount charged to depreciation in 1919.

The Puget Sound Traction, Light & Power Company figured its depreciation while operating the lines at 20 per cent of the passenger revenue less the amount expended for maintenance. This was a purely arbitrary method of figuring depreciation and varied with the revenues and maintenance each year.

If the city paid $5,000,000 more than the lines were worth, as many people believe to be the case, the depreciation, of course, is being figured upon an inflated valuation. As I understand it, an engineer was employed to spread the $15,000,000 over the assets which were being turned over to the city and to estimate the proportionate value of each class of property or equipment making up the total. At an actual value of $10,000,000, the depreciation would be approximately $200,000 less per year.

For comparative purposes we find that the municipal railway lines of San Francisco for the year ended June, 1919, charged to depreciation $334,867.21 on a total valuation of $6,499,480. The method used in San Francisco took 14 per cent of the passenger revenues without any deduction for maintenance. This would be slightly more than 5 per cent on the valuation of $6,500,000, whereas the percentage used on the Seattle lines was slightly over 4 per cent.

The city of Seattle in its light and power plant has been and is now charging depreciation each year. For the year 1919 the sum of $244,128 was charged to depreciation, which on a valuation of approximately $7,600,000 of assets actually in service, would make the rate of depreciation approximately the same as that used for the street railway by the State Board of Accountants.

From the examination I have been able to make, it seems to me that the city must take one of two courses—it must continue to proceed on the $15,000,000 valuation and figure actual depreciation on what is equivalent to watered stock, or else it must make a new valuation and charge off in a lump sum the excess price paid for the lines and thereafter figure the actual depreciation on the actual value of the lines.

EXPENSE		
Operating:		
Way and structures (maintenance of roadway, buildings and grounds)		$282,993
Equipment (maintenance of cars, shop equipment, automobiles, etc.)		528,507
Power (power produced and purchased)		558,529
Conducting transportation (trainmen, carhouse and car service expense)		1,950,459
Traffic (advertising park and resort attractions)		2,228
General and miscellaneous (general office expenses, industrial insurance, injuries and damages, stationery and printing, store expense, rent of track and facilities)		245,109
Auto buses (expense of auto buses connecting outlying territory with end of car line)		904
		$3,568,729
Depreciation of road and equipment		499,173
		$4.067,902
Deductions from gross income:		
Interest on general bonds	$23,282	
Interest on revenue bonds	579,683	
Amortization of discount on revenue bonds	2,314	
Miscellaneous interest (interest on railway fund warrants)	2,145	
		$607,424
Total		$4,675,328
REVENUE		
Operating revenue:		
Passenger car service		$4,030,602
Special passenger car revenue		471
Auto bus service		274
Express service (carrying newspapers)		3,948
Freight service		32,112
Mail service		6,213
Municipal employment passenger service (police and firemen)		38,000
Miscellaneous transportation service		3,265
		$4,114,885
Miscellaneous revenue:		
Station and car privileges (advertising privileges on stations and cars)		$12,947
Rent of track and facilities		20,938
Rent of cars		3,523
Rent of real estate		4,638
Electric current sold		579
Other miscellaneous revenue		643
		$43,268
Total		$4,158,153
Net loss for 1919		$517,173

In submitting his report to Mayor Caldwell, Mr. Carroll attached the following commentary:

The statement of income, profit and loss of the City Railway Department does not include certain expenses, properly chargeable to railway operation, borne by the general fund and charged by authority of the legislative body of the city to the expense of the respective departments rendering the services.

When the city acquired the traction properties of the Puget Sound Traction, Light & Power Company on April 1, 1919, it became necessary to increase the number of employees in several general fund departments. In the corporation counsel's office, two assistants to the corporation counsel, five claim agents, one law clerk and two stenographers were added to the force. Owing to the large grist of damage claims and increased litigation, expense for office supplies, stationery and printing, postage, etc., was materially increased.

The total cost of the city railway legal business borne by the general fund in 1919 was about $20,000; the purchasing department expenses were increased approximately $5,000; the expense of the comptroller's department for auditing claims, issuing warrants and keeping accounts of the railway department cost in round figures $6,000. In addition, there was an increase in the city treasurer's office expense of about $1,000 for handling city railway business in 1919. In the Public Utilities Department, all of the superintendent's salary of $4,500 and half of the auditor's salary of $3,250 have been charged to that department and paid from the general fund, notwithstanding more than two-thirds of their time has been devoted to railway operation.

Altogether some $35,000 of expense for the railway department was paid in 1919 out of the general fund. It is true that the general fund receives 2 per cent per annum on all railway fund money on deposit in city depositories, which would amount to perhaps $15,000 in 1919.

Similar expenses of light and water utilities, though relatively small, are likewise borne by the general fund and are consistently subject to the same criticism.

Loans and advances have been made to the railway fund, altogether amounting to $200,000, by other funds, principally by the general fund, without charge for interest. This practice is not new. It has been the custom of the legislative body to make loans to other utilities from various funds without providing for interest payment thereon, same being in my judgment a questionable policy.

In the budget for 1920 provision was made by the City Council for reimbursement to the light department depreciation reserve fund of an item of $25,000 previously loaned by that fund to the railway department. In accordance with this plan, the $25,000 was included in the general fund tax levy for 1920, and in February of this year was paid by the general fund, thus relieving the railway fund of this liability and reducing the total loans and advances from $200,000 to $175,000. In other words, the city made a levy of $25,000 for the benefit of the city railway.

Another matter that should now be presented for consideration is the provision for redemption of outstanding railway bonds. On Feb. 1, 1922, $833,000 of the $15,000,000 of bonds issued the traction company will be due and payable. Each succeeding year till 1929 a like amount will fall due. Thereafter, this amount will be increased by the addition of other serial bonds falling due, yet no sinking fund provision has been made by the city to take care of these redemptions.

The accompanying table shows the figures of earnings contained in Comptroller Carroll's report.

Changes in the personnel of the railway are referred to elsewhere in this issue.

Tax Assessments Protested

The Brooklyn (N. Y.) Rapid Transit Company has obtained from Justice Lazansky in the Supreme Court twelve writs of certiorari in connection with its appeal for the reduction of the 1920 special franchise taxes levied by the State Tax Commissioner. The writs are returnable in the Supreme Court at Albany on May 10, when the commission will be required to show by what process it arrived on the valuations it estimated and the railroad companies will be given an opportunity to show that the companies' properties were much overvalued. The reductions in valuations asked by the various companies total more than $25,000,000, with actual tax reductions of several million dollars.

Rhode Island Agreement

Quick Change in Attitude of Security Holders Indicates Likelihood of Success of Reorganization Plan

The stockholders and bondholders of the United Traction & Electric Company and the Rhode Island Suburban Railway, Providence, R. I., have agreed upon a plan of reorganization of the Rhode Island Company. In a final desperate attempt to reach common ground, the traction and the suburban bondholders at a meeting on March 31 accepted the ultimatum of the stockholders.

Speedy Action Necessary

Action was necessary on March 31, if at all, to save the entire system from disintegration. It was the last day for the introduction of legislation in the General Assembly under the rules, except by unanimous consent, and this was recognized as impossible.

Several acts proposing sweeping changes in the laws regulating the electric railway transportation and motor bus systems were presented in the lower branch of the Assembly. It is now up to the Legislature to make possible the transformation of the electric railway properties.

Governor Beeckman, contrary to custom, appeared before the House on March 31 and appealed to the members to give prompt and favorable consideration to the measures for the best interests of the whole State. He said that the reorganization of the railway was a subject of the most vital importance to the State, and that upon passage of the acts presented depended the future welfare of the traction system. He said:

> Under the plan accepted this morning, there will be a saving of $560,000 in annual fixed charges, and in return for this the company asks relief aggregating about $300,000 or $400,000.
>
> I believe that if we do not grant this relief we are going to cut off a great part of our electric railway system certainly, and possibly all of it. If we do not pass these acts in some form the railway will go under the hammer. It is absurd to say that the legislation proposed would harm the jitneys or buses in any way. It does not mean that the fares are to be raised. That would be manifestly ridiculous.

Based upon the plan drawn up by the protective committees of both sets of bondholders on March 11, the settlement provides for the merging of all properties now operated by the Rhode Island Company in the United Electric Railways to be capitalized at $22,600,000.

Slight Change in Plan

The only change made in this plan, as originally made public, is to eliminate the sinking fund which was to have been established to extinguish the prior lien bonds in twenty-five years and which would have required an estimated fixed charge of $54,680 a year.

Under the provisions of the plan, the securities of the United Electric Railways will consist of $3,000,000 prior lien bonds, $11,100,000 general mortgage bonds and $8,500,000 stock. The prior lien mortgage is to be an open mortgage to secure bonds to the amount of $5,000,000. Of these, $3,000,000 will be not-to-exceed 7 per cent bonds, of which $1,000,000 will be issued at once for new money for the corporation. The remaining $2,000,000 would be issued hereafter, at not to exceed 7 per cent, if new money is required.

The holders of the traction bonds and suburban bonds agree to forego the defaulted interest on their bonds to the amount of $1,200,000. In addition to this they cut their principal by $1,400,000 and receive $1,400,000 in stock.

The stockholders will receive, for their present $8,000,000 holdings, $6,600,000 in the stock of the new corporation. Without the obligation to raise any new money they are to be subjected to a scaling of less than 20 per cent. Arrangements have been made by which the United Electric Railways will be able to get the $1,000,000 new money as soon as needed.

The plan is made subject to the obtaining from the General Assembly of suitable legislation, including the placing of railways, jitneys and motor buses under the supervision of the Public Utilities Commission as common carriers.

For their $9,000,000 holdings the traction bondholders are to receive $8,100,000 in general mortgage bonds, the interest rate to continue at 5 per cent, and $900,000 in stock.

The suburban bondholders will get in exchange for their $5,000,000 of 4 per cent bonds $2,000,000 of 4 per cent bonds, based on the prior lien, $2,500,000 of 4 per cent general mortgage bonds and $500,000 stock.

For all its electric railway properties in Rhode Island, the New Haven Railroad will get $500,000 in 5 per cent general mortgage bonds and $500,000 in stock.

The general mortgage will be a junior mortgage to the prior lien mortgage and will have a life of thirty years.

The amount of fixed charges to be met by the United Electric Railways by this plan would be $680,000 a year.

Financial News Notes

Additional Director Elected.—Isaac E. Sawyer of the Mechanics' Savings Bank, Holyoke, Mass., has been elected an additional director of the Holyoke Street Railway.

Middlesex & Boston Reopens Lexington Line.—The Middlesex & Boston Electric Company has reopened its line between Waltham and Lexington after a shutdown of about two months.

Operating Managers for New York Interurban.—Day & Zimmerman, Philadelphia, Pa., are planning to take over the Western New York & Pennsylvania Traction Company, Olean, N. Y., as operating managers.

Berkshire Service Suspended.—Due to shortage of funds and lack of coal together with the blocking of tracks by the heavy snow fall in January, the Berkshire Street Railway Pittsfield, Mass., has suspended all service in the Pittsfield district.

Abandonment Authorized.—The Public Service Commission for the Second District has granted permission to the Chautauqua Traction Company, Jamestown, N. Y., to abandon its lines between Westfield and Barcelona for the reason the road never paid.

Hingham Co-Operates in Financing Cost of Operation.—The town of Hingham, Mass., decided at the town meeting held on March 22 to appropriate $5,000 for aid in financing the operation of the lines in the town controlled by the Eastern Massachusetts Street Railway.

Equipment Purchased by Deferred Payments.—The Board of Public Utility Commissioners of New Jersey has approved the agreement of the Salem & Pennsgrove Traction Company, Salem, N. J., with the J. G. Brill Company, Philadelphia, for the purchase of six safety cars. The purchase price was $30,561. Thirty-six notes maturing at monthly intervals are to be given in payment for the cars.

Wants Abandonment Approved.—The Toledo, Bowling Green & Southern Traction Company, Toledo, Ohio, has filed a petition with the State Public Utilities Commission asking for permission to abandon service over its branch between Trombley and Jerry City, Ohio. The portion of the road is only 2 miles long. It is said to have been operated at a loss for several months. A hearing by the commission was set for April 2.

Holding Company Not Liable.—The United States Circuit Court of Appeals has sustained the ruling of a lower court that the Philadelphia Company is not liable for bond interest on underlying bonds of the Pittsburgh Railways. Suit was brought by B. C. Allen to hold the Philadelphia Company liable for accrued and current interest on $10,000,000 of first mortgage bonds of United Traction Company, a subsidiary of the Pittsburgh Railways.

Grand Rapids Seeks Valuation Data.—Mayor Gallmeyer of Grand Rapids, Mich., has invited the members of the State Public Utilities Commission to a conference for the discussion of the local utility problems. Among these are agreements with the gas company and the Grand Rapids Railway. An interim contrast is desired with the former, pending some form of stable settlement. As for the railway, that matter has not yet taken definite shape except that the city desires information about valuation methods and procedure in anticipation of the expiration of the railway franchise on April 21, 1921. The city contemplates retaining E. E. Brownell as consulting engineer to represent it. The company has retained as its representative William J. Hagenah, Hagenah & Erickson, Chicago.

Traffic and Transportation

Suggestions Adopted

Kansas City Railways Points to Many Improvements in Service During Past Few Months

Co-operating with the municipal authorities and civic organizations, the Kansas City (Mo.) Railways has recently put in effect a number of regulations calculated to relieve traffic congestion and speed up car schedules. The changes were recommended in the report of the committee of one hundred business men appointed by the Kansas City Chamber of Commerce to investigate traffic conditions and to report on a remedy for the congestion, especially in the business district. The committee's report was summarized in the ELECTRIC RAILWAY JOURNAL for March 20, page 614.

Company Has Done Its Part

The company has issued a statement through its official publication, the *Railwayan*, in which it calls attention to the fact that many of the committee's recommendations have been carried out since the body began its work several months ago. The carrying out of other recommendations rests entirely with the city and the public.

In the latter class the company places the proposal that its franchise be amended to include a service-at-cost clause providing for a variable fare and a variable rate of return upon the capital invested. The company points out that under the Public Service Commission operation the service-at-cost plan is already practically in effect.

The committee urged that charges such as licenses and street paving and cleaning, snow-removal and lighting costs be no longer charged against the company, since these only tend to increase the fare and have no place in the operating costs of an electric railway. The company's statement declares that the question of remitting these charges must also be decided by the city.

Franchise Conditions Fulfilled

It is pointed out that the company has fulfilled franchise requirements providing for extensions to its lines. The report recommends the repeal of the section of the franchise requiring certain prescribed investments in extension each year, and that only such extensions be required as the Board of Control deems necessary and believes will be self-sustaining. Other franchise changes, including the working out of uniform franchises for the lines in Missouri and Kansas, rest with the municipalities involved.

Interest money to the amount of more than $1,000,000 is to be invested in the property during 1920. The company points to this fact in noting the recommendation that new capital, so far as possible, be in the form of stock investment instead of bonds. Attention is called to the fact that under existing conditions there is no market for stock.

With regard to the committee's request that the company provide means of receiving and acting promptly upon complaints, the company states that all complaints and suggestions meet with prompt attention. To meet the demand that service in the outlying districts be adjusted to the actual demand, it is pointed out that the company has for some time been turning back cars on several lines.

Increase in Car Speed

Increase in speed of cars, urged by the committee, has already been obtained, largely through the recommendations made by John A. Beeler. The company further states that it has for many years urged upon its employees the necessity of courteous treatment of the public. The committee's suggestion that looping in the downtown district be discontinued has been carried out by the Board of Control, which has discontinued looping wherever possible.

A resolution has been adopted by the City Council creating a traffic committee consisting of three aldermen each, from the upper and lower house, to confer with Mr. Beeler on ordinances which will provide for the further rerouting of cars, regulation of stops and other traffic measures.

Co-operation in Financing

The Eastern Massachusetts Street Railway, Boston, Mass., has prepared a plan for co-operation in financing and operating the railway lines in the towns of Dedham, Westwood, Norwood and Walpole, which if accepted by the towns served by the company will result in the continuance of the lines in these communities.

The plan calls for the contribution of $20,000 to be raised by the towns, to which will be added $40,000 to provide $60,000 required to rehabilitate the lines. If the $20,000 is raised the company will guarantee service for a period of one year.

In addition to the request for reimbursement, the Eastern Massachusetts Street Railway suggests that a committee be appointed from each community to co-operate with the trustees of the railway in the supervision of operation and the handling of questions and problems pertaining to service in the district.

The recent decision to discontinue service on these lines after April 1 will become effective if the plan proposed does not meet with acceptance by the communities.

Fare Increase Denied

Oregon Commission Hopes to Secure Approval of Program That Will Forestall Increase

The Public Service Commission of Oregon, in a decision handed down at Salem on March 23, held in abeyance the application of the Portland Railway, Light & Power Company for increased fares with which to meet its steadily increasing costs of operation and recommended that the much discussed proposal for the city of Portland to take over the tracks of the company be referred to the voters of Portland at the special State election to be held on May 21. By taking over these tracks it is estimated that the valuation of the company's properties would be reduced about $5,000,000. Under the provisions of the order the latter recommendation applies only to the tracks in the streets and does not include the entire traction system.

Problems which in the opinion of the majority of the commission should be referred to the voters for decision at the special election recommended by that body are as follows:

> Elimination of financial burdens, including the maintenance on paving already laid and estimated at $47,000; bridge rentals, $65,000; franchise taxes, $15,500; car licenses, $7,500; free transportation to city employees, $22,000; maintenance, depreciation, taxes and interest on prospective paving (average six months), $13,000, or an aggregate of $170,000.

The majority decision was signed by Fred G. Buchtel, chairman of the commission, and Fred Williams, while a dissenting decision urging an increase was written by H. H. Corey.

The majority opinion points out that the commission is reluctant under present conditions and circumstances to attempt to remedy the situation merely by increasing fares. It says:

> We seriously doubt whether any fare would result in a complete and final solution of the difficulties of the railroad corporation at this time. From our investigation and analysis of the data presented it is not at all unreasonable to assume that the acquisition of the tracks by the city, together with elimination of bridge tolls and other relief, would not only place the Portland railway system at present and for the future upon a sound financial basis, but permit of a prompt reduction in the present rate of fare.

Mayor Baker asserted that this solution of the transportation problem, indicated by the action of the commission in declining, for the present, to grant an increase in fares, is an obviously disagreeable one, but the best that can be afforded under the circumstances. The Mayor believes that the suggestion of the commission that the city acquire the trackage is the best way out of the transportation tangle, while declaring that he is in no respect converted to municipal ownership and that even the partial partnership proposal should be accepted only as a last expedient. He said that the City Council will discuss at an early date the advisability of placing both proposals on the ballot.

In commenting editorially on the decision the Portland *Oregonian* said:

> It is obvious that some drastic and not wholly desirable remedy must be adopted

in the carfare situation in the interests not only of the company but of the community itself. Purchase by the city of the rails is of that class. It cannot logically be offered as an economy in operation. It is proposed as a measure of relief for the company for which all the people shall pay in lieu of that other form of relief—an increase in fares—for which the car riders alone would pay. It is a plan that will appear to the apprehensive as a first step toward full municipal ownership and operation. It is difficult to understand how, even if the plan were not thus enlarged, it could escape some of the drawbacks of the latter policy.

More P. R. T. Improvements Planned

Philadelphia Transit Director Proposes Plan for Operation of Frankford Line—Company Wants Equipment Fund

Recommendations looking to the improvement of electric railway service in Philadelphia, Pa., were submitted to the City Council on March 30 by the Philadelphia Rapid Transit Company and by William S. Twining, director of city transit. Director Twining presented to the Council a report outlining a plan for the operation and equipment of the Frankford elevated line, now nearing completion. The company asked permission to establish a $6,000,000 equipment fund to meet the need for additional rolling stock.

Director Twining's program for the operation of the Frankford elevated calls for a 5-cent fare for a ride between any station on the present Market Street subway-elevated line to any station on the Frankford line, with free surface transfer privileges. Mr. Twining proposed two courses of action in the event that the company refuses to come to a satisfactory agreement. First, Mr. Twining suggested the city should petition the Public Service Commission for a peremptory order demanding the company equip and operate the new elevated, or, second, that the city should construct additional lines in the central business district to serve as a feeder for the Frankford elevated in its present headless and tailless condition.

Would Give Thirty-Year Lease

In case the company agrees to operate the new line, it will, under Mr. Twining's plan, receive a lease from July 1, 1920, to July 1, 1957. A provision is inserted for cancellation by the city upon reasonable notice and upon fair terms. Mr. Twining's plan calls for an annual rental payment to the city of 4 per cent of the city's initial investment in the line, this sum to be increased by the interest charges on additions made by the city during the life of the lease. The rental would be a direct obligation upon the company and not contingent upon any other payment. Sinking fund payments on city bonds would not be included in the rental requirements.

The company's proposal to establish a $6,000,000 equipment fund, which took the form of an ordinance, was accompanied by a letter from W. C. Dunbar, vice-president in charge of accounting. Mr. Dunbar explained that the certificates to be issued would bear interest at 6 per cent annually, maturing in equal semi-annual instalments during a period of not more than ten years, and they would be secured by a lien on 1,500 surface and ninety-seven elevated-subway cars.

This proposed equipment trust certificate issue is required to finance immediate necessities and supply increased car-carrying capacity, said Mr. Dunbar. The financing of new lines and extensions is planned to be accomplished by the formation of new companies issuing first mortgagage bonds to cover the cost of construction to be guaranteed by the P. R. T., which company will also be the sole owner of such nominal issue of capital stock as may be required. Plans for the issuance and sale of these bonds will be presented from time to time for the Council's approval. Mr. Dunbar said in part:

> Pursuant to the specific provisions of the second section of the 1907 contract stipulating that upon the occasion arising for any additions or betterments to the lines, power or equipment of the Philadelphia Rapid Transit System, a communication shall be submitted by this company to City Council setting forth the necessity for such additions or betterments requiring additional capital and properly chargeable to capital account together with the estimated cost thereof and a plan of financing, we beg to advise:
>
> 1. That it is necessary each year to undertake substantial expenditures for the improvement and upbuilding of the physical plant to meet the increasing demands for transportation with new construction and equipment.
>
> 2. That in accordance with the uniform system of accounts for electric railways prescribed by the Interstate Commerce Commission and adopted by the Public Service Commission of Pennsylvania, expenditures are properly chargeable to capital account when incurred for new and additional property or when constituting a betterment as represented by the additional cost or value of track, power plant, car equipment or other facilities installed in the replacement of existing property.
>
> 3. That additional capital is required by the Philadelphia Rapid Transit Company in order to meet expenditures for additions and betterments to property actually incurred during the year 1919, and for additions and betterments necessary to be undertaken at this time.
>
> 4. That during the year 1919 the sum of $1,521,269.16 was expended for additions and betterments to track, power plant, car equipment and other property; that the sum of $1,000,000 was borrowed by the company on short term note in order to meet these expenditures; and that this obligation must be met by the issuance and sale of a marketable security.
>
> 5. That the sum of $2,400,000 is urgently required to meet the immediate necessities.

Trailer Cars an Issue

The question of trailer car operation is a live issue in Chicago at the present time. In an order issued last November by the Public Utilities Commission the Chicago Surface Lines was directed to add 200 cars to the service within five months. For financial reasons, due to the frequent changes in rates of fare, the companies have not been able to carry out this order.

At a hearing before the commission on March 24, Henry A. Blair, president, explained this situation and said the company has undertaken to construct an experimental trailer in its own shops and he thought this would be ready in sixty days. The plans and specifications will be submitted to the commission. Most of the routes operated by the Surface Lines do not have loops at both ends, but there are a number of lines where it is believed two-car trains can be operated to advantage, particularly on some routes entering the business district.

At the same session before the commission complaints were made through the Attorney General's office that many cars were being held in depots during rush hours. In nearly every case it was explained that this was due to defective equipment or shortage of crews.

Buffalo Fares Discussed

Council Members Inclined to Reject Proposal for a Charge for Transfers

Members of the City Council of Buffalo, N. Y., have signified their intention of rejecting the proposal of the International Railway that the city join with the company in an application to the Public Service Commission, Second District, for an order providing for a basic 5-cent fare with a charge of 3 cents for the first transfer and 1 cent for each additional transfer, in place of the 7-cent fare order of last November.

Herbert G. Tulley, now president of the railway, says that as soon as the Council formally rejects the proposal the company will give the city ten days' notice that it will put the 7-cent fare into effect. Thomas E. Mitten, a member of the bondholders' protective committee and a big factor in the operation of the International, has been opposed to a 7-cent fare. It was he who suggested the 3-cent transfer charge.

After a series of conferences with the municipal authorities, Mr. Mitten and Mr. Tulley agreed to reduce the charge for the second transfer from 3 cents to 1 cent. Mayor George S. Buck says he might consent to a transfer charge if a 2-cent charge is made for the first transfer and a 1-cent charge for the second transfer. This the company refuses to consider.

Three of the five members of the City Council have publicly announced they will not allow the company to charge a 7-cent fare despite the action of the Public Service Commission and will carry the appeal to the United States Supreme Court for a decision as to whether or not the Public Service Commission's 7-cent fare order is constitutional in view of the company's franchise fixing a 5-cent fare with free transfers.

In his report to the City Council after an investigation into the number of passengers who use transfers, Mr. Tulley said that only 40 per cent of the riders use transfers. He believed it would not be fair to charge a straight 7-cent fare when a 3-cent transfer charge would serve the same purpose and only affect part of the patrons.

City Protests 8-Cent Fare in St. Louis

The Public Service Commission of Missouri has granted an extension of time to the United Railways, St. Louis, under which it may collect an 8-cent fare from single passengers over its lines until April 15. The city is demanding a rate of 7 cents, with four tickets to be sold for a quarter. The city contends that the valuation of $60,000,000 claimed by the company for rate-making purposes is $10,000,000 too high. The order of the commission authorizing the 8-cent fare was effective until March 20. The company asked for an indefinite extension.

Major C. E. Smith, consulting engineer of the city, was one of the principal witnesses for the city. He said that it was his belief $2,000,000 a year could be saved by the company by installing one-man cars and operating them intelligently. There were several sharp tilts between Mr. Smith and Thomas E. Francis, attorney for the company. Mr. Smith submitted thirty-two exhibits covering the operations of railway systems in various cities. His conclusion was that the St. Louis railway is being poorly managed. Mr. Francis at one point said:

> Never having operated a street railway system yourself, you are merely giving horseback opinions as to how the St. Louis line should be operated, are you not?

Mr. Smith replied that was a horseback question. He then said:

> I do know that some 600 street railway lines are operating one-man cars, and that the St. Louis system is from five to ten years behind more progressive systems. I have made it my business to learn these facts.

Colonel Albert T. Perkins, manager of the company, said it was the intention of the company to ask the commission for authority to expend probably $2,000,000 for new cars and something like $1,500,000 for replacing old tracks, and these sums would more than consume the reserve and depreciation funds.

Four 10-Cent Zones Established

Four 10-cent zones on each side of the Connecticut River for the 13 miles of track on each side owned by the Hartford & Springfield Street Railway were authorized by Judge Lucien F. Burpee of the Superior Court of Hartford County on March 19, after Receiver Harrison B. Freeman had informed the court that the bondholders had refused to advance any more money to the road.

The new rates mean an advance in fare from 61 to 66 cents on each side of the river, between Hartford and Springfield, the Connecticut Company and the Springfield Street Railway operating part of the road on either side of Mr. Freeman's company and allowing the Hartford & Springfield company's cars to run over their lines. The connecting lines will not increase fares.

Only a week before the receiver had received authority from Judge Burpee to borrow $10,000 to keep the road running, the court telling Mr. Freeman to see if things could not be put on a paying basis, "if Providence would let him."

The railway's line on the west side runs from Windsor to the Massachusetts line and on the east side from East Windsor Hill to the State line. The increase in fares awaits formal action by the Public Utilities Commission, which assured Mr. Freeman before he asked the court for the increase that it saw no reason for refusing it.

The interest on the bonds of the company has been in default for about two and one-half years and the taxes due to the State of Connecticut have not been paid for three years. Mr. Freeman is not particularly optimistic about the way in which patrons of the road will take the new rate.

Transportation News Notes

Monongahela Fare Case Presented.—The rate case of the Monongahela Valley Traction Company, Fairmont, W. Va., which asks for increased fares on its lines in Parkersburg, was submitted to the Public Service Commission on March 27. The commission has taken the matter under advisement.

Ten Cents Asked in Walla Walla.—The Walla Walla Valley Railway, Walla Walla, Wash., has filed with the State Pubic Service Commission a rate schedule under which it proposes to charge 10-cent fares in Walla Walla beginning April 15. The present fare is 8 cents.

One-Man Cars for Boston.—Edward Dana, general manager of the Boston (Mass.) Elevated Railway, has applied to the State Department of Public Utilities for authority to operate one-man safety cars on the company's lines. The road has contracted for thirty such cars.

Savannah Hearings Ended. — The Georgia Railroad Commission has concluded hearings at Savannah on the petition of the Savannah Electric Company to increase its fare and its lighting and power rates. C. M. Candler, chairman of the commission, stated that a decision would be announced shortly.

Seven Cents in Sheridan.—The Sheridan (Wyo.) Railway began charging 7-cent fares on March 15. The increase was authorized by the State Board of Equalization & Public Service Commission. The commission's order provided for the sale of twenty tickets for $1.25, making the ticket rate 6¼ cents. The fare was formerly 5 cents.

Higher Fare in Morristown.—Seven-cent fares became effective on the lines of the Morris County Traction Company, Morristown, N. J., on April 1. The increase was made under authority of the State Board of Public Utility Commissioners. The rate was formerly 6 cents. The board refused to allow the company to raise the price of school tickets from 3 cents to 3½ cents.

Six Cents in Little Rock.—The City Council of Little Rock, Ark., on March 23 passed an ordinance under the terms of which the Little Rock Railway & Electric Company will be permitted to raise its fare from 5 cents to 6 cents. The company will be required to spend $100,000 on additional equipment for rush-hour service within the next four months.

Denies 8-Cent Fare.—The Missouri Public Service Commission has denied the application of the Kansas City Railways for permission to charge 8-cent fares on its lines in Independence. The present 5-cent fare within the city limits has been ordered continued. The commission has authorized an increase in the rate between Kansas City and Independence to 10 cents. The order went into effect on April 1.

Fares Up on French Lines.—French tramways and bus lines are raising their fares. The Paris "Metro," or subway, has been authorized by the municipal authorities to increase its rates from 5 cents to 10 cents, first class, and from 3 cents to 6 cents, second class. Fares on the Paris surface lines and bus routes have been advanced from 5 cents to 12 cents, first class, and from 3 cents to 10 cents, second class.

Fights Nashville Increase.—A resolution calling for a committee of three to recommend an expert appraiser to examine the books of the Nashville Railway & Light Company, Nashville, Tenn., was recently adopted by the Nashville City Commission. The resolution charged the State Railroad & Public Utilities Commission with "unjust discrimination" against the city in permitting the company to raise its fare to 7 cents.

Would Grant 6-Cent Fare.—The Public Service Commission of Washington has been petitioned by the Hoquiam Commercial Club, Merchants' and Traders' Bureau and the Rotary Club to grant the Gray's Harbor Railway & Light Company, Aberdeen, a 6-cent fare. The company has filed with the commission a 7-cent schedule to replace its present 5-cent fare. The City Council of Aberdeen has protested the 7-cent fare to the State commission.

Ask More for New York Lines.—Two electric railways operating in New York State have applied to the Public Service Commission for the Second District for permission to raise their fares. The Peekskill Lighting & Railroad Company asks authority to charge a 7-cent fare in Peekskill for a period of one year. The fare is now 6 cents. The Peekskill trustees have already approved the increase. A 10-cent fare is asked by the Putnam & Westchester Traction Company, operating between Peekskill and Oregon.

Bulletin for Charlotte Carmen.—As a part of its campaign for improved public relations, the Piedmont & Northern Railway, Charlotte, N. C., has begun the publication of a semi-monthly bulletin, the *P. & N. Special*, which is to be sent free to all employees and all shippers served by its lines. This publication is to be edited by John Paul Lucas, director of public relations for the Southern Public Utilities Company, who has assumed a similar position with the railway.

More Cars for Subway.—The Interborough Rapid Transit Company, New York, N. Y., on March 25 placed in operation new service schedules called for by the order of the Public Service Commission for the First District for increased service in both rush hours and non-rush hours. The principal increases made are in non-rush hours. Trains are to be operated on more frequent headway and with an increased number of cars. The service as called for provides nearly 25,000 more seats than were operated daily prior to March 25. Increases are made in the evening non-rush hours as well as in day-time non-rush hours, while there has also been a material increase made in the local service operated in the west side subway in evening rush hours.

Would Raise Commutation Rate.—The Union Traction Company of Indiana, Anderson, Ind., has filed a petition with the State Public Service Commission asking for an increase in its commutation rates on all of its lines. The company asks that the rate of 1½ cents a mile on commutation books be changed to a basis of forty rides for the price of twenty-five full one-way tickets at 2¾ cents a mile. This would mean a rate of 1.64 cents a mile. The company asks that a minimum charge of from $3 to $4 be fixed for any book of tickets and that it have authority to put the new rates in effect on ten days' notice. It points out that the commission has granted commutation rates similar to those which it asks to traction companies in adjacent territory.

Must Pass on Jacksonville Fares.—The Supreme Court of Florida on March 19 handed down an opinion affirming the authority of the State Railroad Commission to fix rates of fare, municipal franchise ordinances notwithstanding. Under the court's order the commission is called upon to pass upon the petition of E. J. Triay, receiver for the Jacksonville Traction Company, for a 7-cent fare on the company's lines. Following the refusal of the Jacksonville voters to grant the higher rate, the receiver applied to the commission, which refused to act in the case on the ground of lack of jurisdiction. Mr. Triay then secured from the Supreme Court an alternative writ of mandamus directing the commission to hear the application. The commissioners thereupon asked the court to quash the writ.

Interurban Road Retrenching.—Package freight and other freight service was discontinued on March 15 on the lines of the Maumee Valley Railways & Light Company, connecting Toledo, Maumee and Perrysburg. The abandonment of the service has been approved by the Public Utilities Commission after the company showed that it had operated at a loss for some time. Approval of the passenger fare increase recently submitted to the commission is still pending. Several suggestions for curtailing passenger service have been presented, but company officials declare they are not feasible. Recently the company asked bondholders to allow an extension of one year with a higher rate of interest and an option on another extra year extension on account of the financial situation of the company.

Fargo Lines in Need.—The Fargo & Moorhead Street Railway, a subsidiary of the Northern States Power Company, which operates in Fargo, N. D., and Moorhead, Minn., has appealed to the authorities of these cities for financial relief. The Fargo City Commission has indicated its willingness to meet with representatives of the Moorhead City Council to consider the company's request with a view to granting it an increase in fare. In asking for additional income for the lines, M. L. Hibbard, general manager of the company, stated that net operating revenue for 1919 amounted to $3,185 and that wage increases made in January of this year involved additional expenditures of $7,500 annually. He pointed out that this increase in operating expenses would wipe out the apparent profit of 1919 and would create a deficit of over $4,000 in 1920.

New Publications

Controllers for Electric Motors

By Henry D. James. 354 pages. Illustrated. D. Van Nostrand Company, New York City.

This work is based on a series of articles originally published in the *Electric Journal* during 1917 and 1918. It refers particularly to industrial controllers, but it includes a chapter on series parallel control and the electropneumatic contactor. The book gives much practical information on this vital subject.

Diary for 1920

Published by the Electric Railway & Tramway Journal, 16 Eldon Street, London, E. C.

Besides containing a space for each day with blotter between the leaves, this diary gives the text of the 1919 transport act, award of the Court of Arbitration for workers, list of British tramways, railways, and light railway companies and their officials, together with a list of colonial and foreign railways with officials having offices in London, etc.

Statistics in Business

By Horace Secrist, Professor of Economics and Statistics, Northwestern University. 137 pages. Illustrated. McGraw-Hill Book Company, Inc., New York City.

In compact and readable form Dr. Secrist has given a lot of information regarding the collection, assimilation and presentation of data. In view of the increasing tendency to put facts into graphical form, such books as these should prove helpful and stimulating. In this book the author has something to say also regarding summarizing the facts, the deduction of averages, etc., a very important topic in electric railway analysis.

Design and Construction of Heat Engines

By W. E. Ninde, associate professor of mechanical engineering, Syracuse University. 704 pages. Illustrated. McGraw-Hill Book Company, Inc., New York, N. Y.

Professor Ninde states in his preface that the object of this book is to supply in one volume the material most essential to the well-equipped, independent designer of heat engines, and to give this material in the form most convenient for use in classroom and practical work by separate treatment of the different phases of the subject. He has based the book upon his notes covering twenty years of practice in this field and in the light of a teaching experience of ten years. The text is divided into sections on the heat engine, thermodynamics, friction and lubrication, power and thrust, mechanics and machine design. While the scope is very broad, the book seems to be well balanced and should be valuable not only as text in the classroom but as reference material for power-plant operating engineers.

Selling Your Services

By George Conover Pearson. Jordan-Goodwin Corporation, New York, N. Y. 237 pages, 5 in. x 7½ in. Price $2.

The book is filled with practical examples of advertisements, circular letters, application letters, follow-up letters, and telegrams, most of which have been actually used in obtaining better opportunities for technical men, salesmen, sales managers, foremen, accountants, advertising managers, clerks, stenographers, editors, etc. It is presented in very readable form and is completely indexed. "Selling Your Services" is not an instruction course. It tells the man seeking to sell his services how to take whatever knowledge and training he has now and find the best market, the market where his ability will be of the most value and therefore will give him the largest returns. Knowing that the same fundamental laws that are effective in selling any product apply equally well to selling a man's services, Mr. Pearson has given in simple, practical, usable form plans that any man can follow to conduct a resultful campaign to sell his own services. For the man who has no job, the man who has not the kind of job he desires, and the man who feels he has reached his limit in his present job, "Selling Your Services" should be of real benefit.

Personal Mention

New International President

Mr. Tulley Elected Head at Buffalo —Many Other Changes in Officers and Directors

Herbert G. Tulley of Philadelphia, vice-president of the Philadelphia (Pa.) Rapid Transit Company and acting president of the International Railway, Buffalo, N. Y., since the resignation of Edward G. Connette, has been elected president of the International. C. A. Weber, secretary to Thomas E. Mitten of the Philadelphia Rapid Transit Company, has been elected secretary of the International Railway, to succeed N. N. Ollie, who has been made assistant secretary. Willis C. Dunbar has been elected comptroller and E. J. Dickson has been re-elected vice-president.

These members of the board of directors have retired: S. R. Bertron, Rodman E. Griscom, Edward G. Connette, George Bullock, Francis T. Homer, Marshal J. Dodge, H. G. Pritchard, Henry W. Killeen, of counsel; John L. Clawson and Robert W. Pomeroy.

The new directors elected include Dr. Henry C. Buswell, Walter P. Cooke, chairman of the board of the Marine Trust Company, Buffalo; E. J. Dickson, vice-president; Willis C. Dunbar, Coleman J. Joyce, R. Walter Leigh, New York; Thomas E. Mitten, Philadelphia; Nelson Robinson, Carlton H. Smith, Herbert G. Tulley, president, and Carl A. Weber. Mr. Joyce is counsel for the Mitten interests.

The directors who hold over include John W. Barr, Jr., Louisville; Charles R. Huntley, president of the Buffalo General Electric Company; Thomas Penney, general counsel; Harry T. Ramsdell, Harry Yates and Henry C. Zeller.

The election of the new board means the elimination of the Bertron-Griscom interests of New York and the entrance of Mr. Mitten and Mr. Robinson and their associates into the active management of the Buffalo lines. A number of the new directors are Buffalo financiers. President Tulley has decided to make his home in Buffalo.

Mr. Tulley was born in England in 1872. He received his early training in the British Army, from which he was honorably discharged after several years' service in India. Coming to the United States, he entered the employ of the Chicago City Railway, where he met Thomas E. Mitten. When the Stotesbury-Mitten management took hold of the Philadelphia traction situation in 1911, Mr. Tulley was made assistant to the president of the Philadelphia Rapid Transit Company. In December, 1918, he was advanced to vice-president of the company. When Mr. Mitten took over the direction of the International Railway, following Mr. Connette's resignation, Mr. Tulley was made acting president of that road. A portrait and biography of Mr. Tulley were published in the ELECTRIC RAILWAY JOURNAL for Dec. 21, 1918.

J. V. Sullivan, Executive

From Figuring About Facts, Chicago Statistician Turns to Face Facts With Figures

J. V. Sullivan, statistician of the Chicago (Ill.) Surface Lines, has received from Henry A. Blair the signal promotion to the position of assistant to the president. In his new capacity Mr. Sullivan will be entrusted with duties of a highly responsible nature.

J. V. SULLIVAN

For the immediate future his time will be largely occupied in working with John A. Beeler, consulting engineer, who is making an extended study of the traffic conditions, equipment and organization of the Surface Lines. Thereafter, he will presumably work closely with Williston Fish, general manager, in carrying out Mr. Beeler's recommendations and in bringing about operating economies and general improvements in the service.

Mr. Sullivan takes up his new duties with a well-rounded knowledge of transportation matters gained through sixteen years of service with the electric railways of Chicago, during which he has had many opportunities for study of the systems in other cities as well. His experience in the broad aspects of these matters has also been enhanced through service during the past several years as a member of the executive committee of the American Electric Railway Transportation & Traffic Association, chairman of the committee on rush-hour service, chairman of the committee on definitions, member for four terms and then chairman of the committee on fares and transfers and member of the standards committee. These activities have also given him a wide acquaintance among railway men.

Mr. Sullivan was born in Chicago on Nov. 1, 1878. He was graduated from Notre Dame University in 1897 and then spent seven years in newspaper work in Chicago. His railway experience began in 1904, when he became connected with the traction companies operating on the north and west sides of Chicago, the predecessors of the Chicago Railways, as general passenger agent. He served in this capacity for one year and was then promoted to the position of general supervisor, which he held until the operating consolidation of the Chicago Railways and the Chicago City Railway in 1914, to form the Chicago Surface Lines. Since that time he has been statistician of the combined companies.

Mr. Wood Heads Pacific Railway Club

At its annual meeting, held in San Francisco, Cal., on March 16, the Pacific Railway Club elected the following officers for the ensuing year:

President, Dennistoun Wood, assistant mechanical engineer and engineer of tests of the Southern Pacific Company; first vice-president, G. H. Harris, general superintendent of the San Francisco-Oakland Terminal Railways; second vice-president, F. S. Foote, Jr., professor of railroad engineering at the University of California; treasurer, G. H. Baker, assistant general freight agent of the Atchison, Topeka & Santa Fe Railway; secretary, W. S. Wollner, general safety and welfare agent of the Northwestern Pacific Railroad.

Following the election of officers, Samuel O. Dunn, editor of the *Railway Age*, delivered an address on "The Future of the Railroads."

C. H. Crooks, general manager of the Fort Dodge, Des Moines & Southern Railroad, Boone, Iowa, has been elected president of the company. Mr. Crooks will continue to act as general manager in addition to discharging the duties of president.

Gordon Campbell has been elected president of the Western New York & Pennsylvania Traction Company, Olean, N. Y., to succeed Wilson R. Page, resigned. Mr. Campbell is the representative of Day & Zimmerman, who will operate and manage the local properties. He is president of the York (Pa.) Railways.

Wilson R. Page has resigned as president of the Western New York & Pennsylvania Traction Company, Olean, N. Y., effective from April 1, when the management of the property was taken over by Day & Zimmerman. The company operates the Olean local lines and interurban lines from Olean to Rock City, Salamanca, Bradford and Little Valley.

Mr. Mortimer Resigns

During His Ten Years as Vice-President and President North American Company Net Earnings Have Nearly Trebled

James D. Mortimer, who has been connected with the North American Company for more than ten years, first as vice-president and for six years as president, has resigned, the resignation to become effective Nov. 1, 1920. He succeeded James Campbell as president in 1914. Mr. Campbell thereupon became chairman of the board of directors, but died a few months later.

Earning Capacity Early Visualized

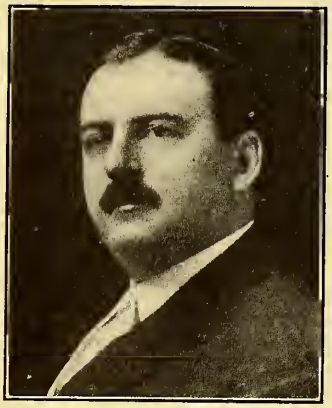
Mr. Mortimer's career with the North American Company has been marked by loyalty to Mr. Campbell and his policies, as well as by a spirit of original progressiveness which has kept him on the front line of utility progress. Within two months of the date of his taking the North American vice-presidency Mr. Mortimer stated to Mr. Campbell that the company was capable of earning 10 per cent on its stock instead of the 4 per cent or so which it was then earning. That goal, which to others then seemed remote, has been reached in ten years, as for the twelve months ended Feb. 29 the net income was practically 10 per cent, after reaching 8.54 per cent in 1918.

Mr. Mortimer has always been willing to break away from the beaten paths in utility development, as is illustrated by a number of conspicuous events of his administration. For example, the zone system of fare collection appealed to him as rational as early as 1911 and three years later it was applied in Milwaukee and vicinity, with the result that now in that city riders are paying fares which have a relation to the length of ride, excepting in the central area. He also early advocated the use of trailers to increase car unit capacity at times. More important still he applied the principle of metering the effect of labor, leading to the development of a new system of wages providing additional compensation in accordance with productivity. This was first applied in the Cold Spring shops at Milwaukee, and gradually extended to the power plant, to the transportation and accounting departments and to the linemen. It is now the ruling plan in substantially all departments of all of the companies underlying the parent organization.

Real Co-operation With Labor

In his efforts to co-ordinate the interests of employees and employer Mr. Mortimer applied in 1915 in the transportation department at Milwaukee a system of review by the employees of penalties imposed upon trainmen as part of the general scheme of wage conferences, all interwoven with the plan of bonus wages and bonus committees. This led naturally to the general labor contract with the Employees' Mutual Benefit Association and to collective bargaining and responsibility with the labor adjustment committee elected in each department by the employees. The E. M. B. A., which was organized in Wisconsin in February, 1912, and later on the other properties, operates as a fraternal industrial union. Its membership includes all of the permanent employees of the subsidiary companies. The activities of the association have since greatly expanded. In 1914 the E. M. B. Savings & Loan Association was organized and the employees of the subsidiary companies have subscribed for nearly $5,000,000 of its stock.

Mr. Mortimer was also one of the first to call the attention of the industry and others to the unprofitableness of the electric railway business. Much of his work as chairman of the program committee of the American



J. D. MORTIMER

Electric Railway Association has been along these lines, including his advocacy of an attitude on the part of electric railways favorable to municipal ownership as best for the railways although not for the public.

This last statement brings us to Mr. Mortimer's great interest in what may be termed mass psychology. This, his experience shows, is a most important factor in getting results. His studies, for example, as to the psychological side of car riding, of the reaction secured from public addresses by utility officials, etc., illustrate this interest. As to car riding, the report prepared for the association by F. W. Doolittle, under Mr. Mortimer's direction as chairman of the committee on cost of transportation service, contains tangible evidence of the importance of getting a proper reaction from the people. In public addresses, also, he has proved it to be highly important for the speaker to know what interpretation will be put upon his remarks.

But most important of all, in many ways, of the duties which Mr. Mortimer has been called upon to perform are those relating to finance. He discovered a stratum of investors in public utility securities that had not previously been reached. More than 3,600 customers of the Union Electric Light & Power Company have purchased $2,668,200 of its preferred stock, and more than 6,000 investors in the territories that are served by the Milwaukee Electric Railway & Light Company and Wisconsin Gas & Electric Company have purchased notes of the former and notes and preferred stock of the latter. Through his personal contact with utilities controlled by the North American Company he succeeded in producing some interesting results as follows:

After All, Money Talks

In ten years the Wisconsin subsidiaries increased their gross earnings by $12,203,000, with a corresponding plant and property account increase of $19,226,000, or $1.67 for each dollar of increased gross earnings. For the Missouri group (omitting the United Railways, St. Louis) the corresponding figures were $5,596,000 and $10,770,000, or $1.92 per dollar. In Wisconsin the reserve and surplus, after providing for dividends and maintenance of physical property, increased from $4,592,000 to $11,543,000. In 1909 the railway utilities produced a substantial part of the gross income of subsidiaries, but in 1919 the gross income from such utilities was less than 22 per cent of that of the subsidiaries and their operating revenues were less than 29 per cent.

Mr. Mortimer's early observation of the trend of operating expenses resulted in practically the first applications to regulatory bodies for relief, and his advocacy of automatic regulation marked an epoch in all public utility industries which may soon be expected to bear fruit.

In all of the above results Mr. Mortimer gives great credit to the men by whom he has been surrounded, and for whose welfare he has constantly striven. As a college man he has appreciated the value of technical and classical training. Twenty years ago he graduated as honor man from the University of California. After teaching for a year he served as an engineer with several utility properties, reaching his present position as a result of his contact with Mr. Campbell, who was president of the Telluride Power Company when Mr. Mortimer was an officer of the Electric Bond & Share Company.

Active in Association Councils

Mr. Mortimer has labored diligently in behalf of the public utility industry in many ways, and his advice is always valued highly in the councils of the American Association which has been the vehicle for some of his best work. The most extended researches which have been conducted under his direction were those embodied in the reports to the American Association on cost of transportation service (1915) and on social relations (1917). With such an established record for initiative, progressiveness and administrative and financial ability it seems incredible that Mr. Mortimer is only forty years of age.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER, SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES BUSINESS ANNOUNCEMENTS

Credits in Railway Field Improving

Railways Commencing to Find Themselves After a Hard Winter—Manufacturers Cautious

Credits in the railway field are fair, and are believed to be improving gradually.

Manufacturers generally are cautious in regard to credit but have been liberal with the railways and helpful within reason. Of course, the management, past performance and prospects of the railway are taken into consideration before any extensions are permitted, but on the whole manufacturers and supply houses have been quite lenient during the past winter.

In virtually every section of the country collections are not in such good condition as they were at the first of the year. There has been no radical falling off in the situation, but just enough lengthening of collection time to cause considerable care in financial matters to be exercised. Money is not so free as it was and in some cases is tight. Call money is high. Early this week call money in New York was 12 per cent, following a renewal rate of 8 per cent. Time money is 8 to 8½ per cent. Actual need of cash, high loan rates, reduced income on account of bad weather during January, February and March and income-tax payments are given as causes for the general slowing up of collections.

Snow Plow Deliveries Five to Seven Months

Steel Plate Scarcity and Uncertainties in Lumber Market Add to Difficulties of Builders

Railways are rapidly coming into the market at this time for snow plows and sweepers. A number of inquiries have been received by different snow-plow and sweeper manufacturers and a total of seven equipments are reported as purchased during the past two weeks.

A large number of railways whose experiences with the snow storms of the past winter are still fresh in mind already have included allowances in their budgets for different kinds of snow-removal equipment. In addition, purchases since the beginning of the war of this type of equipment have been exceedingly small, so from all indications, the year 1920 will be a record-breaker as far as the purchase of snow-plows and sweepers is concerned.

Owing to the length of deliveries on steel plates for making nose plows, shear plows, flangers and scrapers, the builders are unable to quote less than five to seven months delivery.

Lumber is also hard to obtain and shipments have been held up entirely too long.

Deliveries on rotary plows and on short or long-broom sweepers are not much better than for the above types. Motors and control equipment will hold up shipments if nothing else interferes, as deliveries are now from four to six months on that equipment.

With the railways counting up their losses from the lack of proper snow-removal equipment, and with the report that Boston Elevated Railway has placed orders for from four to six snow-plows and sweepers, interest by both railway men and manufacturers will be focussed on this situation.

Heater Parts to Be Ordered Months Ahead

Extended Deliveries Force Railways This Year to Place Requirements Early

Lack of labor and raw material at the potteries, coupled with an unprecedented demand, has caused a shortage of hollow ware.

Deliveries are lengthening, with the result that electric railway heater manufacturers are experiencing great difficulties in making shipments.

Because of the scarcity of hollowware, large electrical manufacturers of stoves, ranges, sockets, insulators, etc., now are attempting to buy entire pottery factories in order to keep pace with production in their own plants. If they are successful, it will decrease the amount of hollowware available for electric railway heater purposes and cause additional delays in shipments.

Heretofore, railways have purchased heater parts during August and September for sixty to ninety days delivery. Under present conditions, with four months the best delivery that electric railway heater manufacturers can obtain on hollowware and with other porcelain and hollowware factories in the electrical industry on a six to eight months' delivery basis, it is plain to be seen that electric railways which expect to install heater parts next fall and winter must place their orders now for shipment as soon after Sept. 1 as the orders can be filled.

Inability of electric railway heater manufacturers to place large orders for raw material owing to last minute calls for heater parts has caused a heavy loss both to the manufacturer and to the railway. However, material is purchased anywhere it is obtainable at the best price, which is often double the regular price, and the railway must pay for the increased cost unless the manufacturer is willing to absorb a portion of it. Sheets for making covers are hard to obtain and premiums must be paid in most cases for this material. Shipments of clips, screws, fastenings and miscellaneous parts generally are late and are obtained only with much difficulty.

Orders for heaters to equip approximately 1,000 cars have been placed since Jan. 1, 1920, or are still pending and will be placed within the next few months. This indicates a healthy condition in the electric heater field and is undoubtedly just one more reason why railways which may be in the market for heater parts should act quickly in placing orders.

Mazda Lamps for Railways Marked Up

Increased Factory Production Costs Are Responsible for Advance Over the Prices of October, 1918

New lamp prices have been put into effect by the Mazda lamp manufacturers as of April 1. Increased costs of production on both railway lamps and on the ordinary types have been given by the manufacturers as the reason for the advances, and in this connection greater advances have been placed on frosted lamps than on clear lamps. Complications in the sand blasting have made this process still more costly.

Prices of Mazda "B" lamps where five in series are used on the 525, 550, 575, 600 and 650 volt railway circuits have advanced from 5 to 25 cents on the clear type and from 7 to 18 cents on the frosted variety, depending on the wattage of the lamp. These price changes appear in the accompanying table. The last increase was put into effect Oct. 1, 1918.

MAZDA "B" LAMPS FOR ELECTRIC RAILWAYS

Watts	Prices Clear Old	Prices Clear New	Prices Frosted Old	Prices Frosted New
23	35	40	38	45
36	35	40	38	45
56	40	45	45	50
94	85	1.10	92	1.10

In the common run of lamps used in stations, etc., in the 110 to 125 volt type, the sizes up to 50 watts have increased from 35 to 40 cents clear and 38 to 45 cents frosted. Similar increase on the 60 watt "B" lamps are announced.

Type C lamps such as are used in up

to date car-houses, shops and power-houses, show increases and decreases. The 75-watt has gone from 70 cents to 75 cents clear, and from 75 cents to 80 cents frosted. No change in price has been applied to the clear types in the 100, 750 and 1,000-watt sizes, but frosted lamps have gone up respectively in these three sizes from $1.15 to $1.20, from $6.75 to $6.85 and from $7.75 to $7.90. On the other hand, the 150-watt C has decreased from $1.65 frosted, the 200-watt from $2.20 to $2.10 clear and from $2.27 to $2.25 frosted. The 300-watt has decreased from $3.25 to $3.15 clear, and the 500-watt from $4.70 to $4.60 clear, while their prices, frosted, have not changed.

Heavy Demand for Railway Motors

Large Sales for Safety Cars With Number of Heavier Types Ordered Rapidly Increasing

Deliveries for large orders of rolling stock of all kinds now are dependent largely on motor shipments. For safety cars, these range from three to four months on a moderate sized order and from four to five months on large orders. Demand has been excellent and the large motor manufacturers are well satisfied with the volume of motor orders received so far this year for safety cars.

Orders for the heavier types of motors are rapidly increasing and with a number of double-truck car orders for large cities pending, sales are expected to show a healthy increase within the next sixty days.

Shipments of the larger sized motors are now being made in from six to eight months, and manufacturers are adding to their shop facilities to take care of the increasing demand.

Bond Prices Decrease

Owing to a recent recession in the copper market, the discount on rail bonds has been revised. Where formerly the old discount was 12½ per cent off list, the new one is 17½ per cent. Other copper products are not affected at this time for the reason that changes in discounts have been announced previously in most instances.

Preparations for spring bonding work are rapidly progressing and many railways have placed requirements for bonds, terminals, pins and for bond wire. Orders are still being received and within another six weeks it is expected that new bonding and repairing of old track circuits will be fairly under way.

Merger of Two Prominent Engineering Firms Effected

The plan for the merger of Westinghouse, Church, Kerr & Company, Inc., with Dwight P. Robinson & Company, Inc., was declared operative on March 18. Dwight P. Robinson has been elected president of Westinghouse, Church, Kerr & Company pending final completion of the merger.

It was stated at the office of Dwight P. Robinson & Company that the Westinghouse Electric & Manufacturing Company, the largest stockholder of Westinghouse, Church, Kerr & Company, will withdraw as a stockholder from the new company and that Guy E. Tripp will remain as chairman of the board of Westinghouse, Church, Kerr & Company only until the organization of the new company is completed.

Details of the new organization have not been fully worked out, but it was stated at the office of Dwight P. Robinson & Company that it is planned to retain the personnel of both of the merging companies. The new company will have an engineering office in the Grand Central Palace, New York City, and the present office of Dwight P. Robinson & Company, at 61 Broadway, will also be retained.

Rolling Stock

Newport & Providence Railway, Newport, R. I., has placed an order recently for two safety cars.

Saginaw-Bay City Railway, Bay City, Mich., is reported to have placed an order for seventeen safety cars.

Cincinnati, Milford & Blanchester Traction Company, Cincinnati, Ohio, is reported to have placed an order for three safety cars.

Boston (Mass.) Elevated Railway is reported to have increased its order of forty elevated cars, which was placed with the Pressed Steel Car Company as noted in the March 13 issue of the ELECTRIC RAILWAY JOURNAL. Twenty-six additional cars of the same type have been placed with this company.

Franchises

Los Angeles (Cal.) Railway.—The Los Angeles City Council has passed an ordinance authorizing the Los Angeles Railway to abandon its franchise for Pico and Eleventh Streets from Broadway to Main Street.

NEW YORK METAL MARKET PRICES

	March 3, 1920	April 1, 1920
Copper, ingots, cents per lb	18.37	18.50
Copper wire base, cents per lb	22.25	22.25
Lead, cents per lb	8.75	9.25
Nickel, cents per lb	45.00	45.00
Spelter, cents per lb	9.10	8.70
Tin, cents per lb	61.50	63.75
Aluminum, 98 to 99 per cent, cents per lb	33.00	33.00

OLD METAL PRICES—NEW YORK

Heavy copper, cents per lb	17.00 to 17.50	16.50 to 17.00
Light copper, cents per lb	14.75 to 15.25	14.25 to 14.50
Heavy brass, cents per lb	9.50 to 10.25	9.75 to 10.25
Zinc, cents per lb	5.00 to 5.25	5.00 to 5.25
Yellow brass, cents per lb	9.00 to 9.25	9.00 to 9.25
Lead, heavy, cents per lb	7.50 to 7.75	7.75 to 7.87
Steel car axles, Chicago, per net ton	33.00 to 35.00	35.00 to 36.00
Old carwheels, Chicago, per gross ton	41.00 to 42.00	39.00 to 40.00
Steel rails (scrap), Chicago, per gross ton	30.00 to 31.00	30.50 to 31.00
Steel rails (relaying), Chicago, gross ton	34.00 to 35.00	34.00 to 35.00
Machine shop turnings, Chicago, net ton	17.50 to 18.00	16.50 to 17.50

ELECTRIC RAILWAY MATERIAL PRICES

Rubber-covered wire base, New York, cents per lb	30.00	30.00
Weatherproof wire (100 lb. lots), cents per lb	27.00	30.00 to 47.00
T-rails (A. S. C. E standard), per gross ton	$55.00 to $57.00	$55.00 to $57.00
T-rails (A. S. C. E. standard), 20 to 500 ton lots, per gross ton	55.00 to 57.00	55.00 to 57.00
T-rails, (A. S. C. E. standard), 500 ton lots, per gross ton*	45.00 to 47.00	45.00 to 47.00
T-rail, high (Shanghai), cents per lb	3.00	3.00
Rails, girder (grooved), cents per lb	3.00	3.00
Wire nails, Pittsburgh, cents per lb	4.00	4.00
Railroad spikes, drive, Pittsburgh base, cents per lb	3.35 to 3.85	3.35 to 3.85
Railroad spikes, screw, Pittsburgh base, cents per lb	7.50 to 9.00	7.50 to 9.00
Tie plates (flat type), cents per lb	3.00	3.00 to 4.00
Tie plates (brace type), cents per lb	3.00	3.00 to 4.00

ELECTRIC RAILWAY MATERIAL PRICES

	March 3, 1920	April 1, 1920
Tie rods, Pittsburgh base, cents per lb.	7.00	3.50 to 4.25
Fish plates, cents per lb	3.00	3.50 to 4.25
Angle plates, cents per lb	3.90	2.75 to 4.00
Angle bars, cents per lb	3.90	2.75 to 4.00
Rail bolts and nuts, Pittsburgh base, cents per lb	4.50 to 6.50	4.50 to 6.50
Steel bars, Pittsburgh, cents per lb	3.00 to 4.00	3.00 to 5.00
Sheet iron, black (24 gage), Pittsburgh, cents per lb	4.50 to 7.50	5.00 to 8.00
Sheet iron, galvanized (24 gage), Pittsburgh, cents per lb	6.00 to 8.00	6.27 to 8.27
Galvanized barbed wire, Pittsburgh, cents per lb	4.60	4.60
Galvanized wire, ordinary, Pittsburgh, cents per lb	4.20	4.20
Car window glass (single strength), first three brackets, A quality, New York, discount †	77%	77%
Car window glass (single strength), first three brackets, B quality, New York, discount	77%	77%
Car window glass (double strength, all sizes AA quality), New York, discount	79%	79%
Waste, wool (according to grade), cents per lb	29 to 32	24 to 29
Waste, cotton (100 lb. bale), cents per lb.	16 to 17	18
Asphalt, hot (150 tons minimum), per ton delivered	.....	....
Asphalt, cold (150 tons minimum, pkgs. weighed in), per ton	25.00	32.00
Asphalt filler, per ton	30.00	30.00
Cement (carload lots), New York, per bbl	2.90	2.80
Cement (carload lots), Chicago, per bbl.	2.00	2.00
Linseed oil (raw, 5 bbl. lots), New York per gal	1.80	1.77
Linseed oil (boiled, 5 bbl. lots), New York, per gal	1.82	1.79
White lead, (100 lb. keg), New York, cents per lb	14½	15½
Turpentine (bbl. lots), New York, cents per gal	1.99	2.16 to 2.36

*U. S. Steel Corp.

†These prices are f.o.b. works, with boxing charges extra.

Inspiration Consolidated Copper Company, Globe, Ariz.—The board of supervisors of Gila County, Ariz., has granted T. A. Donahue, general manager of the Inspiration Consolidated Copper Company, a franchise to build and operate an electric railway line between Globe and Miami.

Recent Incorporations

Cleveland & Sharon Rapid Transit Company, Youngstown, Ohio. — The Cleveland & Sharon Rapid Transit Company has been organized for the purpose of building an interurban line between Youngstown and Warren, Ohio, passing through McDonald and Niles.

Northern Neck Railway & Power Company, Fredericksburg, Va.—Application has been filed with the State Corporation Commission for a charter for the Northern Neck Railway & Power Company, which proposes to build an electric railway 100 miles long from Fredericksburg to a point on the Rappahannock River. The company is capitalized at $5,000,000. Its officers are: Willis H. Fowler, president; G. D Happer, vice-president, and M. Glennon, secretary, all of Norfolk.

Track and Roadway

Pacific Electric Railway, Los Angeles, Cal.—The Pacific Electric Railway has secured a permit to extend its Long Beach freight line from Third Street to Ocean Avenue, Long Beach.

Twin City Rapid Transit Company, Minneapolis, Minn.—The Twin City Rapid Transit Company has placed orders for rails, ties and other equipment for the construction of a line in North Seventh Street and loop trackage in the downtown district of Minneapolis.

Salem & Penns Grove Traction Company, Penns Grove, N. J.—A committee of the Chamber of Commerce of Quinton, N. J., has secured a right of way for a proposed extension of the line of the Salem & Penns Grove Traction Company from Salem to Quinton. The extension would be three miles in length.

Cincinnati (Ohio) Traction Company.—The Cincinnati Traction Company recently notified W. C. Culkins, street railway director, that the cost of changing the present double trolley system in Cincinnati to a single trolley system would amount to $523,550. The value of the salvage was estimated at $353,000, making the net cost approximately $170,000.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis.—The Milwaukee Electric Railway & Light Company has ordered 1,000 ties each from the International Steel Tie Company and the Dayton Mechanical Tie Company, for installation in track reconstruction this summer.

Trade Notes

Mono Corporation of America, Buffalo, N. Y., announces that it has purchased the entire stock of Mono apparatus and accessories from the F. D. Harger Company, Buffalo, N. Y.

Trolley Supply Company, Massilon, Ohio, has moved its factory from Canton to Massilon, where the company recently built a new plant for the manufacture of railway supplies. According to F. E. McLain, president of the company, the move was made March 22.

Western Electric Company, New York, N. Y., on March 8 to 12, held its first general conference in five years at the Hotel Chalfonte, Atlantic City, N. J. Managers and sales managers of the company's forty-five distributing houses and executives from the main New York office were present. F. A. Ketcham, general sales manager, acted as presiding officer of the conference, the keynote of which was "A Larger and More Profitable Business."

Rail Welding & Bonding Company, Cleveland, Ohio, formerly the Lincoln Bonding Company, has moved its factory and offices from 634-36 Huron Road to 2336-2400 Woodland Avenue, where it has purchased a large four story building with a two story annex. With this floor space and a large amount of additional equipment this company is making every effort to meet the greatly increased demand for its products.

A. T. Shurick, recently of the business staff of the *Coal Trade Journal*, has been elected vice-president of F. C. Thornley & Company, consulting and constructing engineers, New York. This firm has been identified with the development and construction of some of the largest coal handling and storage installations in the country, such as the Curtis Bay piers of the B. & O. Railroad, and designs, constructs and prepares for operation plants of this character as well as doing other engineering work.

Eastern Asbestos Company, Providence, R. I., has been established with offices at 417 Grosvenor Building, and the company will sell both standard and special asbestos products, including yarn, tape, cord, cloth, twine, listing, gaskets, carded fiber, gasket cloth, friction disks, sheet and high-pressure packing. P. O. Baker, who has been in the electrical industry for the last eighteen years, is manager. Mr. Baker has just resigned as purchasing agent of the D & W Fuse Company, Providence, and was formerly employed by the Western Electric and Simplex Wire & Cable companies.

Curtain Supply Company, Chicago, Ill., has taken over the manufacture and sale of the steam and electric railway articles formerly manufactured and sold by the Forsyth Brothers Company, Harvey, Ill. Among the articles taken over are the metal sash, weather strips, screens, deck sash ratchets, etc. It is planned to market these products henceforth under the regular trademark name of the Curtain Supply Company, namely "Rex." The company is increasing its plant capacity at 350 West Ontario St. to take care of this additional volume of business in order that it will be in a better position to make delivery on the large number of orders which it already has on its books.

Chicago Pneumatic Tool Company, Chicago, Ill., effective March 31, has moved its general offices to New York and will occupy a new ten story structure erected for exclusive use of the company at 6 East 44th Street, New York. The Chicago district sales branch, previously in the Fisher building, has been moved to commodious new quarters on Chicago's new Boulevard link, at 300 North Michigan Boulevard. The service branch, formerly at 521 South Dearborn Street, has been consolidated with the sales branch at the new address, occupying the first floor of the building, while the sales offices will be on the second floor, or boulevard level. J. L. Canby, district manager, will continue in charge of the Chicago office.

Square D Company, Detroit, Mich., manufacturers of electrical safety devices, announces that E. A. Printz, formerly district sales manager at Chicago, has been made sales manager, A. MacLachlan continuing in the capacity of secretary and director of distribution. D. M. Stone, formerly district sales manager of the Pittsburgh trritory, is now in charge of the Detroit territory. J. A. Jaques, formerly district sales manager at New York, was given the Pittsburgh territory, and H. W. Spahn, district sales manager at Buffalo, was placed in charge of New York. D. H. Colcord, formerly of the department of publicity, Westinghouse Air Brake Company, Pittsburgh, Pa., was appointed director of research engineering. The annual sales conference of the company was held at the Hotel Statler, Detroit, February 16, 17 and 18.

New Advertising Literature

Reading Valve Fittings Company, Reading, Pa.: A catalog of steel and iron flanges and screwed fittings and flanges.

Schweitzer & Conrad, Inc., Chicago, Ill.: Bulletin on farm-service equipment, of interest to electric railway companies furnishing industrial power.

Westinghouse, Church, Kerr & Company, New York City: Bulletin on the "cost plus" plan of doing work, under which this concern has done over $100,000,000 worth of work during the past twenty years.

Gold Car Heating & Lighting Company, New York, N. Y.: Bulletin No. 4 issued January, 1920, on its standardized electric heaters with steel or aluminum cases and equipped with interchangeable heating elements.