

Dhananjayrao Gadgil Library



GIPE-PUNE-068138

HARVARD ECONOMIC STUDIES

- I. The English Patents of Monopoly. By William H. Price. 8vo.
- II. The Lodging House Problem in Boston. By Albert B. Wolfe. 8vo.
- III. The Stannaries: A Study of the English Tin Miner. By George R. Lewis. 8vo.
- IV. Railroad Reorganization. By Stuart Daggett. 8vo.
- V. Wool-Growing and the Tariff. By Chester W. Wright. 8vo.
- VI. Public Ownership of Telephones on the Continent of Europe. By Arthur N. Holcombe. 8vo.
- VII. The History of the British Post Office. By J. C. Hemmeon. 8vo.
- VIII. The Cotton Manufacturing Industry of the United States. By M. T. Copeland. 8vo.
- IX. The History of the Grain Trade in France. By Abbott Payson Usher. 8vo.
- X. Corporate Promotions and Reorganizations. By A. S. Dewing. 8vo.
- XI. The Anthracite Coal Combination in the United States. By Eliot Jones. 8vo.
- XII. Some Aspects of the Tariff Question. By F. W. Taussig. 8vo.
- XIII. The Evolution of the English Corn Market from the Twelfth to the Eighteenth Century. By N. S. B. Gras. 8vo.
- XIV. Social Adaptation: A Study in the Development of the Doctrine of Adaptation as a Theory of Social Progress. By L. M. Bristol. 8vo.
- XV. The Financial History of Boston, from May 1, 1822, to January 31, 1909. By C. F. Huse. 8vo.
- XVI. Essays in the Earlier History of American Corporations. By J. S. Davis. 8vo. 3 volumes.
- XVII. The State Tax Commission. By H. L. Lutz. 8vo.
- XVIII. The Early English Customs System. By N. S. B. Gras. 8vo.
- XIX. Trade and Navigation between Spain and the Indies in the time of the Hapsburgs. By C. H. Haring. 8vo.
- XX. The Italian Emigration of Our Times. By R. F. Foerster. 8vo.
- XXI. The Mesta: A Study in Spanish Economic History, 1273-1836. By Julius Klein. 8vo.
- XXII. Argentine International Trade under Inconvertible Paper Money: 1880-1900. By J. H. Williams. 8vo.
- XXIII. The Organization of the Boot and Shoe Industry in Massachusetts before 1875. By Blanche E. Hazard. 8vo.
- XXIV. Economic Motives. By Zenas C. Dickinson. 8vo.
- XXV. Monetary Theory before Adam Smith. By Arthur E. Monroe. 8vo.
- XXVI. Canada's Balance of International Indebtedness, 1900-1913. By Jacob Viner. 8vo.
- XXVII. The History of the United States Post Office to the Year 1839. By W. E. Rich. 8vo.
- XXVIII. The Theory of International Prices. By James W. Angell. 8vo.
- XXIX. Forests and Sea Power. By Robert G. Albion. 8vo.
- XXX. Banking Theories in the United States before 1860. By Harry E. Miller. 8vo.
- XXXI. Karl Marx's Interpretation of History. By Mandell Morton Bober. 8vo.
- XXXII. Grain Growers' Cooperation in Western Canada. By Harold S. Patton. 8vo.
- XXXIII. The Assignats. By S. E. Harris. 8vo.
- XXXIV. The Economic and Social History of an English Village. By N. S. B. Gras and E. C. Gras. 8vo.
- XXXV. Direct Taxation in Austria. By John V. Van Sickle. 8vo.
- XXXVI. The Greenbacks and Resumption of Specie Payments, 1862-1879. By Don C. Barrett. 8vo.
- XXXVII. The Street Railway in Massachusetts. By Edward S. Mason. 8vo.
- The Theory of Monopolistic Competition. By Edward H. Chamberlin. 8vo. *In process.*
- Interregional and International Trade. By Bertil Ohlin. 8vo. *In process.*

HARVARD UNIVERSITY PRESS
CAMBRIDGE, MASS., U.S.A.

HARVARD ECONOMIC STUDIES

PUBLISHED UNDER THE DIRECTION OF
THE DEPARTMENT OF ECONOMICS

BY THE

HARVARD UNIVERSITY
COMMITTEE ON ECONOMIC RESEARCH

VOL. XXXVII

LONDON : HUMPHREY MILFORD
OXFORD UNIVERSITY PRESS

THE STREET RAILWAY IN
MASSACHUSETTS

The Rise and Decline of an Industry

BY

EDWARD S. MASON

ASSISTANT PROFESSOR OF ECONOMICS
HARVARD UNIVERSITY



CAMBRIDGE

HARVARD UNIVERSITY PRESS

1932

COPYRIGHT, 1932

BY THE PRESIDENT AND FELLOWS OF HARVARD COLLEGE

X4151.7385.N3

G2

68138

PRINTED IN THE
UNITED STATES OF AMERICA

PREFACE

The preparation of this study on street railways in Massachusetts has laid me heavily in the debt of many people whose advice and assistance have been sometimes accepted, never ignored and always appreciated. Messrs. H. C. Sawyer, G. H. Clifford and L. R. Nash of Stone and Webster, Inc., H. C. Attwill, chairman of the Massachusetts Department of Public Utilities, J. R. Macomber and W. E. McGregor of Harris Forbes, Inc., Bentley Warren of the Massachusetts bar, Winthrop Coffin of Coffin and Burr, and George A. Fernald of George A. Fernald Company, have answered my queries without complaint or cavil. Messrs. C. E. Sprague of General Electric and George Ewing of Westinghouse, and Messrs. George Carey and W. W. Woodard, trustees, respectively, of the Greenfield and Montague and the Athol and Orange Transportation Areas have been equally helpful. To Edward Dana, general manager, M. H. Cullen, assistant general auditor, H. H. Norris, educational adviser, and L. A. Armistead, librarian, of the Boston Elevated, to A. J. Boardman, general manager and J. F. Gallagher, assistant superintendent of the transportation department of the Eastern Massachusetts, to Messrs. C. L. Bartlett, general manager of the Massachusetts Northeastern, L. H. Cushing, general manager of the Fitchburg and Leominster, Starkey, general manager of the Gardner and Templeton, and to other operating men whose work has been disturbed by my importunate questioning, I tender my gratitude. I am obligated to the officials of the American Electric Railway Association and particularly to K. L. McKee, statistician, for material put at my disposal.

Professors C. J. Bullock and Leonard Crum of Harvard, Melvin DeChazeau of the University of Virginia and E. W. Morehouse of the Journal of Land and Public Utility Economics have read parts of the manuscript, and Professor Bullock has assisted me in many places and at many times with his knowledge and his judgment. I

am peculiarly and particularly indebted to my research assistants, E. M. Hoover and J. P. Miller. The work was made possible by the financial assistance of the Harvard University Committee on Economic Research.

TABLE OF CONTENTS

PREFACE	vii
INTRODUCTION	xv
CHAPTER I. THE STAGES OF STREET RAILWAY DEVELOPMENT	3
Expansion	8
Consolidation	13
Rising Costs	14
Motor Competition	16
CHAPTER 2. THE FINANCING OF THE INDUSTRY	18
Volume of Capital	19
Promotion	21
Capitalisation and capital structure	26
Dividend policy	29
Holding companies	34
CHAPTER 3. CONSOLIDATION OF STREET RAILWAYS IN MASSACHUSETTS	41
Economies of consolidation	46
Consolidation and net earnings	53
The street railway holdings of the New Haven railroad	61
CHAPTER 4. STREET RAILWAY COSTS AS AFFECTED BY THE DENSITY OF TRAFFIC	71
The unit of output	71
Overhead and variable costs	73
Density of traffic and costs	77
CHAPTER 5. STREET RAILWAY COSTS HISTORICALLY CONSIDERED	93
Effect of technical changes on the cost of service	93
Cost indices	98

TABLE OF CONTENTS

The composition of operating costs	99
Maintenance and depreciation	101
Wages	105
Power costs	108
Street railway taxation	110
CHAPTER 6. STREET RAILWAY REVENUES	114
The volume of traffic and its variation	114
The rate of fare	118
The elasticity of the demand for service	122
Jitney and motor bus competition	127
CHAPTER 7. THE REGULATION OF STREET RAILWAYS IN MASSACHUSETTS	133
Municipal regulation	133
The Board of Railroad Commissioners	138
Regulation of security issue	141
Valuation and rate regulation	148
Regulation of alternative means of transport	160
CHAPTER 8. PUBLIC OWNERSHIP AND PUBLIC MANAGEMENT OF STREET RAILWAYS IN MASSACHUSETTS	163
Public ownership	166
Service at cost	168
Public management of the Boston Elevated	179
Public management of the Eastern Massachusetts	180
CHAPTER 9. CONCLUSION—PRESENT POSITION OF URBAN TRANSPORTATION	185

APPENDICES

APPENDIX A. THE RELATION OF STREET RAILWAYS TO LAND VALUES AND TO THE DISTRIBUTION OF POPULATION	193
APPENDIX B. INDICES OF STREET RAILWAY COSTS	200
APPENDIX C. MASSACHUSETTS STREET RAILWAY SECURITIES ELIGIBLE FOR INVESTMENT BY MASSACHUSETTS SAVINGS BANKS	202

TABLE OF CONTENTS

xi

APPENDIX D. MASSACHUSETTS STREET RAILWAY FAILURES, BY DECADES	205
APPENDIX E. STREET RAILWAY HOLDING COMPANIES IN MASSACHUSETTS	207
APPENDIX F. HISTORY OF THE ORGANIZATION OF THE BAY STATE STREET RAILWAY	209
APPENDIX G. CLASSIFICATION OF MASSACHUSETTS STREET RAILWAYS	211
APPENDIX H. PERCENTAGES OF DEPRECIATION AND MAINTENANCE TO INVESTMENT AND GROSS REVENUES FOR CERTAIN MASSACHUSETTS STREET RAILWAYS	216
APPENDIX I. STREET RAILWAY TAXATION IN MASSACHUSETTS	217

TABLE OF CHARTS

Worcester Consolidated: ratio of net earnings to capital stock plus premiums	54
Old Colony lines: ratio of net earnings to capital stock plus premiums	55
Boston and Northern lines: ratio of net earnings to capital stock plus premiums	56
Northern Massachusetts: ratio of net earnings to capital stock plus premiums	57
Massachusetts Northeastern: ratio of net earnings to capital stock plus premiums	58
Middlesex and Boston: ratio of net earnings to capital stock plus premiums	59
Relation of revenue passengers per car mile to revenue passengers per mile of track on Massachusetts street railways, 1914 and 1924	78
Relation of investment and of operating costs per revenue passenger to track density of traffic on Massachusetts street railways, 1904	85
Relation of investment and of operating costs per revenue passenger to track density of traffic on Massachusetts street railways, 1914	86
Relation of investment in roadbed and track and in rolling stock per revenue passenger to track density of traffic on Massachusetts street railways, 1914	88
Relation of investment in power plant and in land and other buildings per revenue passenger to track density of traffic on Massachusetts street railways, 1914	89

Relation of costs of maintaining roadway and track and the cost of maintaining rolling stock per revenue passenger to track density of traffic on Massachusetts street railways, 1914	90
Relation of general expenses and of expenses of conducting transportation per revenue passenger to track density of traffic on Massachusetts street railways, 1914	91
Operating costs per revenue passenger adjusted for variations in the price of labor and materials for certain representative Massachusetts properties, 1900-1929	97
Indices of operating costs, 1900-1929	98
Indices of street railway wages, 1900-1929	106
Weekly wages and numbers employed on the Boston Elevated, 1919-1930	107
Street railways and the population changes of Massachusetts towns, 1880-1910	196-197
Indices of street railway materials prices, 1919-1930	201
Massachusetts street railways—revenue and taxes	219

INTRODUCTION

A study of the street railway industry in Massachusetts or of the street railway industry in general may seem to many, in view of the present situation, a trifling with lost causes. As a matter of fact there are a number of reasons which may make an investigation of this kind enlightening to the economist and of some bearing on public policy.

The sphere of possible street railway operation has been, it is true, very seriously curtailed within the last two decades. Rising costs, inelastic fares and, above all, motor competition, have driven the street railway out of the towns and are now in the process of driving it out of all but the largest cities. It still remains a fact, however, that given a certain minimum density of traffic, transportation on rails is cheaper than transportation on rubber, and there is nothing within the predictable future which is likely to alter that fact.

The growing congestion of city traffic is making surface transportation, whether by rail or motor, exceedingly difficult and often intolerable. There seem to be only two possible solutions to this problem; either the common carrier must possess, in the congested areas, a special right of way, surface, subway or elevated, or the private motor vehicle must be partially excluded or closely regulated within these areas. The building of rapid transit lines is economical only if the volume of traffic carried per mile of track is very great. It may be that between rapid transit in the densely populated areas and motor transportation in the outskirts, the street railway proper will be squeezed out altogether. There would seem, however, to be at the present time a definite zone in which the volume of traffic is great enough to make rail transport cheaper than motor and yet not great enough to justify the subway or elevated, in which the surface road may thrive and prosper.

This zone, if it exists, is by no means ultimate for the methods of urban transportation and the public demands for a standard of service have changed in the past and may change in the near future.

so radically as to deprive the street railway of any reason for being. Yet even the present tenuous sphere of operation represents the result of a change in the position of the street railway over the past forty years through every possible phase of the rise and decline of an industry.

The street railway experience in Massachusetts has been, in the main, typical of the experience of the United States as a whole. An account of the industry in this state may then throw light upon a wider field of inquiry than the title implies. There are, however, certain particulars in which the development of the industry in this state has been unique. Government control of public utilities, particularly with respect to security issue, was more careful and informed in Massachusetts than elsewhere during, at least, the first two decades of electric railway history, i.e., through the period of expansion. This in itself renders the statistics of reporting companies of considerably more value than similar data in other states. Despite the check of commission control the expansion of the street railway network was probably more rapid, more extensive and more reckless in Massachusetts than elsewhere. In the main this was the result of the fact that the expansion of the industry here preceded by some years its expansion elsewhere. Overbuilding on the scale witnessed in this state was impossible in the south and west because the sphere of profitable street railway enterprise had by then become more evident. Finally, the history of the industry in Massachusetts has not been typical of its history elsewhere in that the high speed electric interurban running on its own private right of way has never been an important part of the transportation network in this part of the country.

The data on Massachusetts street railway costs, investment, capital structure, equipment and other matters of importance are not only fairly reliable but nearly complete. In a sense the returns of this industry are now in, the cards are on the table and the problem is not that which so frequently frustrates economic research, the lack of essential information; the problem is how to handle and present in intelligible fashion the mass of pertinent material which lies at hand. The industry has lived through the complete cycle of growth and decay and its life history remains to be written.

The decline of the street railway is in many ways as interesting

and important as its expansion. The economics of a declining industry is a neglected study which might be pursued with profit. The experience of the street railway industry in decay is susceptible of generalisations pertinent to all declining industries and basic to a part of economic theory which needs illumination.

The purpose of this volume is a presentation of the history of the street railway in Massachusetts. To handle the material chronologically, however, is neither desirable nor possible. Economic interest naturally settles upon certain partially separable problems in the treatment of which the causes and consequences of the rise and fall of the industry appear. In order to give, however, a rough historical background against which the particular problems of financing, consolidation, costs, revenues and regulation may be discussed, the first chapter is given over to the tracing in broad outline of the stages through which the street railway industry has passed in this state.

**THE STREET RAILWAY IN
MASSACHUSETTS
THE RISE AND THE DECLINE OF AN INDUSTRY**

CHAPTER 1

STAGES IN ELECTRIC RAILWAY DEVELOPMENT

The size and physical structure of the modern city have been definitely affected by the available methods of urban transportation. This is a commonplace but the nature of the relation is complex in the extreme. It is also true, in a sense, to say that the available methods of urban transportation have been called into existence by the growth and physical structure of the modern city. However the causal relation runs, the fact remains that the rapid urbanisation which the 19th century witnessed was accompanied by a continuous change in the methods of urban transportation. The omnibus served as a common carrier in the first half of the century; the horse railway supplanted the omnibus to give way in its turn to the electric surface roads. And now city transportation on rails is going below and above ground and the motor is taking the place of the electric car in all but a relatively small zone of travel on the public highways.

There would be, perhaps, in a study of the development of the electric railway, some profit in reviewing the experience of the electric railway's predecessor, the horse car. For the principles of street railway transportation changed by no means so drastically, with the introduction of electricity, as the street railway equipment itself. The business enterprises remained very largely the same and to begin our study in 1890 with the rapid spread of electric traction in Massachusetts is to ignore a real continuity in the personnel — as well as the principles of management.

The horse railway, moreover, passed through much the same set of experiences as the electric railway was to meet. After the horse railways in Boston and the vicinity had demonstrated their financial success in the early 'fifties'¹ a wave of ill calculated building sent

¹ In 1853 two street railways were chartered and within the next few years half a dozen others followed in Massachusetts. What is reported to have been the first street railroad in this state was established in Cambridge in 1854.

4 THE STREET RAILWAY IN MASSACHUSETTS

the horse road into territory which rapidly proved unremunerative.¹ Just as the electric railway industry was forced to learn later so its predecessor discovered earlier that transportation on rails is not profitable without a certain minimum density of traffic.

Another difficulty, equally pertinent to the later history of the electric road, was soon encountered. It became obvious during the civil war and the period of high prices which followed, that a public utility whose system of prices is as much in the public eye as that of the street railway and whose services are purchased by all, has great difficulty in raising these prices however great the emergency. The street railway industry, during the period of horse as well as of electric traction, has, on the whole, benefited from falling prices and has never found a means, during periods of rising prices, of increasing its receipts with enough rapidity to equal the increase in its costs.

The greater part of the horse car era, however, was one of falling prices and falling costs. Under these conditions, after the period of speculation and experiment had passed, the industry thrived. From the time when the Massachusetts Board of Railroad Commissioners made its first report on horse railways in 1872, until the introduction of electric traction, the horse roads in this state showed a steady increase in track and equipment and an average of financial success which exceeded anything the electric railway can boast for a similar period of time. The electric railway epoch, unfortunately, fell in a period which, for the most part, was one of rising prices and its destiny was closely connected with this fact.

The frequently unfavorable financial showing of the electric road as compared with the supplanted horse road in the same territory, even before the advent of motor competition and the era of rapidly rising costs, requires explanation. There is no doubt that, given the moderate density of traffic enjoyed by most Massachusetts horse roads, electric traction *per passenger mile of similar service* cost less running from Harvard College to Union Square in Somerville. This was an unchartered road and appears to have been a one man enterprise in which the owner was also the driver of the only vehicle, an abandoned railway passenger car obtained from the Fitchburg railroad.

¹ "A few [of the roads] proved their necessity by returning dividends; a few, built to sell suburban property, accomplished their object; but by far the greater number were a disappointment to their projectors." American Street Railway Association. *Proceedings* 1890-91, p. 81.

than horse traction. But passengers were not carried by the mile; nor was the service very similar. The length of ride per unit fare became immediately greater with electric traction. This difference increased steadily as the electric lines extended into the suburbs and as the consolidation of street railways brought with it a wide extension of transfer privileges. On the Cambridge Street Railway, for example, the fares in 1880 ranged from $2\frac{1}{2}$ to 12 cents within fare limits which, after the introduction of electricity and the consolidation of the Boston Metropolitan lines were covered by a 5 cent fare.¹ Where the fare on the horse roads was 5 cents, it was rarely altered during the rapid extension of fare limits which followed the introduction of electricity.

Electric traction, of course, immediately increased the average speed of passenger service. But service was improved in other ways also and at a considerable expense. The absence of comfort in even the best constructed horse car would never have been tolerated of electrical service. The car itself was invariably light and usually rested upon one truck. The rails were light and the road bed greatly inferior to the corresponding class of electric railway road bed. The cars were either unheated, in which case the passengers, equipped with mufflers and ear flaps, kept their feet warm by burrowing them in the hay or straw provided for the purpose, or the heat was provided by an iron stove rising out of the middle of a car seat, in which case the passengers were either toasted or frozen and the car itself was in continual danger of catching fire.

The increasing demands of a public overimpressed by the economy of electric traction and, to a considerable extent, the mistaken estimates of electric railway men themselves, led to the introduction of a standard of service which the 5 cent fare, except under the most favorable circumstances, could not maintain.

The comparison and contrast of horse and electric railway operation, however illuminating, must, nevertheless, give way to the exigencies of space. The proper beginning of this study must be placed in 1887 when the first electric railway to operate in Massachusetts ran from the Thompson-Houston Electric Company down one of the streets in Lynn. The four decades lying between 1890 and 1930 comprise what is important in the history of the industry.

The technical history of the application of electricity to rail traction is interesting but, for our purposes, irrelevant. It is a

¹ P. S. C. 1914 I:416.

little surprising, in view of the fact that cars were run on rails by means of electric motors as early as 1835, that the commercial use of the idea had to wait until the late 1880's.¹ But it remains true that the decisive beginning of the street railway industry in the United States should be dated in the early part of 1887 when Frank J. Sprague completed the construction of the Richmond Electric Railway. At that time there were only nine installations in Europe and ten in the United States comprising altogether less than sixty miles of track and less than one hundred cars and motors of a great diversity of design and excellence. The Richmond road represented a mileage greater than that of all ten American installations taken together and the conditions of operation were such as to give electric motive power a testing which, in the opinion of street railway men assembled in Richmond to view the experiment, was adequate. When President Whitney of the West End road of Boston, one of the largest metropolitan systems in the country, witnessed twenty-two cars starting one after another and all operating simultaneously, the success of electric traction was, in a sense, determined.

The American city had outgrown the horse car and the situation was ripe for the introduction of a transportation system capable of carrying a dense traffic. In the two decades before 1890 several mechanical methods of propulsion had been utilised including the storage battery car and the cable system. The latter to many seemed the logical device to supplant the horse railway and, between 1877 and 1890, forty-eight cable installations had been made in the United States covering parts of most of our large cities.² The success of the Richmond enterprise and the adoption of the overhead trolley by the metropolitan system of Boston, however, foretold the end of cable traction except in exceptionally hilly urban territory.

The electric trolley conquered at a glance. During the decade between 1890 and 1900, not only was practically all of the existing horse railroad mileage converted to trolley but the total street railway mileage was tripled. The rapidity of this transition and of the

¹ Information on the history of the application of the electric motor to street railway traction may be found in the lengthy survey by T. C. Martin in the *Special Census Report on Street and Electric Railways in 1902*. Also in the excellent summary by F. J. Sprague published in the proceedings of the A. E. R. A., 1916.

² *Special census of 1890*, p. 681.

STAGES IN ELECTRIC RAILWAY DEVELOPMENT 7

accompanying expansion of electric lines in Massachusetts during this period is shown in the following table.¹

	Total mileage operated, including sidings	With electric overhead system
1890	664	157
1891	732	279
1892	814	486
1893	895	705
1894	930	825
1895	1087	1025
1896	1291	1255
1897	1453	1444
1898	1591	1583
1899	1739	1731

In the short space of four decades the electric railway has passed through a complete cycle of economic development. Its rise was rapid and its fall almost catastrophic even in this dynamic age. Although the brief history of the industry falls in no clearly marked and mutually exclusive periods, there are certain stages in its development in Massachusetts which may with profit be distinguished. And, in a certain measure, the experience in Massachusetts preceded and foreshadowed the evolution of the industry in the country as a whole.

The four stages into which the history of the industry in this state may be divided overlap but, chronologically, they may be closely identified with the four decades lying between 1890 and 1930. 1. The period of electric railway expansion lasted from 1890 to 1903. The mileage in Massachusetts continued to increase until 1918 but the rate of annual increase was very slow after 1903. 2. The period of consolidation lay in the main between 1900 and 1911, at which date practically the whole street railway mileage in the eastern third of the state, exclusive of Boston, was brought together in the Bay State system. There were no important street railway consolidations after 1915. 3. The period of rising costs began somewhat before 1900 but the rapid increase which worked havoc in the industry came in the decade between 1910 and 1920. 4. The period of intensive motor competition may be identified largely with the last decade. Motor competition was not of great significance before 1915. After 1920 it put the finishing touches on an industry near collapse because of the rise in costs of the previous decade.

¹ Figures as of September 30.

8 THE STREET RAILWAY IN MASSACHUSETTS

EXPANSION

The street railway mileage in Massachusetts nearly tripled between 1890 and 1900. Its growth during the next decade is indicated in the following table.

	Total mileage operated	Increase over preceding year
1900	1973	233
1901	2215	243
1902	2466	250
1903	2621	155
1904	2654	33
1905	2668	14
1906	2736	68
1907	2745	9
1908	2741	4 *
1909	2764	24

* Decrease.

The operated mileage continued to increase slowly until 1918, but a large part of the track added after 1909 was built by the New Haven railroad under particular circumstances which will be discussed in Chapter III. The boom period of the industry in this state was over by the end of 1903.

Street railway mileage before this date not only increased more rapidly than the population but more rapidly than car rides per inhabitant. The number of passengers carried per mile of line declined steadily until 1902 and started to increase only after the cessation of rapid building.

PASSENGERS PER MILE OF SINGLE TRACK ON MASSACHUSETTS ELECTRIC RAILWAYS. 1890-1909

	Revenue passengers per mile of single track		Revenue passengers per mile of single track
1890	267,400	1900	200,262
1891	259,100	1901	195,683
1892	238,034	1902	188,787
1893	235,300	1903	192,548
1894	236,938	1904	195,917
1895	238,963	1905	199,637
1896	226,452	1906	212,514
1897	212,403	1907	217,042
1898	207,982	1908	219,774
1899	205,098	1909	225,887

STAGES IN ELECTRIC RAILWAY DEVELOPMENT 9

This rapid fall in the average density of traffic before 1902 was the result of two causes: first, the steady increase in the length of ride per unit fare and, second, the extension of the street railway network into more sparsely inhabited territory. Motor competition during this period was a matter of negligible importance and consequently the extension of line and the improvement of service led to a continuous increase in the average number of rides per inhabitant.

	Population of Massachusetts	Passengers carried on street railways	Average number of rides per inhabitant
1890	2,238,943	164,873,846	73
1900	2,805,346	395,027,198	141
1910	3,366,410	625,774,376	186
1920	3,852,356	837,167,716	217
1930	4,249,614	560,052,338	132

This increase in street railway riding was partially at the expense of the steam railway. The railroads lost rather heavily in their short distance commuting traffic as is indicated by the decline in the number of passengers alighting at Boston terminals during this period.¹ The gradual increase in the average distance of passenger riding during these two decades is probably also an indication that the railroads were losing a good deal of their short distance business to the street railways.² The railroads were as much alarmed at the encroachments of their electric rivals as they are now at bus compe-

¹ Passengers to and from Boston terminals

1890	48,072,476
1891	51,204,903
1892	54,151,859
1893	56,881,541
1894	52,756,601
1895	52,015,921
1896	53,499,695
1897	49,691,215
1898	48,967,467
1899	49,174,631

² Average journey in miles on Massachusetts steam railways, 1890-1904.

1890	14.75	1898	16.47
1891	14.25	1899	16.82
1892	14.35	1900	17.08
1893	14.56	1901	17.09
1894	14.85	1902	17.14
1895	15.17	1903	17.16
1896	15.89	1904	17.49
1897	16.29		

tition; and the New Haven's acquisition of trolley properties was, at the outset, a measure designed to forestall competition.

In the main, however, this increase in street railway traffic represented new business. The increase in population and the movement to the cities naturally led to an increase in the average number of rides per inhabitant but while the population came to the railways the railways also went to the population. In 1890 all of the cities and 53 of the 354 towns in Massachusetts were served by street railways. Between 1890 and 1900, 111 towns were added to this list and, between 1900 and 1910, 47 more. Many of these towns, particularly those added in the latter decade, were off the railroad lines and the street cars introduced a freight as well as a passenger service.

When electric power was first applied to street railways it was generally understood that this was only an improved method of carrying passengers over the public highway. The scope and nature of electric transportation was considered to be closely similar to if not identical with that of the horse railway. In the classic words of Charles Francis Adams, written in 1898, "This is all the street railway was fifty years ago, when first laid; it is all it is now,—an improved line of omnibuses, running over a special pavement. The analogy throughout is with the omnibus line, and not with the railroad train; with the public thoroughfare and not with the private right of way."¹

At this very time, however, a new theory of the place of the electric railway was springing up and a new phase of its development, represented by the interurban. A network of high speed lines built on private rights of way was covering the middle west. In the *Special Census Report on Street and Electric Railways of 1902* it is estimated that two-thirds of the 2,525 miles of track in Massachusetts were extra-urban and, according to the census classification, therefore interurban.²

As a matter of fact, a very small percentage of the electric railway mileage in Massachusetts has ever been interurban in the

¹ *Report of the Special Committee on the Relations between Cities and Towns and Street Railway Companies.* 1898 House Docs. 475, p. 11.

² The census definition of an interurban is an electric railway more than half of whose mileage lies outside of any incorporated town. Inasmuch as this definition is inapplicable for the Massachusetts political structure the census figures for this state were a rough estimate.

STAGES IN ELECTRIC RAILWAY DEVELOPMENT 11

proper sense of the term. The interurban belongs in the category of the railroad and its principal characteristics are a private right of way and a high speed service. By either of these tests the interurban in Massachusetts has always remained unimportant. As far as the electric railway in this state is concerned the dictum of Charles Francis Adams has remained correct: it has been only an improved omnibus operating in the main over the public thoroughfare.

A comparison of railway mileage operated in Massachusetts over private right of way with that in Ohio, Indiana and Illinois illustrates the relative unimportance of such service in this state at the height of the interurban period.

TRACK ON PUBLIC THOROUGHFARE AND PRIVATE RIGHT OF WAY IN 1907

State	Total electric r. w. mileage	On public thoroughfare	On private right of way	Percentage on private right of way
Massachusetts	2,886	2,622	264	9.2
Ohio	3767	2,109	1,657	44.0
Indiana	1,932	637	1,295	67.0
Illinois	2,776	1,727	1,049	37.8

A comparison between the maximum speed of Massachusetts railways and of electric railways in other parts of the country illustrates the difference equally well. In 1902, the only year in which such statistics were collected by the special census, the interurbans of Ohio, Indiana, Illinois and other states reported maximum speeds, outside of towns, ranging from 40 to 60 miles per hour. In Massachusetts the highest maximum speed reported was 35 miles per hour on the short line between Worcester and Southbridge. There was only one other, out of the seventy-five reporting roads in the state, equipped with cars capable of a maximum speed as high as 30 miles, the Providence and Fall River.

The Massachusetts electric roads were all essentially urban roads which had been extended into country districts. These roads charged a flat rate of fare within wide zones, the stops were frequent and limited service practically unknown. The interurban, properly speaking, operated on a mileage basis and according to the principles of railway economics. The peculiar causes of the decline of the electric railway applied with particular force to the so-called

interurbans of Massachusetts which were nothing but city lines operating in sparsely settled territory.

This first period, the era of electric railway expansion, promised a new epoch in American economic life. The radius of feasible travel measured from the center of the city immediately doubled that which was possible with the horse car. The movement to the suburbs was encouraged and horizons of urban expansion undreamed of before were discovered. The street car lines radiating like the spokes of a wheel from every center of population brought the country man into the town and took the city man to the country. Pleasure riding on the trolley seems fantastic in this age of the motor car but a considerable part of the traffic of a large number of railways was furnished by just this kind of travel. In 1902 the street railways of Massachusetts owned thirty-one pleasure parks situated mainly in the country and derived an important part of their revenue from carrying passengers back and forth from town to park.¹

The industry itself was filled with optimism. Wages and the cost of materials fell till near the end of the century and street railway costs fell with particular rapidity as electrical equipment was rapidly improved. The operating ratio, i.e., the ratio of operating expenses to operating revenues declined steadily till 1900 and then remained fairly constant for the next decade.

It is interesting, though perhaps only academically so, to speculate on what the fate of the electric railway would have been had not the rise in costs and motor competition combined to strangle it. It is certain that by 1903, before rising costs and motor competition were of influence, electric railways in Massachusetts were hopelessly overbuilt. As early as 1897 the Board of Railroad Commissioners had pointed out that twenty out of the forty-eight reporting companies were paying no dividends and that there was no likelihood that the majority of the country properties ever would pay dividends. Yet construction went rapidly forward during the next five or six years. The activity of the street railway promoter and the unflagging optimism of the street railway investor gave Massachusetts the most extensive mileage in proportion to area and population of any state in the Union.

¹ The Holyoke Street railway, for example, which carried, in 1902, 6,336,300 fare passengers, reported 1,280,000 park visitors.

STAGES IN ELECTRIC RAILWAY DEVELOPMENT 13

ELECTRIC RAILWAY TRACKAGE DENSITIES IN VARIOUS STATES¹

Miles of main track:	1902	1907	1912	1917	1922	1927
United States	21,681.9	32,485.9	38,333.6	41,446.7	40,364.3	37,027.5
Massachusetts	2,377.6	2,721.8	2,802.4	2,956.9	2,557.9	1,923.3
New York	2,660.7	3,595.5	4,274.3	4,492.3	4,445.2	4,033.4
New Jersey	833.2	1,262.1	1,230.3	1,260.2	1,241.1	1,004.5
Pennsylvania	2,378.5	3,449.6	3,897.6	4,058.6	4,046.9	3,710.2
Miles of main track per 1000 square miles:						
United States	7.16	10.72	12.66	13.69	13.34	12.23
Massachusetts	287.64	329.28	339.03	357.72	309.48	232.68
New York	54.26	73.07	86.87	91.30	90.34	81.97
New Jersey	101.31	153.47	149.60	153.23	150.91	122.14
Pennsylvania	52.71	76.44	86.37	89.94	89.68	82.22
Miles of main track per 100,000 population:						
United States	27.46	37.40	40.54	40.88	37.06	31.55
Massachusetts	81.72	85.40	81.03	79.92	65.10	46.58
New York	35.10	42.22	45.69	44.98	41.16	33.88
New Jersey	41.68	54.39	46.37	43.02	35.77	22.84
Pennsylvania	36.29	47.73	49.55	48.38	45.49	39.66

¹ Data on trackage, from U. S. *Census of Street and Electric Railways, 1902, 1907, 1912, 1917, 1922, 1927.*

Data on areas and populations, from *Statistical Abstract of the United States for 1925.* The population figures used were calculated by interpolation along a logarithmic curve connecting the two nearest decennial censuses in each case.

CONSOLIDATION

The period covering the second decade of electric railway history may be conveniently and not inaptly described as the period of street railway consolidation. The union of metropolitan lines had been completed before the end of the horse car era, and various groupings of contiguous lines were completed during the first decade after the introduction of electricity. But the period of rapid consolidation in which most of the city roads in Massachusetts acquired a network of outlying suburban properties lay between 1900 and 1910. The conditions in the industry propitious to consolidation came to a focus in these years.

The unsatisfactory showing of country lines in many cases made their continued operation as independent properties impossible. These were faced with the alternative of scrapping plant and equipment or of selling out to city companies. A misguided estimate of the economies of large scale operation led the latter oftentimes to look with favor upon an extension of their holdings. Street railways with a high ratio of net earnings to investment found it possible to

water their stock somewhat by acquiring outlying properties since the Railroad Commission allowed an increase of capital equal to the capital of the acquired company regardless of the price paid for the subsidiary. It is even possible that on occasion insiders bought up unprofitable country lines at a low figure and unloaded them on their own companies at a figure considerably higher. The Railroad Commission favored consolidation because it usually meant an extension of service per unit fare. More important, probably, than any of these reasons for consolidation, street railway promoters found it profitable to buy up a group of contiguous street railways, organize a consolidated company and unload the ownership on a public avid for street railway securities. All the Massachusetts street railway holding companies were formed in this period.

Whatever the reason for consolidation, one of the principal results was that although the collapse of smaller properties was staved off for a time the city properties found themselves saddled with a long mileage on which the average density of traffic was low. While the street railway mileage in this state was increasing slowly until 1918, the number of reporting companies fell rapidly from 118 in 1900 to 98 in 1905, 73 in 1910 and 53 in 1915. Consolidation was the major cause of this decline, and consolidation in operation was even more marked than consolidation in ownership. In 1915, of the 53 reporting companies, 38 operated not only their own lines but the mileage of the 15 remaining companies.

Since a special chapter is devoted to consolidation there is no need to spend further time here on this phase of the history of the industry. It is sufficient to point out that, as a result of consolidation, the average Massachusetts street railway found itself at the beginning of the great rise in costs in a worse position than it would have been in, had the smaller and weaker companies been allowed to meet their fate.

RISING COSTS

The third decade, 1910-1920, witnessed a spectacular rise in street railway costs. The rise in costs, particularly the rise in wages, was, however, a phenomenon which had made street railway operation in this state increasingly difficult from 1900 on. Using 1913 as a base year the following tables indicate the approximate changes in the cost of street railway operation from 1900 to 1925.¹

¹ The construction of these indices is discussed in Chapter V and in Appendix B.

STAGES IN ELECTRIC RAILWAY DEVELOPMENT 15

	Index of materials	Index of wages	Index of street railway operating costs
1900	94	80	84
1901	95	81	85
1902	98	80	86
1903	102	82	88
1904	92	85	87
1905	95	88	90
1906	101	90	93
1907	107	92	96
1908	97	90	92
1909	97	94	95
1910	98	94	96
1911	97	96	96
1912	101	96	97
1913	100	100	100
1914	98	103	102
1915	101	106	104
1916	128	114	118
1917	164	132	141
1918	169	176	174
1919	173	207	198
1920	194	232	221
1921	175	200	193
1922	169	190	184
1923	173	206	197
1924	160	211	197
1925	162	216	201

From 1900 to 1914 the cost of street railway operation had increased by 20 per cent. Yet apart from a few country properties, and those in hopeless condition, no Massachusetts street railway had asked for an increased fare. Moreover, the demands for a reduction of fare limits had been few and insignificant. Yet the industry as a whole in the state was, before the rapid rise in costs had commenced, already in an unhappy situation. Street railway mileage was excessive, the length of the ride had continuously increased with extension of line and consolidation, and costs had steadily risen. Half of the companies in the state were paying no dividends, some were not earning even fixed charges, and those which did pay dividends were doing so very largely at the expense of a proper maintenance of their plant and equipment.

Beginning in 1914, with the rapid rise in costs, demands for fare increases poured in on the Public Service Commission which, in the

next five years, devoted the major part of its time and energy to the street railway situation. But the remedies, such as they were, came too late. Fare increases were allowed rather slowly and grudgingly. Even when allowed the effect of fare increases on revenues was disappointingly small, and to add to the difficulties an unregulated jitney competition cut heavily into the street railway summer traffic from 1915 to 1920. The result was that the small companies collapsed, the larger companies abandoned lines, and receivers appeared in the land. The Bay State Company, operating the largest mileage in the state, went into receivership in 1917 and, in 1918, both the Bay State and the Boston Elevated were put into the hands of state commissions.

The decline in street railway mileage operated in Massachusetts from 1918 to 1930 is shown in the following tables.

	Miles of main track operated		Miles of main track operated
1918	2932	1924	2322
1919	2752	1925	2216
1920	2620	1926	2116
1921	2579	1927	1922
1922	2566	1928	1801
1923	2484	1929	1662
		1930	1444

MOTOR COMPETITION

The last decade of street railway history has seen motor competition drive the electric car from all except urban territory. The motor bus has shown itself to be the more efficient common carrier over routes yielding a relatively low density of traffic, for the bus involves an investment which can be more closely adapted to the demand.

Massachusetts was one of the first states to invest in a system of hard surfaced roads capable of withstanding motor traffic. The Massachusetts Highway Commission was established in 1893 with a substantial annual appropriation for building state roads.¹ Even so motor competition was not an element of importance in the street railway situation until about 1915 and the bulk of its damage has been done in the last decade.

¹ See next page.

STAGES IN ELECTRIC RAILWAY DEVELOPMENT '17

¹ MILEAGE OF STATE HIGHWAYS IN MASSACHUSETTS AS OF NOVEMBER 30

1895 62	1907 702	1919 1311
1896 109	1908 740	1920 1354
1897 160	1909 785	1921 1394
1898 206	1910 838	1922 1440
1899 250	1911 880	1923 1489
1900 296	1912 920	1924 1522
1901 358	1913 980	1925 1548
1902 415	1914 1039	1926 1565
1903 482	1915 1101	1927 1590
1904 548	1916 1155	1928 1609
1905 610	1917 1209	1929 1628
1906 655	1918 1247	1930 1665

Data from the Annual Reports of the Massachusetts Highway Commission and the Massachusetts Department of Public Works.

MOTOR VEHICLES REGISTERED IN MASSACHUSETTS

1905-1930

1905 4,889	1914 77,246	1923 566,150
1906 6,572	1915 102,633	1924 672,315
1907 16,739	1916 136,809	1925 764,338
1908 18,066	1917 174,274	1926 826,224
1909 23,971	1918 193,497	1927 819,703
1910 31,360	1919 247,182	1928 883,595
1911 38,907	1920 304,631	1929 1,019,460
1912 50,132	1921 360,732	1930 1,008,476
1913 62,660	1922 449,838	

CHAPTER 2

STREET RAILWAY FINANCING IN MASSACHUSETTS

A consideration of the financing of an industry falls traditionally into a number of familiar topics; the capitalisation and capital structure, methods of security marketing, promotion, reorganisation, and a few other subjects. These are matters of importance in their own right but for our purposes their importance lies in connection with the problem which forms the principal theme of this chapter, the flow of loanable funds into the street railway industry, its causes and its consequences.

At the present time the flow of new capital into the industry is very small, maturing obligations can only be refunded at higher charges and considerable interest centers in the problem of reorganisation. The unfavorable capital structure of the industry with its heavy preponderance of senior securities results in a small and decreasing net income after fixed charges have been met. On the other hand the small and declining net income makes new financing, where feasible at all, impossible except in terms of senior securities. The financing of the industry is in a vicious circle and the way out is by no means clear.

At the same time the growth of American cities necessitates continual extension of transit facilities, and the changing nature of the transportation problem calls for the investment of new capital in busses to replace the street car in the outskirts and in rapid transit to replace the street car in the congested areas. Meanwhile the American public shows itself unwilling to pay the price in street car fares necessary to maintain and improve this service. To a certain extent the street railway may find it possible to obtain new funds by voluntary reorganisation with a substitution of junior for senior securities and leaders in the industry have been at work on this problem.¹ Voluntary reorganisation is, however, under all circum-

¹ Considerable discussion of finance and, in particular, of the problem of voluntary reorganisation, was published in the 1925 proceedings of the A. E. R. A. Advisory Committee on *Electric Railway Finance*.

STREET RAILWAY FINANCING IN MASSACHUSETTS 19

stances difficult and, under some, impossible. Compulsory reorganisation has been a more frequent practice and a number of Massachusetts street railways have found therein the means of continuing their service for a few more years. In those situations in which no form of reorganisation is capable of maintaining service with a fare which the public will accept, and yet continued service is deemed necessary, state intervention is about the only alternative and, in recent years, this has been taking place in increasing measure and in a variety of ways.

The flow of new capital into the industry is, obviously, a present and pressing problem. We shall be concerned in this chapter, however, with various aspects of the history of street railway financing in this state.

VOLUME OF CAPITAL

The street railway industry in 1890, in Massachusetts and in the country as a whole, was, as regards capital invested, relatively small. The total investment in Massachusetts in that year was slightly over 26 millions, and for the United States, somewhere between 400 and 500 millions.¹

The growth in book assets during the next four decades for street railways tabulated by the census is as follows:

	Massachusetts	United States
1890	26,317,808	408,475,451 *
1902	121,627,650	2,545,132,305
1907	164,338,000	4,300,040,525
1912	212,210,162	5,448,694,637
1917	241,306,756	6,272,617,041
1922	250,951,396	6,655,273,700

* Special Census Reports.

The Massachusetts figures represent pretty closely the total amount of investment in street railway companies at the various times indicated; but they neglect the large state and municipal investments in rapid transit development in the metropolitan area, totalling over \$60,000,000 by 1930. The figures for the United

¹ The Massachusetts figure probably understates somewhat the investment since street railways in this state possessed at the end of the horse car period a considerable volume of concealed assets representing reinvested profits. The figure for the United States as a whole is probably somewhat of an overstatement.

States, on the other hand, represent a serious overstatement and the causes of this overstatement make it difficult to estimate with any accuracy the annual flow of new capital into the industry. The street railway industry outside of Massachusetts was heavily over-capitalised and the figures for both total assets and total liabilities represent a valuation which bears little relation to investment. During the period of street railway expansion it was the practice in many parts of the country to issue stock as a bonus to the purchasers of bonds and as a payment to promoters and organisers. The probability is that, outside of Massachusetts, street railways were very largely built on the proceeds of the bond issues and that a large part of the stock represents pure water. Furthermore the earnings in the industry have never been high enough to permit the squeezing out of water by the reinvestment of profits.

In Massachusetts, however, the available data permit us to estimate with some accuracy the average annual flow of new capital into the street railway industry on private account. The state investment in rapid transit is, of course, published and easily accessible.

AVERAGE ANNUAL NEW INVESTMENT IN MASSACHUSETTS
STREET RAILWAYS ¹

Period	Average annual investment (to nearest \$1000)
1890-94	\$ 5,995,000
1895-99	8,519,000
1900-04	10,684,000
1905-09	6,874,000
1910-14	7,874,000
1915-19	5,392,000
1920-24	3,346,110
1925-29	2,428,916

The volume of security issues, needless to say, is in any period greatly in excess of the new capital investment. Refunding operations, the organisation of holding companies, and the reorganisation

¹ This estimate is secured by adding to the average annual increase in total assets the average annual investment wiped off the books of reporting companies. This calculation neglects the salvage value of the materials of defunct companies and, consequently, somewhat overstates the volume of new capital, but this overstatement is relatively small. The figures for new investment were, before about 1920, practically identical with the figures for new security issues. After the general cessation of dividend payments, however, the principal part of the new investment came from reinvested earnings.

STREET RAILWAY FINANCING IN MASSACHUSETTS 21

of operating companies are sufficient to occasion a continuous flotation of street railway securities in the absence of any increase in the total volume of capital invested. During the last decade, however, the maturing of bond issues has been the regular occasion for receivership on all but the strongest city properties.

PROMOTION

The Massachusetts Public Service Commission, summarising in 1914 the period of street railway expansion, was of the opinion that, "In no section of the country was the development of street railways, electrically operated, of such mushroom growth as in this Commonwealth."¹ The result was, as we have seen, that Massachusetts acquired a street railway mileage greater per square mile and per unit of the population than that of any other state.

The enterpriser and director in this rapid expansion was the street railway promoter. From 1890 to 1903 when the volume of building fell off sharply, the promoter was active in converting the smaller horse roads to electricity and in building new electric lines through the more sparsely settled areas of the state. In the larger cities the wealthier lines naturally undertook the transition to electricity without his assistance.

Promotion, thriving on the unlimited prospect which the electric railway opened to the ordinary investor in the 1890's, was easy and profitable. By 1900 or shortly afterwards the light of day had penetrated sufficiently into the details of street railway operation to illuminate the bare facts. The Board of Railroad Commissioners in 1904, reviewing the experience of this period, wrote the conclusion to its chapter.

"In the early days of the change from horse to electric railway, promotion ran wild with the idea that immense profits were to be realised in the extension of the old and in the construction of new railways as electric roads in any and every direction; that when no business was in sight, it would appear under the creative magic of the electric car. The test of this opinion, necessarily a test of years in which novelty disappears, is now practically complete."²

The typical street railway promoter in Massachusetts was a man of some legal experience and political connection. The first and oftentimes most difficult part of his undertaking was to secure from

¹ Mass. P. S. C. 1914: 382.

² B. of R. R. Com. 1904: lxvii.

the towns included in his project the right of location on terms not too prejudicial to the immediate success of his enterprise. Strange as it appears now, in the light of the subsequent history of the industry, town governments in even the most unlikely street railway territory were firmly convinced of the enormous money making possibilities of electric traction and determined to wrest all possible advantages in exchange for the right to locate. Since the promoter expected shortly to unload his enterprise on the investor he had considerably less incentive than he might otherwise have had to reduce the burdens imposed by municipalities to a minimum. Furthermore, street railway promotion was a competitive field in which resistance to the claims of the towns might easily lose the location to another and more optimistic rival. The hot competition among promoters for locations succeeded in burdening street railways at the outset with obligations of which, as we shall see later, they never entirely succeeded in ridding themselves.

The location obtained, there devolved upon the promoter the necessity of raising capital, building the road, and of operating it until such time as he might dispose of it to the investor. A substantial and well-organised promotion company, of which there were a number in this state,¹ performed several distinct services and was customarily organised into corresponding departments. An engineering department constructed the road bed, laid the track, and installed the line equipment; an operating department conducted transportation until the road was disposed of; a legal department handled the claims and advised in the negotiation with municipalities; the promoters themselves looked after the issue and sale of securities, the buying of equipment, and the operation of the subsidiary departments.

The promotion of street railways was greatly facilitated, at least during the first half of the 90's, by the extremely lenient credit policies of the equipment companies. Not only was long term credit freely granted but these companies accepted the bonds and often-times the stock of the newly organised railway companies in exchange for rolling stock, motors, line equipment and power plant installation. The Thompson-Houston Company of Lynn, the General Elec-

¹ The best known were probably Shaw and Ferguson. Between the years 1889 and 1900 either or both of these promoters were on the boards of thirty Massachusetts street railways. Their tenure of office usually depended upon the length of time required to dispose of the property.

STREET RAILWAY FINANCING IN MASSACHUSETTS 23

tric Company which it became after 1892, Westinghouse, and various manufacturers of street railway rolling stock accepted securities on a large scale. The General Electric Securities Company, as is well known, was formed for the purpose of taking over the securities of street railway and electric light companies which had been accepted in exchange for equipment. Undoubtedly this credit policy was necessary during the first stage of the development of the industry when investors were hesitant and viewed dubiously the possibilities of electric traction. There is also no doubt that this credit policy was one of the factors which led, in Massachusetts at least, to the extension of street railways into unprofitable territory.

Thus assisted, most of the promoter-built roads in Massachusetts received their remaining financing from local capital. Certain classes in the community were by their profession particularly interested in street railway service and bought street railway securities readily. "There is little doubt," according to the Public Service Commission, "that, when the railways were originally built, real estate owners and business men at times took their securities with little hope of direct profit, but in anticipation of indirect benefits which would accrue from their construction."¹

The assistance of those who invested in street railway securities for other reasons than that of the expected return from their street railway investment accelerated without doubt the expansion of the industry. But the sale of securities to legitimate investors was absurdly easy. In the language of the investment houses, electric railway securities in the 90's could be distributed "right out of the window." The only fact the investor cared to observe was the dividend rate and naturally the promoter interested in disposing of his enterprise took care that the dividend rate under his operation should be evident. That expenditure for maintenance and depreciation during the first few years of a railway's existence was apt to be abnormally small and that dividends might be paid by neglecting proper maintenance and depreciation were facts which stood outside the ken of the ordinary investor.

Certain other facts of subsidiary importance encouraged the investment in street railway securities. The street railway was a public utility regulated by a state commission. To the minds of some investors, state regulation undoubtedly conveyed in a vague way the suggestion of a guarantee of earnings. Furthermore the

¹ Mass. P. S. C. 1918: XXIV.

stock of street railway companies was not subject to taxation, "and for that reason, it became a popular investment for trust estates and similar investors in Massachusetts who are obliged by law to disclose their holdings and hence have the need of investing in tax free securities."¹

All in all the street railway promoter of the 90's in this state found the raising of capital a not too arduous task. Since he made the chief part of his profit on the difference between the total amount realised by the sale of securities and the total cost of building and equipping the property, the ordinary promoter-built line tended to be a rather cheaply constructed affair. The evidence of a member who sat continuously on the Board of Railroad Commissioners from 1895 to 1914 and who later became head of the Inspection Department under the Public Service Commission is relevant to this matter.²

"A large portion of the railway constructed for the use of electric cars was built by promoters, evidently for sale and profit. It was fortunate for them that a ready customer was at hand, as many of the properties were of a cheap type and the revenue so limited that the companies as separate corporations would probably have been of short duration."

Massachusetts law did not permit capitalisation of the payment for promoters' services. Securities were authorised on the understanding that the proceeds of sale represented money actually invested or to be invested in plant and equipment. Under a perfect administration of the Massachusetts system of security control there could be no margin between the cost of the railway and the proceeds of securities sold to cover that cost. Since promotion flourished in this state and promoters grew wealthy it is evident that the administration of the law was something less than perfect.

It could hardly be otherwise. To control expenditure on construction and equipment would require a staff of engineers and accountants which the Railroad Commission did not possess until 1902, and by this time the era of promotion had passed.³ A glance

¹ Federal Electric Railway Commission 1920 III:2059. Evidence of J. B. Eastman formerly of the Mass. P. S. C.

² Bay State Rate Case. Evidence of Bishop. Exhibit 64 p. 2.

³ The first chairman of the Public Service Commission summarised as follows the lack of control of the Railroad Commission over street railway promotion.

"The fact seems to be, as nearly as we can determine it, that the promoters awarded to themselves the contracts for construction, that the Board of Rail-

STREET RAILWAY FINANCING IN MASSACHUSETTS 25

at the annual expenses of the Commission during the 90's is enough to ascertain the impossibility of an adequate control even given the power. The statement has been made by various commissioners that, after all, the Railroad Commission was familiar with the cost of constructing and equipping street railways per mile and could control security issues by means of this knowledge. But this supposes a certain standard of construction under known conditions. It was not very difficult for promoters to lay down a cheap construction and to represent the conditions as unusual, and without an adequate staff of track and equipment inspectors the control of the Commission was tenuous. Something of this sort was admitted by the Railroad Commission in its report of 1901.¹ In general, however, the Commission was not willing to admit this. Its following statement on this matter is typical.

"It is a source of gratification that under our restrictive laws, while capital has taken its own risk as to the earning capacity of these enterprises, in no case has there been an issue of stock or bonds in excess of the fair cost of the railway property, to act as a contributing factor to the existing troubles."²

This is probably true if the "fair cost of the railway property" is taken to include promoters' expenses and profit. These expenses and profits ought of course to be considered as cost and capitalised if the services which a promoter performs are recognised as useful and necessary. The fact remains that the Railroad Commission was not in a position to know during the period of street railways promotion what part of the proceeds of the sale of securities went into the cost of construction and equipment, what part represented the legitimate expenses of organisation and promotion, and what part the promoter was able to reap as profits. Its control over security issue road Commissioners, until 1902, had no power to prescribe standards of construction; that it was dependent in the supervision of security issues, until 1902, upon experts paid by the companies themselves; and that there has never been any regulation of floating indebtedness. The result was that many of the roads were poorly and cheaply built, and it is a fair deduction that costs were at times less than the estimates upon which security issues were based, and that the promoters added the difference to their profits and further enriched themselves, in some cases, through the medium of floating debt." Statement of F. J. Macleod before the *Street Railway Investigation Committee* of 1917. Nov. 28, 1917.

¹ Mass. B. of R. R. Com. 1901: 55. See also F. S. C. 1916: 33, where a list of suspect securities is given.

² *Ibid.*, 1904: LXVII.

was sufficient to prevent *within rough limits* an overcapitalisation, but these limits were rough enough to allow street railway promotion to be a profitable business.

It lies pretty evidently on the record that the method of street railway promotion in Massachusetts between 1890 and 1902 led to a heavy over-investment of capital. The business, in this period, was one of considerable mystery and hence could not be undertaken by the ordinary small town enterpriser or group of enterprisers. At the same time the expectation of large and easy profits made the ordinary investor an eager buyer of securities once a company could be organised. Promoters made the most of this situation and succeeded in saddling the small town investor with the ownership of properties which any one conversant with street railway enterprise would have avoided. In the rare cases when promoted roads showed the possibility of profitable operation, the promoter might retain control of the property.¹ Usually, and for obvious reasons, the promoter unloaded his road as rapidly as possible.

CAPITALISATION AND CAPITAL STRUCTURE

The absence of an adequate staff of inspectors and accountants during the early period of street railway history deprived the control of security issue, as we have seen, of some of that rigor which it later acquired. Nevertheless it is probable that, allowing a fair return for promotion and organisation, the total book investment of Massachusetts roads represented pretty closely the amount of money invested, though not prudently invested, in the street railways of this state.

A comparison of the capitalisation per mile in other states, representing a similar relation of urban to rural trackage, indicates its conservative character.²

CAPITALISATION PER MILE OF MAIN TRACK 1902-1922

	1890	1902	1907	1912	1917	1922
Massachusetts	\$28,390	\$39,067	\$46,583	\$57,786	\$61,735	\$68,606
New York	150,300	177,532	173,006	185,616	238,915	249,195
New Jersey	35,120	148,155	135,439	131,833	139,673	137,012
Pennsylvania	62,650	103,267	109,072	81,261	103,475	96,647
United States	34,410	96,287	100,495	104,930	111,391	107,908

¹ The street railway which later became the Massachusetts Northeastern was an example of a promoter-built road in which the prospect of profitable operation led to its retention by the promoter.

² Special Census Reports. The Electric Railway Census of 1927 does not publish this material.

STREET RAILWAY FINANCING IN MASSACHUSETTS 27

These capitalisation figures, which are sums of the par values of capital stock and funded debt, tend slightly to distort the picture to the advantage of the Massachusetts railways. The street railways in this state have long made it a practice to borrow largely at short time from the banks since this was the only form of financing not under commission control. However, a comparison of the capital structure of Massachusetts roads with the capital structure of street railways of the country as a whole demonstrates that the difference, at least since 1902, has not been great.¹ Furthermore, if one remembers that a good part of the capital stock of street railways the

¹ LIABILITIES OF MASSACHUSETTS STREET RAILWAYS

	Total liabilities	Capital stock	Funded debt	Current liabilities
1890	26,317,808	14,879,130	6,027,942	4,704,917
%	100.0	56.5	22.9	17.9
1891	39,448,819	23,540,536	9,870,150	5,182,753
%	100.0	59.6	25.0	13.1
1897	67,509,916	32,670,272	28,007,600	5,859,069
%	100.0	48.4	41.5	8.7
1902	121,627,650	59,378,602	37,966,942	21,897,899
%	100.0	48.8	31.2	18.0
1907	164,338,000	74,397,675	60,279,000	25,785,601
%	100.0	45.2	36.7	15.7
1912	212,210,162	93,791,575	80,728,700	32,811,427
%	100.0	44.2	38.1	15.5
1917	241,306,756	105,842,899	97,471,716	35,900,665
%	100.0	43.8	40.4	14.9
1922	250,951,396	107,718,334	102,807,353	36,986,967
%	100.0	42.9	40.9	14.7
1927	236,989,632	102,610,032	93,824,069	17,608,759
%	100.0	43.29	39.59	7.43

LIABILITIES OF U. S. STREET RAILWAYS

	Total liabilities	Capital stock	Funded debt	Current liabilities
1890 ^a	408,475,451	211,277,798	151,872,289	30,368,466
%	100.0	51.6	37.1	7.4
1902	2,545,132,305	1,266,883,289	974,112,422	252,145,435
%	100.0	49.7	38.2	9.9
1907	4,300,040,525	2,031,986,366	1,672,959,930	488,471,004
%	100.0	47.2	38.8	11.4
1912	5,448,604,637	2,379,346,313	2,329,221,828	606,690,400
%	100.0	43.7	42.7	11.1
1917	6,272,617,041	2,473,846,651	3,058,377,167	583,580,514
%	100.0	39.4	48.7	9.3
1922	6,655,273,700	2,329,173,090	3,117,621,457	1,041,739,207
%	100.0	35.0	46.8	15.6

^a Partial data, covering about four-fifths of the trackage in the country. Mainly horse power.

country over is water, it will be seen that in proportion to money actually invested in stocks and bonds, the current liabilities of Massachusetts roads have probably been, since 1900, less than the average.

The figures given in the footnotes on the previous page, indicate, what is a matter of common knowledge, that the capital structure of the street railway industry is weak and has been steadily becoming weaker. The growing proportion of funded debt plus current liabilities has meant a declining margin of earnings over fixed charges. This has increased the cost of new borrowing, has made refunding possible only at higher interest rates and, when new borrowing was possible, has increased the proportion of creditor to proprietorship liabilities which, in turn, has again reduced the margin over fixed charges.

RATIO OF STREET RAILWAY NET EARNINGS TO FIXED CHARGES
IN MASSACHUSETTS

	Massachusetts	Boston Elevated-West End	Holyoke	Springfield	Union (New Bedford)	Worcester
1890	2.49	2.55	10.21	2.61	2.87	3.26
1895	2.19	2.69	2.96	2.04	2.82	2.14
1900	1.59	1.18	1.88	2.70	2.58	1.73
1905	1.52	1.25	1.79	1.94	2.01	1.54
1910	1.40	1.26	1.97	1.53	2.97	1.55
1915	1.44	1.25	1.93	1.81	2.73	1.51
1920	1.20	1.16	1.81	2.05	3.03	1.17
1925	1.49	1.56	1.66	1.36	2.99	1.68

Net earnings after depreciation allowances, if any. The fixed charges include interest on funded and unfunded debts, taxes and the rentals of leased roads.

The Massachusetts control over security issue sets certain limits to this unfavorable alteration of capital structure. According to the laws of this state the bond issue of a street railway must not exceed the par value of its stock issue plus premiums. Moreover, stock cannot be issued at less than par. The result has been that most Massachusetts street railways have been precluded from borrowing under any conditions except from the banks at short term.

The capital structures of the more important companies in Massachusetts, while exhibiting at times considerable differences, show the same general changes over the whole period. Two of these roads, the Springfield and Holyoke had, in 1892, no funded debt and an insignificant amount of current liabilities. Most roads, however, by

STREET RAILWAY FINANCING IN MASSACHUSETTS 29

1900 had pushed their bond issue close to the legal limit. After 1915, only two roads in the state, the Boston Elevated and the Union of New Bedford found it possible to acquire additional funds by the issue of stock.

THE DIVIDEND POLICY OF MASSACHUSETTS STREET RAILWAYS

The dividend policies of Massachusetts street railways and, it is safe to say, of street railways throughout the country, preserved a favorable position in the capital market for the securities of the industry long after the financial condition of most companies had ceased to justify this position. The comparative ease of refunding operations and the persistent flow of new capital into street railways during the decade which immediately preceded the war provides an interesting commentary on the influences which direct the movement of loanable funds in the capital market.

An examination of the sale of securities of those ten or twelve Massachusetts companies whose bonds were regularly handled by investment companies indicates that up to 1914 at least, the bonds of a well established street railway could be issued on about as favorable terms as the bonds of well established companies in other industries. The return and conditions of issue varied of course with the fluctuations in the bond market but neither the financial conditions of the company, unless it appeared hopelessly bad to the casual observer, nor the probable prospects of the industry appear to have been matters of serious consideration.

By 1913 or 1914, it is true, electric railway securities had begun slightly to lose favor among the more discerning. It was beginning to be seen that plant and equipment in this industry were subject to a rapid depreciation and obsolescence; labor troubles seemed to descend upon street railways with more than usual regularity; municipal politics and demagogic appeals for lower fares frightened many investors. For these and other reasons electric light and power, gas and telephone securities began to forge ahead of street railway securities in the public approval.

A real knowledge of the conditions and prospects of the industry, however, and of the actual position of individual companies would have stamped a great many street railway securities of unblemished reputation as an unlikely investment a number of years before this. The fact of the matter is, and the street railway situation is merely

one of many examples which might be exhibited, that the capital market has favorites, and the merits of a security have oftentimes little to do with the esteem in which it is held. When street railway issues were in the public eye neither the ordinary investor nor the investment house which handled the issue looked beyond the reported earnings unless it was to the maintenance and depreciation charge which was compared with a rule of thumb ratio to gross earnings set absurdly low.

Massachusetts law made the securities of certain Massachusetts street railways eligible for investment by the state savings banks. It was the duty of the Railroad and, later, the Public Service Commission to determine which companies were eligible and the test applied was whether the company had maintained an unbroken five per cent dividend record for at least five years previous without impairment of assets or capital stock. The Commission was quite incapable of deciding whether assets had been impaired without a thorough investigation, and repeatedly protested against the necessity of making up a list of securities which appeared to bear a commission certification. The list has been continued up to the present time but an act of 1915 relieved the Commission of the necessity of determining whether maintenance and depreciation had been adequate.¹ As later events demonstrated a number of companies on the list had not made an adequate maintenance and depreciation allowance, but no warning by the Commission or any other agency was sufficient in the period before 1914 to make even a reasonably careful investor look much beyond the dividends paid.

It became obvious early in the period of electric railway expansion that the electrified roads were running much closer to the wind than the old horse car companies. The Railroad Commission pointed out in 1893 that during the five years preceding 1888 the combined accounts of the street railways of the state showed an average dividend of 5.66 per cent and the maintenance of an average surplus of 12.45 per cent of the capital stock. Similar figures for the five year period ending in 1893, a period of rapid electrification, showed an average dividend of 6.44 per cent and an average surplus maintained of only 3.51 per cent.²

¹ Acts of 1915, C 273. A list of the companies whose securities were available for investment by Massachusetts Savings Banks is published in the Appendix C.

² Massachusetts B. of R. R. Com. 1893: 109.

STREET RAILWAY FINANCING IN MASSACHUSETTS 31

Not only did the ratio of dividends paid to net earnings in the first decade after electrification show a considerable increase over a similar ratio in the last decade of horse operation, but the percentage continued to increase after 1900, as the following table shows.

RATIO OF DIVIDENDS DECLARED TO NET DIVISIBLE INCOME FOR ALL COMPANIES AND FOR LEADING COMPANIES OVER 5-YEAR PERIODS

	1890-4	1895-9	1900-4	1905-9	1910-4 ^a	1915-9 ^b	1920-4	1925-9
All companies	82.6	80.4	96.0	90.5	97.4	165.6	76.7	104.4
West End	89.5	88.2	99.9	100.0 ^c	100.0 ^c	100.0 ^c	100.0 ^d	
Boston Elevated		58.5 ^e	91.5	95.2	116.5	"	83.5	97.8
Globe	21.9	29.6	103.8 ^f					
Brockton-Old Colony..	84.5	61.8	92.1	69.9	90.4 ^g			
Lynn & Boston								
Boston & Northern	} 82.8	93.0	199.0	82.0	82.5	113.5	81.3	91.2
Bay State								
Eastern Massachusetts								
Fitchburg & Leominster	48.2	77.2	87.0	75.5	78.2	93.0	76.7	0.0
Holyoke	58.9	78.8	104.2	88.5	97.5	83.8	94.6	91.5
Springfield	66.8	77.0	108.3	100.5	105.0	82.7	50.2	88.5
Union	62.5	61.1	79.5	73.2	48.6	79.5	78.7	92.6
Worcester Consolidated	87.0	87.4	94.0	89.9	95.2	66.8	69.6	50.5

^a Period of 4.75 years only, due to change in reporting date.

^b Period of 5.5 years (July 1, 1914, to Dec. 31, 1919) with the omission of the latter half of 1915. The excessive figures for "all companies" in this period was affected by the peculiar position of the Boston Elevated. See note ^c.

^c From Jan. 1, 1920 to June 10, 1922, when consolidated with the Boston Elevated.

^d Fiscal year 1897-8-9.

^e Dividends declared, \$5,405,321. Deficit after operating expenses and fixed charges but before dividends, \$757,768.

^f From Oct. 1, 1899, to Jan. 19, 1901, when consolidated with the Brockton.

^g From Oct. 1, 1909, to July 1, 1911, when consolidated with the Boston & Northern.

Despite the increase in percentage of dividends to net earnings the average dividend rate for all Massachusetts companies fell slowly though irregularly till 1914 and rapidly during the war period. The decline in dividend rates on the stock of companies excluding the Boston Elevated and the West End was, of course, greater than the figures for all companies imply.

The distribution of a high percentage of net earnings is not necessarily an unsound financial policy, though certainly not a conservative one, if net earnings are calculated after a careful and sound provision for all costs including a full allowance for maintenance, depreciation and obsolescence. Massachusetts street railways, however, with one or two possible exceptions, did not make such an allowance. Net earnings were calculated without proper provision

for maintenance and dividends were paid by permitting the property to depreciate.¹

A proper consideration of the question of depreciation must be postponed till the chapter on costs. Nevertheless its importance in relation to the dividend policy of Massachusetts street railways requires a few remarks at this juncture. At the outset of the period of electric railway expansion, the street railway operators were completely ignorant of the average life of the new plant and equipment which was so rapidly being installed. Naturally they relied to some extent on accumulated horse railroad experience and, to the extent they did so, they seriously underestimated the proper annual allowance for replacement. Even had they known in advance, however, the physical durability of their new equipment, the rapidity of technical change in the industry would have made an accurate calculation for replacement impossible. It has been the testimony of many experienced street railway men that they have rarely seen a piece of street railway property worn out. Long before it has yielded up its maximum service it has been relegated to the scrap-heap.

A conservative and cautious policy under such circumstances would have dictated a high depreciation charge or the accumulation of a large replacement reserve. Instead, however, street railway companies preferred to replace their plant and equipment largely by means of the issue of new securities. Since replacement meant also improvement there was a certain justification for this policy; and, at any rate, it lay entirely without the competence of the Railroad Commission to determine a proper balance between replacement out of operating expenses and improvement from the proceeds of new security issues. The result was, as the report of the famous Charles Francis Adams Commission of 1898 clearly asserted, that by the end of the century Massachusetts street railways had cost a great deal more than it would have cost to rebuild them at that time.²

Although the existing investment may be considered as the unavoidable cost of building up an industry during a period of changing technique, the result was that street railway companies found

¹ "The general rule has been to pay operating expenses first, fixed charges next, dividends next, and last of all, if anything is left over, to care for depreciation. In not a few cases, indeed, the ordinary maintenance of the property has been subordinated to dividend payments." Statement of F. J. Macleod before *Street Railway Committee* of 1917.

² *Report of Special Committee on the Relations between Cities and Towns and Street Railway Companies*. 1898 House Docs. 475, p. 11.

STREET RAILWAY FINANCING IN MASSACHUSETTS 33

themselves saddled with a load of securities on which investors, in the era of great anticipation, expected large and immediate returns. The easiest way of satisfying stock and bondholders and thus of preserving the standing of a company in continual need of new capital on the capital market, was to neglect maintenance and depreciation. Failure to maintain plant property only injures the credit of a company after an interval of time, and in that interval of time street railway operators hoped to repair their position from a steadily increasing volume of traffic. The result was that companies exhibited as earnings what should have gone to depreciation and declared dividends not out of income but out of assets.

"The greed for dividends," said the Railroad Commission in 1897, "on the part of the stockholders of many of the companies, who have generally invested with the mistaken expectation of not only sure but lucrative returns, is often too importunate for the managers to resist; but the practice of paying dividends where no divisible income has been earned, or in excess or anticipation of such income, or even to the full amount of such income, with no reserve for depreciation, is vicious and fatal in the end to the strength and success of the company."¹

The anticipation of expanding traffic per mile of track proved, as we have seen, too sanguine. The result was that the smaller companies had definitely to choose between neglecting maintenance in order to maintain for a while a tenuous hold upon credit by paying dividends, or to cease paying dividends in order to maintain their property. Either course involved suicide though by a more or less lingering method. In consequence a large number of small companies went into receivership between 1900 and 1905.² And an even larger number avoided receivership by sale to one of the number of large street railway consolidations which were being formed in Massachusetts at that time.

The consolidations which, as we shall see in the next chapter, held out great promise of operating economies, found, when these economies failed to materialise, that they too had to make this choice between proper maintenance and preserving their credit position. They accepted in general the second alternative. The first decade of this century witnessed in Massachusetts the rather strange spec-

¹ Mass. B. of R. R. Com. 1897: 108.

² See Appendix D for number of receiverships granted, by five year periods between 1890 and 1930.

tacle of the sale of the securities of these consolidations oftentimes at a premium because of the regularity of dividends paid at the expense of a continually depreciating plant.

It may be asked in the light of this situation why Massachusetts street railways did not ask at this juncture for the increase of fares to which their position seemed to entitle them. A part at least of the answer is given in the evidence of the chairman of the Public Service Commission at the hearings of the Federal Electric Railway Inquiry in 1920.¹ In order to ask for fare increases the street railways would have had to disclose their financial standing and the extent of the depreciation of their property. Such a disclosure would have injured their credit. Consequently the payment of dividends was continued until the combination of rising costs, automobile competition, and the high operating expenses of a depreciated property forced them into receivership.

HOLDING COMPANIES

It is often asserted that the dividend policy of Massachusetts street railway companies is to be explained by the prevalence of holding company ownership and banker control in this state. This is a matter which must be examined. Furthermore the emergence and predominance of holding companies in this industry, provides a chapter in the history of its financing which is worthy of consideration on other grounds.

The first company organised for the purpose of holding Massachusetts electric railway securities was the Massachusetts Electric Companies, launched in 1899, though the New York, New Haven and Hartford Railway had begun, in a small way, to buy control in street railways shortly before this. From this time on the establishment of holding companies proceeded at a rapid rate until by 1912 there were, excluding the Boston Elevated, only three considerable street railway companies in the state outside of holding company control.² After that date no new holding companies were formed apart from reorganisation of existing companies.

Excluding the Boston Elevated and the West End, leased by this company, holding companies in 1910 owned something over four-fifths of the total stock of Massachusetts railway companies. An

¹ II: 1446. Evidence of F. J. Macleod.

² The Holyoke, the Union of New Bedford, and the Fitchburg and Leominster.

STREET RAILWAY FINANCING IN MASSACHUSETTS 35

idea of their significance may be obtained from a consolidated balance sheet of their position in 1912, a year when the holding companies of this state were at the height of their importance.

BALANCE SHEET OF MASSACHUSETTS STREET RAILWAY HOLDING COMPANIES, 1912 *

Number of companies.....	9	
Total assets and liabilities.....		\$105,274,330
<i>Assets</i>	<i>Liabilities</i>	
Stocks and bonds of electric railway companies	Capital stock	\$81,600,383
\$77,765,986	Common stock \$42,308,005	
Stocks and bonds of companies other than electric railways and other permanent investments	Preferred stock 39,202,378	
19,515,082	Funded debt	18,509,800
Treasury securities ..	Floating debt	745,000
700,300	Reserves	103,940
Cash and current assets	Accounts payable	247,826
3,406,689	Interest and taxes due and accrued	151,635
Stock and bond discount sinking and other special funds and sundries	Dividends due	207,493
3,261,894	Surplus for companies showing a surplus..	3,708,253
Deficit for companies showing a deficit...		
624,379		
\$105,274,330		\$105,274,330

* Special Census Reports. *Street and Electric Railways*, 1912. There were really twelve holding companies in Massachusetts at this date.

All the Massachusetts holding companies were voluntary associations since there was some doubt, at least before 1911, as to whether a corporation could be organised under the laws of this state for the purpose of acquiring the securities of public utilities.¹ They were promoted, with one or two exceptions, by banking houses interested in capitalising what were considered to be the brilliant prospects of the street railway. Massachusetts law prohibited operating companies from capitalising what was generally known as the franchise value or indeed from capitalising anything except money

¹ Massachusetts House Documents 1913. No. 1788. Report of a Committee on the following: "Resolve to provide for an investigation relative to the holdings of voluntary associations and certain corporations and to the consolidation of companies controlled by them."

actually invested. This prohibition did not apply to the voluntary association holding company.

These companies usually issued bonds or preferred stock of par value approximately the same as the par value of the street railway company securities acquired. Their common stock represented the prospective high earning of their operating companies. The Massachusetts Electric Companies, for example, promoted by two Boston banking houses, issued \$12,000,000 par value preferred stock which about covered the par value of the stock of subsidiary companies acquired and probably considerably more than covered the fair market value of this stock, and, in addition, \$12,000,000 par value of common stock. Then \$1000 preferred and \$1000 common were offered for \$1050. In this manner the Massachusetts holding companies succeeded in capitalising street railway properties at something like the amount at which street railway operating companies were capitalised in other states not having Massachusetts's strict system of security control.

The device of the holding company is often said to be advantageous to the investor since it secures to him a diversity of investment unattainable by any except a very wealthy man. This advantage seems not to have been forthcoming to the investor in the Massachusetts street railway holding companies. With but one exception, the New Hampshire Electric Railways, the properties of these companies lay entirely in Massachusetts; and with few exceptions their holdings were entirely in street railways.¹ What actually happened was that the securities of sound companies were added to those of companies on the verge of receivership. The former succeeded in carrying the latter until the rising costs of the war period made this burden impossible.

The preferred stocks and bonds of the holding companies were based almost exclusively on the common stocks of operating companies; the common stocks of the holding companies were, generally speaking, pure water. Aside from a ½ per cent dividend on the common stock of the Massachusetts Consolidated Railways paid in 1913, none of these holding companies ever paid anything on their common stock. The dividends on the preferred stock were low, were often passed, and, of course, ceased entirely during or shortly after the war period. The Public Service Commission and the various

¹ A list of Massachusetts street railway holding companies and their holdings is given in Appendix E.

STREET RAILWAY FINANCING IN MASSACHUSETTS 37

special commissions reporting on the holding company situation before the war felt that Massachusetts investors bought the preferred securities of these companies without realising that they were no better than the common stock of the operating companies.¹ This is no doubt true but since the holding companies were in the habit of publishing their holdings no one except the investor can be held to blame for this misapprehension.

The advantages, apart from diversity of investment, which are usually held to be attainable from holding company control are those resulting from engineering and legal supervision, from large scale purchasing, and from accounting and financial assistance. Certain of the prospectuses of Massachusetts street railway holding companies mention these advantages. The prospectus of the Massachusetts Electric Companies, for example, quoted the following statement from the consulting engineer:

"It is a self-evident fact that there will result a large saving from the uniting of these roads. A saving will be made in salaries. Power stations, car houses, rolling stock and all kinds of property can be brought together, and by a carefully devised plan in reorganisation, large amounts can be saved in operating, a more systematic and harmonious service rendered to the public, thus causing better satisfaction and more patronage, all of which will result in much benefit to the investor and the public as well."

There is not much evidence that Massachusetts street railway holding companies performed these services for their subsidiaries. Out of the twelve voluntary associations holding securities in Massachusetts street railways in 1912, seven controlled only one road each. In a number of these cases the holding company was responsible for the consolidation of various roads into one property but after the consolidation the services mentioned in the previous paragraph were performed by the operating company and not by the holding company. Whether or no consolidation led to economies will be considered in the next chapter. Of the five remaining holding companies two were interested in street railways to an insignificant extent; and two others, the New England Investment and Securities Company and the Worcester Railways and Investment Company, controlled by the former, performed no engineering, purchasing or accounting services. The New England Investment and Securities

¹ See Fed. Electric R. W. Com. III: 2075. Evidence of J. B. Eastman, Also Mass. House Docs. 1913. No. 1788, p. 59.

Company, organised to take over the New Haven railroad's properties in Massachusetts, was specific on the matter in its report to the state committee of investigation.

"No materials were furnished to subsidiaries. There are no contracts for the operation of plants, rendering of services or furnishing of supplies, though sometimes as a matter of convenience the company may supply another company with material; but this is done directly and not through the association, and such material is always paid for at the price at which it has been purchased."¹

There is no doubt that the economies of consolidation were a good talking point in the sale of holding company securities. Four of the larger Massachusetts street railway companies were put together by holding companies, the Bay State, the Massachusetts Northeastern, the Boston and Worcester and the Middlesex and Boston. But the real reason for the organisation of holding companies was the desire on the part of banking houses for the profits of promotion. A market avid for street railway securities made their organisation easy with or without economies of operation.

There have been many hints and a few direct assertions that holding company control of Massachusetts street railways has resulted, in a number of ways, in unsound business practice. It has been alleged that the condition of the operating companies was sacrificed to dividend requirements. According to the evidence of J. B. Eastman, "there is a tendency to draw from the underlying companies every possible cent which you can, in order to make a showing on these inflated shares."² Even graver charges were made by former Governor Foss of Massachusetts. "Banker management has got to cease from all these railroads and public service corporations. It is a failure. Why? Because the temptation to wreck these roads and reorganise them is too great. They do it every ten years or thereabouts, and that is what happens."³

The holding companies were sometimes charged with injury to particular operating properties to the advantage of others or of the holding company itself. Speaking of the Boston Suburban Electric

¹ Mass. House Docs. 1913. No. 1788, p. 25. The only holding company unaccounted for is the Massachusetts Northern Railways which changed its name to the Massachusetts Consolidated Railways in 1913. This company controlled three railways of moderate size, the Concord, Maynard and Hudson, the Connecticut Valley and the Northern Massachusetts.

² Fed. Elec. R. W. Com. III: 2075.

³ *Ibid.* I: 792.

STREET RAILWAY FINANCING IN MASSACHUSETTS 39

Companies which owned the Middlesex and Boston Electric Railway, Norumbega Park, and a power company furnishing current to the railway line, the Massachusetts Public Service Commission maintained that control of a street railway by a holding company which loans to the railway at large profit, controls the company selling power and also owns a pleasure park to which large payments are made is "obnoxious to sound principles of corporation management and confusing to a proper system of regulation by this commission."¹

There is little doubt that the desire for the profits of promotion and organisation led in a number of cases to the assembling of street railway systems which ought never to have been assembled. This is a matter which can be discussed more adequately in the following chapter. But once the systems had been consolidated and capitalised at figures allowed by the Railroad and Public Service Commission, there is little evidence that the dividend policy of the controlled operating companies was any different or less sound than that of independent operating companies with a similar relation of earnings to capitalisation. None of the holding companies paid high dividends on preferred stock and, as we have seen, the dividends on the common stock were negligible. The dividends paid, it is true, were oftentimes at the expense of maintenance but this was true of independent operating companies in the same period and in similar condition. In the case of both types of companies a certain defense lies in their common necessity of preserving their credit in the capital market.

The organisation of holding companies whose security issues are uncontrolled and whose relations to subsidiaries are difficult of control by state commission increases no doubt the possibility of injury to the operating companies through stock manipulation and uneconomically determined purchase and operating contracts. With respect to holding company control of Massachusetts street railways, however, it has not been demonstrated nor is there evidence to demonstrate that this has occurred. The dividend policies of all these companies can be adequately explained without resorting to the hypothesis of stock manipulation. And, in the only instance in which uneconomic purchase or operating contracts has been alleged, the allegation has remained unproved. In the Middlesex and Boston rate case the Public Service Commission remarked that the petitioner

¹ Mass. P. S. C. 1914: 100. Middlesex and Boston Rate Case.

(the Middlesex and Boston Company owned by the Boston Suburban Electric Companies) has not shown that money could not have been borrowed at lower rates in the open market than from the holding company; nor has the petitioner shown that the contract for power with the Edison company was the best available arrangement. Neither, however, does the Commission bring forward evidence that these contracts were uneconomic.

The financial control of Massachusetts street railways by holding companies succeeded in prolonging the life of a number of badly planned and uneconomically constructed operating companies. The result was that a number of soundly built and operated companies were more poorly equipped and maintained than they otherwise would have been, and that they went into the receivers' hands, by way of their holding companies, before their proper time. Apart from this, the result of ill advised consolidation, holding company operation, or "banker's control" as some of the critics style it, cannot, at least in Massachusetts, be seriously criticised.

CHAPTER 3

CONSOLIDATION OF STREET RAILWAYS IN MASSACHUSETTS

The period of electric railway consolidation in this state lies between 1890 and 1915 with most of the activity concentrated in the first decade of the century. During the whole period there were one hundred and forty-two operating consolidations of which one hundred and twenty-four were consummated by outright stock purchase and the other eighteen by leasing or operating contracts. After 1915 the problem facing the industry was the breaking up of systems put together, often uneconomically, in the era of expansion; a breakup to salvage the mileage worth operating.

The ordinary Massachusetts city line in the course of its expansion usually absorbed a number of adjacent suburban roads. The Brockton Street Railway, for example, which, in 1890, was a medium sized property in a medium sized city, acquired by purchase in rapid succession the Brockton and Holbrook, the Eastside, the Whitman, the Brockton and Stoughton, and, after its purchase by the Massachusetts Electric Companies, the Brockton and East Bridgewater, the Boston, Milton and Brockton, the Brockton, Bridgewater, and Taunton, the Taunton and Brockton, the New Bedford, Middleborough, and Brockton and the Quincy and Brockton; all small, contiguous country properties and all acquired in the short space of ten years.

The street railway companies of Lowell, Lynn, Worcester, Holyoke, Springfield, and other Massachusetts cities undertook this same expansion until, by 1910, there was not, except for the Boston Elevated, a single street railway system in the state which could be called a pure city property.¹ Consolidation was mainly responsible for the decline in the number and the growth in the average size of street railways in this state before 1915.

¹ The Union of New Bedford was the nearest to a pure city system and for this, as well as other reasons, the Union continued to make a creditable financial showing long after most of the other street railway companies in Massachusetts had slumped.

42 THE STREET RAILWAY IN MASSACHUSETTS

AVERAGE MILEAGE OPERATED BY MASSACHUSETTS STREET RAILWAY COMPANIES, 1890-1929, EXCLUSIVE OF BOSTON LINES

	Number of operating companies	Average number of miles of main track operated per company
1890	34	9.63
1895	51	16.64
1900	71	23.20
1905	62	36.62
1910	54	43.20
1915	37	87.75
1920	29	72.50
1925	28	64.60
1929	18	70.75

When the subsidiary road was acquired by stock purchase, the legal consolidation usually provided for a share for share exchange of stock, regardless of the price paid. The companies acquired were, for the most part, small-town properties with unsatisfactory records of earnings. Although it is, in general, impossible to discover the price paid for the stock of the purchased companies it is clear from their financial position that the price was usually considerably less than par.¹ Since the shareholders of the buying company could subscribe pro rata for the stock of the purchased company, the share for share exchange was somewhat in the nature of a stock dividend.

The Massachusetts system of security control encouraged consolidation in a number of ways. The small country and suburban properties with bond issues equal to the par value of their stock and incapable of selling stock at par found it impossible to raise the funds often necessary to carry on operations, and were forced to sell out to city companies more advantageously situated.² The city companies in buying up small subsidiaries were enabled to distribute earnings over a larger capitalisation. Over and above the incentives to consolidation gratuitously provided by the Massachusetts system of security control it is probable that occasionally consolidation was

¹ The Holyoke Street Railway acquired the Hampshire property at \$125 a share and the Amherst and Sunderland property at \$60 a share. The consolidation involved a share for share exchange though Holyoke stock was selling in the vicinity of \$150 a share. Mass P. S. C. 1917: 93. Holyoke Rate Case.

² C. J. Bullock—"Control of Capitalization of Public Service Corporations in Massachusetts." *American Economic Review* X: 5.

brought about at the instance of dominant stockholders who had bought up the securities of adjacent properties at low prices.¹

Occasionally the fixed obligations of the subsidiary company were written down upon consolidation. Roads acquired upon foreclosure or at receiver's sales were taken in at a valuation which the Commission tried to keep equal to the obligation undertaken by the buying company.² In general, however, the bonded indebtedness of the acquired company was not affected by consolidation and, consequently, when the capital stock was acquired at less than par, the relation between stock and bond indebtedness contemplated by Massachusetts law was seriously altered. Consolidation had the effect of thinning the equity.

A very important cause of street railway consolidation in Massachusetts was undoubtedly the desire and opportunity for promoters' profits. The agency was usually the holding company and the justification offered, the economies of large scale operation. As we have already seen, the most striking example in this state of the relation between holding company control and the consolidation of operating properties was the organisation of the Massachusetts Electric Companies and the Bay State Street Railway.

The Public Service Commission at a later date, when the evidence of time had considerably modified the general attitude toward consolidations, spoke as follows of the organisation of this company: "The plan was hastily devised, in the days when trust formation was at its height, by two bankers but one of whom had had street railway experience. No particular thought seems to have been given to determining how large and heterogeneous a system could be efficiently handled."³

The promoters bought up all, or the major part, of the stock of thirty-one street railway companies and two light and power companies scattered from New Hampshire to Rhode Island, then or-

¹ In one or two cases the Board of Railroad Commissioners took action at the instance of minority groups.

² See the case of the Interstate Consolidated Street Railway Company, Mass. B. of R. R. Com. 1895: 165. When the Athol and Orange Company acquired the Templeton Company in 1913 the book assets of the latter company were written down from \$786,293.95 to \$435,000, and the agreement with the creditors of the Templeton company determined the valuation which the Public Service Commission allowed on the acquired property. P. S. C. 1913: 270-271. See also Millford and Uxbridge Rate Case.

³ Mass. P. S. C. 1916: 68.

ganised the Massachusetts Electric Companies in 1899 to take over this stock. There were several steps necessary to the creation of a consolidated operating property. Two or three considerable consolidations, for example the Lynn and Boston and the Brockton, were included among the street railways acquired. The holding company proceeded to organise its properties north and south of Boston into a few large operating companies and, in 1901, it reduced these operating companies to two, one, the Old Colony, which embraced the railways south of Boston and the other, the Boston and Northern, which operated the roads north of Boston. Meanwhile it rounded off its holdings by the acquisition of several contiguous lines. In 1911 the two companies were united in the Bay State which company operated all the street railways in eastern Massachusetts with the exception of the Boston Elevated. As finally formed, the Bay State included seventy-two operating properties at one time independent.¹

The stock of the acquired companies was exchanged on a share for share basis with the stock of the consolidated operating properties. The par value of the common stock of the operating companies acquired totaled \$8,047,000, to which must be added \$397,422.89 in street railway notes and \$930,702.92 in cash. This constituted the total assets of the Massachusetts Electric Companies at the outset; and, in return for these assets the holding company turned over to the two banking houses \$12,000,000 par of its preferred stock and \$12,000,000 of its common.² These stocks were put on the market at \$105 for \$100 of preferred and \$100 par of common. During the first few years of the companies' existence the preferred stock sold at around \$93 a share³ and the common fluctuated between \$10 and \$25.

The motive behind the consolidation was promoter's profits and, if the stock of the subsidiaries acquired was bought at a price representing a fair estimate of probable earnings, the profits should have been handsome. There is some evidence, however, that these stocks came high. The stock of South Shore and Boston, for example, a consolidation of five small roads which had been brought into existence by a promoter anxious to sell the property to the Massachusetts

¹ See Appendix F for chart of this organisation.

² Since the Massachusetts Electric Companies was a voluntary association its securities were really preferred and common trustee certificates.

³ P. S. C. 1916: 45. Bay State Rate Case.

Electric Companies, was bought at a figure close to par, although during the only full year of its operation the South Shore and Boston had failed to earn fixed charges, let alone dividends.¹

Whether the promoter's profits were large or small the fact remains that this extensive consolidation of operating properties was capitalised and sold to the investors in the securities of the Massachusetts Electric Companies at a price which could only be justified by the expectation of very large economies of joint operation. The extent to which these economies remained unrealised becomes evident in the course of this chapter.

The economies of combined operation were a good talking point for those anxious to profit from the promotion of consolidations. On the other hand the expectation of these economies was the real reason for a number of consolidations in which the promoter had no part. Small contiguous roads were put together in the hope of encouraging a greater volume of through traffic. Interurban companies such as the Boston and Worcester acquired intersecting properties as feeders for the main line. Urban systems frequently absorbed suburban and country properties on the expectation that increased riding would make possible a fuller realisation of their existing city plant and equipment.

Certainly this was the expectation of the Massachusetts Board of Railroad Commissioners. Beginning in 1897, when the Board was first given the power to permit consolidation,² its attitude was wholeheartedly favorable. Generally speaking it authorised every application for the consolidation of street railways, which proposed no increase in the combined capitalisation, which proposed no change in fares or service disadvantageous to the public, and which joined together contiguous or intersecting lines. It looked with favor upon the rehabilitation of small properties through consolidation with stronger systems. The Board expressed its attitude clearly in 1900 in connection with the thirteen street railway consolidations consummated in that year:

¹ The income statement of the South Shore and Boston for its only full year of operation is as follows:

Gross Income	\$243,763
Operating Expenses	200,139
Operation Ratio	82.9
Fixed Charges	45,876
Deficit	2,252

² Before this date consolidation required a special act of the General Court.

"In each case this has been accompanied by specific reductions in fares and extensions of rights of transfer. These consolidations tend also to afford larger opportunity for equalisation of fares, improvement in service and the exercise of supervision over operation. There must, however, be a limit to the extent to which it is advisable that street railways should be brought under one management. Having this in mind, there is no reason to doubt the beneficial effects of the union thus far made without increase of capitalisation of several smaller companies into one stronger system, with its less expensive methods of operation and larger facilities for the conduct of a satisfactory public service."¹

Later when the effect of the policy of absorbing weak properties on the financial condition of the large systems began to be felt the attitude toward street railway consolidation changed. In 1916 the Public Service Commission observed that, "the terms of any further consolidations of street railway properties which may be sought must be scrutinised with great care. In the past, the tendency has been to estimate somewhat too highly the virtue inherent in such consolidations and to permit them freely, provided the total capitalisation outstanding remained unchanged."²

By 1916, however, the consolidation movement in this state was over. During the years when the movement was at its height the Commissioners were favorable to consolidation and made the growth of street railway systems easy. In so doing there is no doubt that *for the time being* the quality of the service enjoyed improved; the unit fare commanded greater riding privileges.

THE ECONOMIES OF CONSOLIDATION

The economies of consolidation, although affecting the financial returns of the united property, cannot with any considerable accuracy be measured by a comparison of net earnings of the independent operating companies with the net earnings of the consolidated property. In the first place such a comparison extending over a period of years is vitiated by changes in the cost of operation. And though it is possible, through the use of an index of operating costs, to make certain allowances for these changes, the index, based upon general experience in the industry, may have little use in particular situations. In the second place, the unit of product,

¹ Mass. B. of R. R. Com. 1900: 94.

² P. S. C. 1916: XX.

the passenger ride, is usually not the same thing before and after consolidation and the data are often insufficient to permit of a quantitative reduction to a common base. Finally, unless the independent properties before, and the united properties after, consolidation are maintained at approximately the same standard, net earnings tell us little about the economies of consolidation.

Any comparison of net earnings, therefore, to be of significance must be accompanied by additional information regarding costs, service and depreciation. Nevertheless, under circumstances in which a proper allowance can be made for these variables, such a comparison may throw valuable light upon the problem at hand. In any case, it is the best quantitative method available for the handling of an essentially quantitative problem and should be used for what it is worth. Before proceeding, however, to a consideration of the effect of consolidation upon net earnings, some discussion of the expected economies and their probable importance under Massachusetts conditions is necessary.

The principal economies set forth by the promoters of consolidations and other, more disinterested observers of the phenomenon, are (1), the lower cost of financing per unit of capital raised; (2), a better allocation and distribution of equipment, an economy which must necessarily grow in importance as old plant wears out and new installations can be made; (3), an improvement in management through greater specialisation and the employment of men of higher caliber; (4), a more intensive utilisation of track and rolling stock in consequence of an increase in the volume of traffic induced by a consolidated service; (5), the lower price per unit of materials to be secured by large scale buying.

1. The first economy, cheaper financing, is one often asserted to be inseparably connected with consolidation. Under certain conditions this is probably true but it is doubtful whether the Massachusetts street railway consolidations fulfilled these conditions. If a number of independent operating properties whose securities possess a purely local reputation are put together in a system capable of borrowing in a larger capital market the cost of financing is apt to decline. Street railway consolidations in Massachusetts were not of sufficient size or importance, however, to take them out of a capital market in which a dozen or more independent operating companies borrowed on as easy terms. Massachusetts street railways drew their funds almost entirely from local investors and any

independent property which could make a good financial showing was at no disadvantage, because of its size, in the investment market.

It is true that consolidations all over the state took in independent companies which, under existing conditions of security control, found it impossible to borrow on any terms. The reason for this inability, however, did not lie in the fact that they were small independent companies but in the fact that their financial showing gave small promise of return to potential lenders. Consolidation spread the assets and earnings of stronger companies over these weak properties but, in so doing, it made, in the course of time, the terms on which the consolidation borrowed more onerous than they would have been had the strong company maintained its independence.

The Boston and Northern and the Old Colony were the largest street railway consolidations in the state and they were formed by adding a number of more or less weak properties to two strong companies, the Lynn and Boston and the Brockton. There is some evidence that the immediate effects of consolidation were to improve the terms upon which these two roads borrowed; the prices of their outstanding bond issues increased as well as the premiums on their new issues of stock. The reason for this improvement, however, is to be found in the fact that the operating companies, at the instance of a holding company interested in selling its securities at a high figure, declared large dividends at the expense of maintenance and depreciation. This was, necessarily, a policy of short duration as was also the improved position in the capital market.

An examination of the history of the market for street railway bonds in Massachusetts indicates pretty clearly that, outside of the Boston Elevated, which, before 1915, borrowed on easier terms because of its favorable financial showing and because its securities were numerous, well known, and regularly quoted on the Boston stock exchange, the dozen or so largest street railway companies in the state were in about the same position. It is difficult to compare bond prices and yields because of the paucity of comparable maturities and terms of issue but the following quotations tend to bear out the above conclusions. After 1910 the Boston and Northern and the Old Colony were in distinctly a worse position in the investment market than those city properties, such as the Holyoke and the Union of New Bedford, which had refrained from extensive assimilation of country lines.

CONSOLIDATION OF STREET RAILWAYS

49

PRICES AND YIELDS ON VARIOUS STREET RAILWAY FIRST MORTGAGE BONDS ¹

Obligation of	Rate	1900		Price		Yield at prices of July 1
		Maturity	Jan. 1	July 1		
Union (New Bedford).....	5%	'14	105	105		4.76%
Worcester	5	'18	107	108		4.63
Boston and Northern	5	'24	113	113		4.42
Old Colony	5	'14	105	105		4.76
Old Colony	5	'20		107		4.67
<u>1905</u>						
Boston Elevated	4	'35		105		3.81
Boston and Worcester.....	4½	'23	100	102		4.41
Lexington and Boston.....	4½	'20	102	102		4.41
Lowell, Lawrence & Haverhill.	5	'23	105	103		4.85
Worcester	4½	'20	105	104		4.32
Boston and Northern.....	5	'24		110		4.55
Old Colony	5	'19	107	107		4.67
<u>1910</u>						
Boston Elevated	4	'35	99	96		4.16
Boston and Worcester.....	4½	'23	95	93		4.84
Lowell, Lawrence & Haverhill.	5	'23		102		4.90
Worcester	4½	'20	93	93		4.84
Boston and Northern.....	5	'24	105	104		4.81
Old Colony	5	'20	95	95		5.27
Boston and Northern.....	4	'54	88	87		4.59
Old Colony	4	'54	87	84		4.76
<u>1915</u>						
Boston Elevated	4	'35		81		4.94
Boston and Worcester.....	4½	'23		93		4.84
Lowell, Lawrence & Haverhill.	5	'23		100		5.00
Worcester	4½	'20		97		4.64
Boston and Northern.....	5	'24		99		5.05
Old Colony	5	'20		98		5.10

¹ From the *Commercial and Financial Chronicle*. Street Railway Supplements.

2. The union of a number of small, contiguous properties into a large street railway network undoubtedly makes possible a more effective allocation and utilisation of equipment. The economy of power generation alone, involved in large scale output, is considerable. But in this connection two important and relevant facts must be considered. At the time when many of the most important Massachusetts consolidations were formed the possibility of large scale generation and long distance transmission of electric current was non-existent. The street railways used direct current and, as

the Special Census Report on street railways of 1902 remarks, "The well-established limits to the economic distribution of direct current at the ordinary voltages for street railway work — do not exceed 10 miles, although longer distances have been covered."¹

The transition to alternating current was in process at this time but economy in the generation of power was not a saving of importance in the early consolidations.

Secondly, almost all the small properties absorbed had their own power plants and the necessary transmission facilities. As long as these could cover operating expenses and yield something towards fixed charges it was economical to keep them in use. The economies of power generation were not then usually as great as might seem possible from consolidation.

This same difficulty was met with in other types of equipment. If the consolidated properties could have been laid out anew with a re-location of car houses, a new articulation of track and a replacement of rolling stock the economies of consolidation would in many cases have been great. As long, however, as the operating expenses per unit with existing equipment were less than the total expenses per unit involved in a re-building, it was more profitable to use the old equipment. Since capital charges in the street railway industry are a high proportion of total costs, this meant that unless the economies to be obtained by reconstruction were enormous it would pay to go on using the existing equipment. In the course of time the wearing out of rolling stock, track and line equipment might have made these economies feasible but, as it happened, a number of things had, by that time, put the street railway industry in such a precarious position that abandonment rather than reconstruction was the only possible policy.

There is no doubt, as we shall see in the next chapter, that track layout has a definite effect on street railway costs. But the examination of a number of street railway consolidations leads one to the conclusion that economies of this sort would not have been available even had reconstruction been possible. In the Massachusetts Northern and the Massachusetts Northeastern consolidations, for example, small roads were put together end to end in such fashion that the operation of the consolidation must perforce be a mere summation of the operations of the smaller properties without possibility of a new distribution of equipment.

¹ *Street and Electric Railways. Census of 1902, p. 219.*

3. The economy of management incident to consolidation is one which it is exceedingly difficult to estimate. It seems evident that there is a great possibility of fruitful specialisation of function in a large organisation unavailable to a small one. But the actual economies of this sort possible because of consolidation depend on a number of variables. To the extent that it is possible to purchase expert advice or to hire particular managerial services from established specialists these economies may be secured without consolidation. A heterogeneous group of street railway properties may offer no advantages to central management. A long mileage spread over a large territory may offer as many disadvantages as advantages to consolidated operation. The Public Service Commission felt that these last two difficulties were of exceptional importance in the Bay State Consolidation.¹

Considerable evidence has been presented by street railway operators to the effect that mere size of the property brings unimportant managerial economies. E. Gonzenbach in a paper before the American Electric Railway Association maintained that the advantages of organisation connected with a far flung property had been exaggerated.² H. G. Bradlee of Stone and Webster, after a considerable examination of street railway operating statistics, gave it as his opinion, "that operating expenses per car mile are not materially affected by the mere size of the road. In general the small companies may be said to have slightly lower operating expenses per car mile than the large companies, but some of the large companies operate on a very low basis and some of the small companies operate on a high basis."³

What evidence the history of Massachusetts consolidations affords is not sufficient to enable one to judge whether the economies of management were greater or less than the waste.

4. It is obvious that an increase in the volume of traffic carried upon a fixed track and equipment will always result in economy of operation. We have here the familiar example of a reduction in the overhead charge per unit of output. To the extent that consolidation increased the volume of traffic it undoubtedly reduced the cost of transportation per passenger mile. The evidence is overwhelming that consolidation did as a matter of fact increase the

¹ Mass. P. S. C. 1916: 69.

² A. E. R. A. *Proceedings* 1909: 141.

³ *Ibid.*, 1912: 270.

volume of traffic on existing plant. The absorption of small suburban lines by city properties increased the movement between town and country. The union of small contiguous properties helped to build up a long distance business. The consolidation of a large number of independent properties into an extensive network such as the Bay State increased the value of the service which the street railway had to offer to its patrons in this territory.

An appreciation of these advantages to the traveling public explains in large part the stamp of approval which the Railroad Commission and the General Court set upon street railway consolidation in Massachusetts. Consolidation undoubtedly tended to increase the volume of traffic and consequently it tended to decrease the cost of carriage per passenger mile. But it is extremely doubtful whether the street railways benefited from this reduction. For consolidation almost universally meant an increase in the distance traveled per unit fare. Consequently, though the cost per passenger mile fell, it is doubtful whether there was a decline in the cost per passenger carried.

The Railroad Commission reporting in 1900 on the thirteen street railway consolidations permitted in that year asserted that, "in each case this has been accompanied by specific reductions in fare and extensions of rights of transfer."¹ The consolidations themselves were largely responsible for this increased service offered per unit fare and the reason seems to have been an exaggerated estimate of the effect on the volume of traffic.

5. The economies which consolidation secured through the volume of its purchasing were probably inconsiderable. The really important purchases necessary to the construction and equipment of the properties had already been made. The discount to be secured on the large scale buying of materials for maintenance was probably more than offset by the higher price the consolidation frequently had to pay for labor. The small town management hired its labor with a knowledge of the capacity of the laborer, and carried on its maintenance and repair at times when the local labor market was favorable. These advantages were outside the scope of the large consolidation.

All in all it seems probable that street railway consolidation, in Massachusetts at least, brought considerably less than the generally expected economy.

¹ Mass. B. of R. R. Com. 1900: 94.

CONSOLIDATION AND NET EARNINGS

This conclusion seems to be borne out by an examination of the net earnings on capital investment before and after consolidation. But it must be recognised that the evidence available is relatively unsatisfactory and inconclusive. The tables and charts presented below represent the results of six of the most important groups of street railway consolidations in Massachusetts.

The relation of net divisible income (after allowance for interest, taxes and depreciation) to capital stock paid in plus premiums does not, it must be admitted, give us necessarily a measure of the "profits" of the consolidated property. For, though the stock of the consolidating and consolidated properties was invariably exchanged on a share for share basis, this does not mean that the price paid for the latter was equal to the market price of the former. A good many of the consolidations represented stock watering through the payment of low prices for the acquired stocks of the consolidated companies. We do not know the prices paid for these stocks. A low return on total capital paid in, plus premiums, is compatible then with a high return to the owners of the stock of the consolidating company.

A better measure of the economies of consolidation might be given by comparing gross earnings minus operating expenses before and after consolidation per dollar of investment. This would eliminate the effect of changes in the capital structure on the percentage of net earnings to paid-in capital. But there seem to be two good reasons for preferring the net-earnings-to-paid-in-capital-ratio as a better measure of the economies of consolidation. First, one of these economies is supposed to be connected with cheaper borrowing by a consolidated property. The effect of this cheaper borrowing is only visible on net earnings after fixed charges have been met. Second, the capital structure changed but slightly during the period of consolidation for the companies we are concerned with. Furthermore what change occurred took the form of an increase in the proportion of bond to stock indebtedness. The equity was thinned but, if the new investments were wisely made, the net effect should have been an increase in the percentage of net earnings to capital paid in. The figures presented below show no marked increase in this percentage after consolidation and there is no reason to attribute this absence of result to changes in the capital structure.

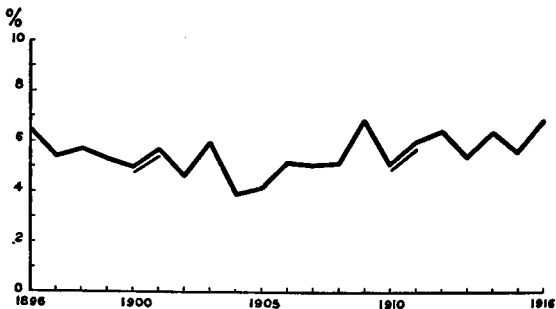
The company known as the Worcester Consolidated represented by 1912 a consolidation of seventeen formerly independent properties. The following table and diagram indicate the ratio of the sum of net income to the sum of the paid-in capital. The principal consolidations took place in 1900-01 and 1910-11:¹

WORCESTER CONSOLIDATED STREET RAILWAYS

Percentages of net divisible income to capital stock plus premiums.
1896-1916

1896 6.40	1903 5.92	1910 5.05 *
1897 5.39	1904 3.88	1911 5.91
1898 5.65	1905 4.10	1912 6.32
1899 5.27	1906 5.15	1913 5.29
1900 4.93	1907 5.08	1914 6.29
1901 5.62	1908 5.11	1915 5.44
1902 4.53	1909 6.82	1916 6.75

* Corrected for fiscal year only 9 months in length.



¹ On the following charts the period of consolidation is represented by a double line.

The Old Colony Street Railway was a consolidation of twenty-five companies, twenty-one of which were operating independently in 1897 and four of which were established later. The principal consolidations were made from 1900 to 1902:

OLD COLONY LINES

Percentages of net divisible income to capital stock plus premiums. 1897-1907

1897	4.18	1903	5.06
1898	4.83	1904	3.24
1899	4.04	1905	3.62
1900	4.71	1906	4.29
1901	6.53	1907	5.24
1902	6.04		



The Boston and Northern lines were a consolidation of some twenty-three independent properties, the principal groupings occurring from 1900 to 1903:

BOSTON AND NORTHERN LINES

Percentages of net divisible income to capital stock plus premiums. 1897-1908

1897	5.90	1903	4.40
1898	6.28	1904	1.56
1899	5.14	1905	4.05
1900	7.45	1906	6.35
1901	6.43	1907	5.69
1902	7.08	1908	5.57



The Northern Massachusetts came into existence as a result of the consolidation of three rather small properties in 1913 and 1914:

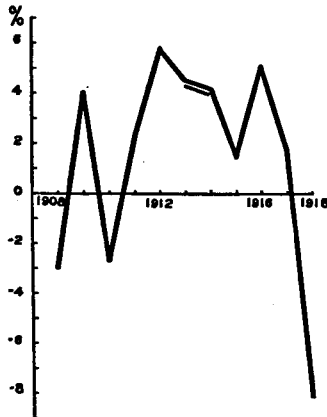
NORTHERN MASSACHUSETTS

Percentages of net divisible income to capital stock plus premiums, 1908-1918

1908	2.96 *	1914	4.20
1909	4.07	1915	1.45
1910	2.70 †	1916	5.10
1911	2.25	1917	1.74
1912	5.76	1918	8.10 *
1913	4.50		

* Net loss after operating expenses and fixed charges but before dividends.

† Correction made for fiscal year only nine months in length.



The Massachusetts Northeastern property was a consolidation of ten roads consummated in 1913 and 1914. Three of these roads were New Hampshire properties and the difference in accounting periods in New Hampshire and Massachusetts makes a combination of the accounts difficult:

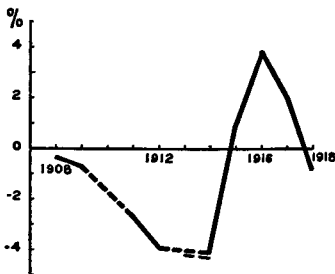
MASSACHUSETTS NORTHEASTERN ROADS

Percentages of net divisible income to capital stock plus premiums, 1908-1918

1908 .....	.38 *	1914	4.15 *
1909 .....	.71 *	1915 .....	.94
1910	†	1916	3.82
1911	2.68 *	1917	1.93
1912	3.91 *	1918 .....	.81 *
1913	†		

* Net loss after operating expenses and fixed charges but before dividends.

† Data lacking.



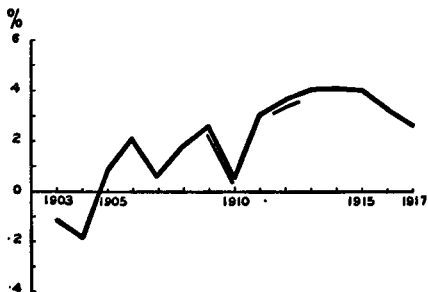
The Middlesex and Boston was a consolidation of nine operating properties, the chief groupings occurring in 1909, 1910 and 1912:

MIDDLESEX AND BOSTON ROADS

Percentages of net divisible income to capital stock plus premiums, 1903-1917

1903	1.15 ¹	1911	3.04
1904	1.81 ¹	1912	3.65
1905 .....	.89	1913	4.02
1906	2.16	1914	4.05
1907 .....	.62	1915	4.01
1908	1.80	1916	3.28
1909	2.62	1917	2.68
1910 .....	.55		

¹ Net loss after operating expenses and fixed charges but before dividends.



The tables and diagrams presented above indicate the percentage of net earnings to capital investment of the group of independent roads taken as a unit five years before consolidation and the same percentage for the unified property five years after consolidation. Where the process of consolidation has been spread over a number of years data are presented covering the five years, approximately, before the first important amalgamation and the five years following the last. This percentage of net earnings to capital investment is not, for reasons we have indicated, a good measure either of the economies of consolidated operation or of the profitableness of consolidation to the consolidating company. Nevertheless it remains true that if any large and immediate economies in operation, of the sort promised by company promoters, had been realised the results would have been evident in the percentage of net earnings to capital investment.

The above data, properly interpreted, certainly indicate no such results. The Boston and Northern and Old Colony consolidations show an immediate and rather large increase in net earnings but the whole of this increase is to be accounted for by the large reduction in their expenditure on maintenance in the years from 1901 to 1904. This reduction, which was laid bare in the Bay State Rate Case of 1914, enabled the promoters of the consolidation to pay an extraordinary dividend for two or three years compensated, in 1904 and 1905, by very small net earnings when the companies were forced to make good their neglect of maintenance.

The figures for the Middlesex and Boston and the Massachusetts Northeastern properties show a considerable increase in net earnings after consolidation. This result in the main, is to be explained in both cases by fare increases secured at the same time as consolidation. To the extent that consolidation enabled the companies to sustain the cost of rate cases, the increase in net earnings might be attributed to consolidation, but it is not, in any considerable measure, to be attributed to the economies of joint operation.

In so far as our data on the net earnings of consolidations indicate anything, and it is to be admitted that they are of doubtful significance, they substantiate the contention of the previous section, that the economies of consolidated operation of street railways in Massachusetts did not justify the hopes of investors or the promises of the promoters.

The typical street railway consolidation in Massachusetts, at

least after 1890, united a relatively strong city property with one, or a number of, country properties. The effect on the dividend rate was usually immediate. The Worcester Consolidated, which paid an 8% dividend regularly from 1895 to 1900, never paid over 6% after the consolidations of 1901. The Springfield street railway, which had paid an 8% dividend consistently from 1890 to 1910, consolidated in the latter year with the Western Massachusetts and in the following year with the Springfield and Eastern, with a resulting increase in its capital stock of \$1,450,000. The result was an immediate fall in the dividend rate to 7% and, after 1916, a complete cessation of dividends on the common stock until 1920. Of course, a decline in the dividend rate did not necessarily mean a decline on the return to investors; that depended on the price paid for the stock of the consolidated properties.

The rising costs of the war period illuminated, however, the weakening effect of consolidation upon Massachusetts city properties. The more extensive the consolidation the earlier the company was forced to pass its dividend. The only company which did not reduce its dividend during the war period was the Union of New Bedford, almost the only city property in the state which had not weakened itself by suburban consolidations.

THE NEW YORK, NEW HAVEN AND HARTFORD AND ITS
MASSACHUSETTS STREET RAILWAY HOLDINGS

An important episode in the history of the financing and consolidation of Massachusetts electric railways was the trolley buying of the New York, New Haven and Hartford Railroad, but it is an episode which is complete in itself and may be treated as such.

The story of the New Haven's attempt, under the leadership of C. S. Mellen, to monopolise the transportation facilities of New England of necessity carries us somewhat outside the scope of street railway enterprise and somewhat outside the boundaries of Massachusetts. But, in so doing, it sheds considerable light upon an important period in street railway development and upon a significant interpretation of the position of the street railway in the country's transportation system.

The New Haven's trolley ventures were generally described around 1906 and 1907 as epoch making. By 1913 it was agreed with equal generality that the Mellen policy was one vast mistake. This sharp reversal of opinion in a sense foreshadowed the destiny

of the street railway industry; the years which intervened between 1907 and 1913 witnessed the change from growth and prosperity to decline and depression.

The acquisition of electric railways on a large scale began in 1903 when Mellen came to the presidency of the New Haven. At that time the railroad was in possession of a scant fifty miles of street railways acquired at the instigation of Presidents Clark and Hall. The New Haven in the main had met the menace of electric railway competition by fighting in the courts the granting of locations which paralleled the steam lines. Mellen met this competition by acquiring street railways but, further, elaborated a new policy which was to unite the steam and electric lines into a single network of complementary properties.

He commenced by buying roads in Connecticut and soon had a virtual monopoly of electric transportation in that state. The Connecticut campaign, carried on with the passive coöperation of an inert body of railroad commissioners and involving as it did a partial domination of the state government is an interesting study in itself, irrelevant, however, to our subject. In Massachusetts the New Haven began by buying a few small suburban roads around Worcester, the Worcester and Holden, the Marlborough and Westborough, the Worcester and Southbridge and the Worcester and Blackstone Valley. These roads were ostensibly held by the Consolidated Railways Company, a Connecticut holding company organised to administer the securities of the New Haven's street railway properties.¹

The acquisition of more considerable properties soon followed. A special holding company, the Springfield Railways Companies, was organised to buy the stock of the Springfield system. The New Haven quickly acquired a major part of the stock of the Berkshire system and the Worcester Consolidated Company. By 1908 Mellen had acquired sixteen Massachusetts street railways representing about $\frac{1}{6}$ the total mileage and $\frac{1}{6}$ the total capital of electric railways in this state.²

An admiring contemporary, shortly before this, had summarized his campaign by stating that in the west his position was secure.

¹ The Worcester and Connecticut Eastern had been the original vehicle by which the New Haven acquired its Massachusetts properties but this soon became the Consolidated Railways Company.

² *Mass. Commission on Commerce and Industry, 1908, p. 51.*

"But eastward the case is different, and his system is still vulnerable in the large and intricate network of steam roads of the Old Colony group lying southward of Boston and north of Providence and Fall River. The key of the position is Providence and the suggested protective step, the buying up of the street railway system there, which means the purchase of the whole street railway system of Rhode Island, which has been twice recapitalised with very liberal injections of water."¹

This foreshadowed step was soon consummated and with it the New Haven control of electric railways in the two southern states of New England was complete. Shortly before this its energetic president had acquired the New England Navigation Company, operating steam boat lines from the principal New England ports to New York. Shortly afterwards came the project of amalgamation with the Boston and Maine. The Boston and Albany, the only considerable independent railroad outside the New Haven system, was hemmed in by New Haven trolley properties which paralleled its right of way from Worcester to Springfield, and which, with a few connections in the Berkshires, could be made to parallel it to the New York state line. This development, reported the *Railroad Gazette*, is "tending more and more to cut off its local passenger traffic and to reduce it to a through line—a kind of long bridge between Boston and Albany."²

Before discussing the financial results and political repercussions of this policy in Massachusetts it would be well to consider its rationale and explanation. The New Haven owned in 1907 slightly less than 1500 miles of trolley line representing an investment of around \$120,000,000. The Delaware and Hudson owned a few hundred miles of street railway track, and the Southern Pacific was to acquire slightly over 1,000 miles. Apart from these three companies, however, the steam roads of the country had kept out of this field; and among these three companies the New Haven's policy was by far the most interesting and important.

At first, and possibly foremost, the Mellen policy was designed to eliminate electric railway competition. Parallel lines were acquired and also properties which would make the building of parallel lines by other interests unprofitable. It is a little difficult after witnessing for the last two decades the declining street railway

¹ *Railroad Gazette* 40: 538. June 1, 1906.

² *Ibid.*, 43: 192. August 23, 1907.

industry to understand clearly the seriousness of the bugaboo of electric railway competition between 1900 and 1910. The decrease, however, in local and suburban traffic on all the New England railways with the spread of the electric system gave some point to the apprehension of railroad men. As it turned out this fear was exaggerated. The Mellen trolley purchases, however, far outran the needs of a merely protective policy. Street railways were acquired in the belief that an economic and profitable amalgamation of electric and steam properties was possible. Where electric and steam lines were parallel the electric roads were to be used for local passenger traffic and the steam roads for through service.¹ The small suburban trolley could act as feeders to the steam road. It was possible on certain sections of the New Haven's properties to purchase a ticket for passage from points on an electric line to any point on the steam line. The value of the electric lines as feeders could be enhanced by a harmonising of schedules of operation.² Then too the New Haven interests already expected considerable economies from operating consolidations of their electric properties.³ Their Massachusetts holdings, however, for a number of reasons were never consolidated. Finally, Mellen had broad visions of an interchangeable traffic between steam and electric properties made possible by a change in the type of rails used on electric railways and furthered by an eventual electrification of his main lines. "A passenger taking the car at his door in one city could be delivered over the electrified steam line at the 'doorway of destination' in another city."⁴

The financial showing of the electric railways acquired by the New Haven was not considered by its management to be an adequate indication of the wisdom of the policy. The electric roads presumably served the steam roads and augmented their traffic. Mellen regarded himself as in the business of selling transportation; the character of the transportation sold was a matter of minor importance.

The potential monopolisation of transportation facilities incident to this policy was the thing which brought the New Haven into conflict with the governing agencies of Massachusetts. The New

¹ *Railroad Gazette*, 43: 192. August 23, 1907.

² *Ibid.*, 39: 388. October 27, 1905.

³ *Ibid.*

⁴ *Ibid.*, 39: 477. November 24, 1905.

Haven bought the greater part of its trolley properties in Massachusetts without interference from the Board of Railroad Commissioners. But in 1905 the Attorney General of the state handed down the opinion that such purchase was illegal under Massachusetts law; and the legislature, shortly afterwards, called for an investigation. When the Boston and Maine asked in 1906 for permission to purchase trolley properties in Massachusetts the attention of everyone was called to the fact that the New Haven through its holding companies had been doing just this thing for a number of years. The affair became a first rate political issue and Governor Guild in a message to the legislature "attacked the whole theory of steam-electric mergers."¹

The issue in the mind of the public was pretty clearly the monopolisation of transportation, and the public animus against the New Haven was born of the fear which this possibility conjured up. But the case of the commonwealth against the railroad was based on the violation of the Massachusetts law of public utilities. Under color of its Connecticut incorporation the New Haven was acting in Massachusetts in a manner in which a company incorporated only in Massachusetts would be forbidden to act by law. The case turned in particular on three counts.

1. The New Haven had increased its capitalisation without authorisation from the commonwealth.
2. The New Haven, without authorisation of the commonwealth, had obtained control of the securities of other corporations.
3. The New Haven, again without authorisation, had issued bonds and coupon notes in excess of its capital stock.²

The purchase of electric railways without authorisation was the principal charge; and in the so-called trolley merger case the Supreme Court of Massachusetts held these purchases to have been illegal, and ordered the railroad to divest itself of its trolley holdings before July 1, 1909.³

The New Haven had sought to allay the public alarm in Massa-

¹ *Railroad Gazette* 41: 26. July 13, 1906.

² Report of the *Joint Committee on the New Haven Railway*, 1911, p. 13-14. (The so-called "Validation Committee.")

³ 198 Mass. 413. The particular statute violated was St. 1906 c. 463 Part II § 57 which reads, "A railroad corporation, unless authorized by the general court or by the provisions of the following five sections shall not directly or indirectly subscribe for, take or hold the stock or bonds of or guarantee the bonds or dividends of any other corporations."

chusetts shortly before this by transferring all its Massachusetts holdings from the Consolidated Railways Companies, the Connecticut corporation, to a newly organised Massachusetts company called the New England Investment and Securities Company. It also refrained from further purchases of Massachusetts railways. But it was another matter to divest itself at forced sale of properties expensively acquired. Moreover the attitude in Massachusetts toward New Haven ownership, in certain sections at least, was obviously changing rapidly.

The street railways of the commonwealth were finding it difficult to make ends meet and with rural communities clamoring for electric communication the street railway mileage remained practically stationary. Only the New Haven properties were building; and in the western part of the state, served by the Berkshire Street Railway, the political pressure for transportation facilities was so great that the state legislature by special act validated the New Haven ownership of the Berkshire system.

This validation ran counter to the advice of the Massachusetts Board of Railroad Commissioners, which, in a special report to the legislature, asserted its opinion that, "Private capital can be secured for the construction of additions to and extensions of street railway or other lines in Massachusetts when sound and reasonable public demands exist."¹

This was probably true but the New Haven was evidently willing to build when no "sound and reasonable" demand existed. A bill was before the legislature to legalise the New Haven control of lines in central Massachusetts on the promise of the company to spend \$5,000,000 in rural extensions.² In the light of this change of attitude the attorney general tacitly abandoned his attack on the New Haven's trolley holdings in this state.

The Mellen policy appeared finally to be successful in this direction and its success must be largely attributed to a decline in the street railway industry in Massachusetts, a decline which made

¹ Mass. B. of R. R. Com. 1909: 126.

² *Railway Age Gazette* 52: 668. March 22, 1912. This bill, House Bill No. 2152, was designed to incorporate the Worcester, Springfield and Berkshire Street Railway, uniting the major part of the New Haven's street railway holdings in Massachusetts together with certain other properties. The Board of Railroad Commissioners reported unfavorably on the project, because of an increase in the capitalisation involved and it never became law. See Mass. B. of R. R. Com. 1912: 167.

X4151.7385.N3
G2
68138

existing companies unwilling to extend their mileage and new companies unwilling to venture into untried fields. But though this decline in street railway prospects permitted the New Haven in certain quarters to conquer public opinion and legislative opposition it proved the management's undoing. Attacks came from another quarter. Stockholders awakened to the effect of the enormous increase of fixed charges resulting from Mellen's policy of expansion and saw with alarm the resulting decline in dividends and in the financial position of the company. Attempting to recoup its trolley losses the New Haven management introduced economies in the steam line operation, and the results on service led to rigorous complaints from shippers and the general public.¹

The opposition to the Mellen policy at the outset had come from those who feared monopolisation. The opposition which finally overthrew him came in the form of a concerted attack from stockholders on the inside and from the users of New Haven steam railway service on the outside. In July, 1913, Mr. Mellen resigned, asserting that time would vindicate the wisdom of steam and electric consolidation.

Time has not done so. Nor did it appear evident in 1913 that time would do so for the motor car and rising electric railway costs were already pointing sufficiently in the other direction. The New Haven acquired its street railway holdings at high prices, prices which could only be justified by discounting a rosy future for electric traction. In the words of the Interstate Commerce Commission, "The outside properties of the New Haven have been acquired at extravagant prices." But the Commission went on to say, "They are for the most part of substantial value, and in many instances are a kind of property, the value of which should improve."² This was in 1912. A year or so later, when the street railway situation had become more gloomy, the Commission was more dubious.

"Marked features and significant incidents in the loose, extravagant, and improvident administration of the finances of the New Haven as shown in this investigation are . . . the recklessness in the purchase of Connecticut and Massachusetts trolley lines at prices exorbitantly in excess of their market value."³

It is difficult to discover the exact prices paid by the New Haven

¹ Mass. B. of R. R. Com. 1912: 78.

² 27 I. C. C. Rep. 593.

³ 31 I. C. C. Rep. 34.

in its Massachusetts purchases but certain figures are available. In 1905 the New Haven, through a subsidiary, authorised Lee Higginson and Company to acquire the stock, or a major part of the stock of the Springfield Street Railway at \$225 per share.¹ This was a good company which had paid a dividend of \$8 a share regularly since 1890. But a dividend of this size does not justify \$225 a share unless either the earnings or the prospect of future earnings is greatly in excess of dividend requirements. The earnings little more than covered dividends; the price therefore discounted a very optimistic view of the future.²

The stock of the Berkshire Street Railway was bought at prices which ranged from \$100 to \$300 a share.³ It was carried on the books of the New Haven at \$149.20 a share which probably represented about the average price paid. The Massachusetts validation committee of 1911 calculated a value of \$67.50 a share after a valuation of the property.⁴ Capitalising the net earnings of 1910 at 4½ per cent gave a figure of \$49 a share. The events of the next few years demonstrated that even this latter value was excessive.

The New Haven bought in 1906 from the Boston and Worcester Railway Company the property and rights of the proposed Hartford and Worcester road at a price which yielded, according to a commentator, "a good profit to the Boston and Worcester interests."⁵ In fact some \$134,000 was paid for the right to build a street railway. The New Haven proceeded to sink \$160,000 in the property in building and equipping slightly over two miles of track, after which they transferred the company to another subsidiary at a price fixed, by the Massachusetts Board of Railroad Commissioners at \$140,000.⁶ This price was probably somewhere near its value.

The stock of the small suburban properties near Worcester was carried on the books of the New Haven at a figure close to par and this probably represents about the price paid though these roads were close to a state of bankruptcy when bought.

Enough has been said to show that the prices offered by the New

¹ Trolley Merger Case 198 Mass. 427.

² The stock of the Springfield Company had, however, been selling close to this price before the New Haven became interested.

³ 31 I. C. C. 107. Exhibit D.

⁴ Report of Joint Commission on the New Haven Railway. 1911, p. 95.

⁵ *Railroad Gazette* 40: 100. February 2, 1906.

⁶ Mass. B. of R. R. Com. 1910: 130.

Haven for Massachusetts street railway properties were extravagant. It is interesting to consider the question why such prices were paid. It has been commonly believed that certain of the transactions of the New Haven were fraudulent; that officers of the road were profiting at the expense of the stockholders. In at least two instances the Interstate Commerce Commission found it difficult to avoid the suspicion. The Rhode Island trolleys, owned by a Philadelphia holding company, were purchased at a price over three times the valuation put upon them by the Massachusetts validation committee. "The inevitable query is, what was the motive behind this transaction and who made the profit?" asked the Commission.¹ Any possibility of an answer was destroyed by the deliberate burning of the stock books of the holding company.

The same expedient served to shroud in mystery the final lavish disposition of funds sunk in acquiring the property which later became the New York, Westchester and Boston.

There is no evidence and no suspicion, however, that funds expended in buying Massachusetts trolleys went to others than the proper recipients. These sums were invested on the expectation that the electric railway had a brilliant future and that the steam-electric consolidation proposed by the New Haven management would yield earnings more than sufficient to justify the expenditure. Such seems, on the whole, to have been the opinion of the Validation Committee. Referring to the major part of the New Haven's trolley purchases in Massachusetts, those held by the New England Investment and Securities Company, the Committee said, "the companies referred to are stated to be earning in excess of the interest on these securities, and the chance that they will ever constitute a real liability upon the New York, New Haven and Hartford Railroad Company is very remote."²

A comparison, moreover, of the amounts paid by the New Haven and the amounts paid for similar properties by the bankers who built up the Old Colony and the Boston and Northern consolidations indicates that the railroad management was not alone in its exaggerated estimates of the possibilities of electric traction. All in all it would appear that the judgment of the New Haven management was no worse, or better, than the judgment of the average uninformed investor on the future of the street railway.

¹ 27 I. C. C. 580.

² Validation Report, p. 125.

The New Haven insisted on its transportation monopoly and it insisted upon the speedy consummation of this aim. This meant, in the words of the Interstate Commerce Commission, "the reckless and scandalous expenditure of money; it meant the attempt to control public opinion; corruption of government; the attempt to pervert the political and economic instincts of the people in insolent defiance of law."¹

The use of stockholders' money in trolley purchases, whatever may have been the situation elsewhere, in Massachusetts at least, appears not to have been fraudulent. It was, at worst, simply a stupid misjudgment. The railroad has, in consequence, spent the last fifteen years in writing off its trolley losses and will no doubt spend a large part of the next fifteen in the same occupation.²

¹ 31 I. C. C. 68.

² The subsequent history of the relation of the New Haven to its Massachusetts trolley properties is uninteresting. A dissolution order (1914) of the U. S. District Court for the Southern District of New York decreed their disposal by July 1, 1919, but the decree was modified on August 26, 1920, and again on June 4, 1923. An act of the Massachusetts Legislature validated the securities of the New Haven as of May 15, 1915. An act of May 1, 1917, prohibited, among other things, the payment of a dividend above 5 per cent., until the company had replaced out of earnings the losses involved in the sale of securities of its subsidiary properties. An act of June, 1927, provided for the reorganisation of the New England Investment and Securities Company. The New Haven's holdings in Massachusetts have not been diminished by sale but naturally they exhibit the same abandonment of mileage as marks the rest of the state's street railways. The Berkshire Street Railway abandoned, January, 1931, the last of its mileage and now operates with busses only.

CHAPTER 4

STREET RAILWAY COSTS AS AFFECTED BY THE DENSITY OF TRAFFIC

An analysis of costs involving comparisons of different properties at the same time or of the conditions of a particular property at different points in time requires a reading of economic meaning into the statistical material and units of measurement available. A delver into the statistics of Massachusetts street railways over the last four decades is baffled by the quantity of facts, of a kind, which confronts him. Unfortunately the kind of facts which lie so easily at hand does not fit with any simplicity into a proper scheme of economic analysis.

A due regard for the nature of the relevant problems and for the character of the material available suggests a division of street railway costs into investment costs, operating costs and taxes. The problem of taxes, a matter of considerable importance, may be handled separately and put over to the concluding section of the next chapter. The present chapter is concerned with a somewhat special study of the relation between density of traffic and the cost of service on Massachusetts properties, and is in the nature of a digression from the main theme of the industry's development in this state.

THE UNIT OF OUTPUT

A treatment of investment costs and operating costs per unit of product necessitates at the outset some discussion of the nature of the unit of product in the street railway industry. The most significant measure of service *provided* is, probably, the seat mile. For a number of reasons, however, the seat mile is not a unit adapted to the purpose of cost analysis. No data on the number of seat miles provided per annum are available and the derivation of such data for a large number of companies over a period of years would be exceedingly difficult if not impossible. Statistics of car miles are at hand but a great diversity of cars with respect to

seating capacity has always existed and the reported data do not classify the car mileage on a basis of seating capacity.

The best measure of service rendered is, probably, the passenger mile but here again we are faced with the impossibility of collecting or deriving accurate data. The prevalent American flat rate of fare ignores the number of miles ridden per passenger. Moreover there has always existed a great variation between street railways, in this state and elsewhere, not only in the length of possible ride but in the length of the average ride.¹ In general the average ride per unit fare tends to vary directly with the length of line included within the unit fare limit.² As a rule the average length of ride on city properties is, and has been, considerably in excess of the average length on small town properties. Furthermore there has been a marked change in the length of the possible and the average ride per unit fare over time. In the ten years or so following the introduction of electric traction the length of ride increased continuously; during the last fifteen years, on the other hand, there has been a gradual diminution of the length of ride per unit fare but this diminution has been very unevenly distributed over existing street railway properties.

AVERAGE LENGTH OF ROUND TRIPS ON MASSACHUSETTS
STREET RAILWAYS. IN MILES *

	1890	1900
All roads	7.04	10.45
Boston Elevated—West End.....	7.53	11.22
Springfield	5.99	10.24
Worcester	4.99	6.49
Holyoke	5.46	9.93
Union (New Bedford).....	4.51	6.34

* These figures are secured by dividing the number of car miles by the number of round trips. In general the round trip was within one fare limit. After 1900 the number of round trips was not reported.

¹ D. C. Jackson and D. J. McGrath (*Street Railway Fares*, p. 50-51), have published maps of the areas lying within the 5¢ fare areas of a number of representative American street railways in 1913. The variation in Massachusetts 5¢ areas mentioned was great; Boston, 81 square miles, Springfield, 64, Holyoke, 43, Worcester, 42, and New Bedford, 12. The average radii for these areas were 6 miles, 4.5, 3.7, 3.7 and 1.9.

² A large number of traffic counts in various cities leaves no doubt that the facts, "show a well-defined increasing average length of ride with increasing length of line." *Op. cit.*, p. 37.

The impossibility of securing comparable data on seat miles and passenger miles forces us to use as a unit of product in our analysis the revenue passenger carried.¹ The number of revenue passengers carried per unit of resources is a good measure of business or private product but is only a fair measure of service provided or of service rendered. The passenger ride of four blocks represents by this test the same quantity of service, or output, or product, as the passenger ride of ten miles. The considerable variation in the average length of the ride on street railways in Massachusetts at a particular time, or on a given line or group of lines over a period of time, certainly lessens the utility of this unit as a measure of the service rendered by street railways to the consumers. Nevertheless it appears to be the most satisfactory unit of product available.

OVERHEAD AND VARIABLE COST

The division of street railway costs into investment costs and operating costs is dictated by the manner in which the companies present their accounts. The nature of this division and its significance has, however, necessarily changed considerably with the development of the industry and the change in the character of regulation. Under the Massachusetts system of security control the investment may fairly be taken as indicating the amount of money put into the property. This does not mean, however, that there is any very close relation between the amount of the investment and the historical cost of the property in use at any particular time.² Before the period when the Commission was adequately supplied with engineers and accountants there is reason to suspect that a large part of the cost of replacement was not treated as an operating expense but was added to investment. When, as in the last decade, street railways have abandoned track and equipment without writing this property off the books, the divergence between the investment and the historical cost of the part operated has been

¹ The unit of product most frequently used in the industry is the car mile. For purposes of cost comparisons over a number of years for a particular company this is a perfectly valid and useful unit. It is also feasible when the properties compared are of the same class with similar densities of traffic. But in a study of the present sort involving comparison between a large number of very different properties, the differences in numbers of passengers carried per car mile is so great as to deprive it of significance.

² Even allowing for the cost of promotion, organisation and every expenditure necessary to make the property a "going concern."

very great. Nevertheless it remains true that the investment at any particular time, in our analysis of costs, probably represents pretty closely, taking account of the vicissitudes of the industry under Massachusetts conditions, the amount of money required to provide the amount and kind of service provided at that time. Whether the investment was prudent is another matter and one which we shall have to examine later.

The method of calculating and reporting operating expenses has also altered in the course of time, the most considerable changes occurring in the allowance for maintenance and depreciation. An insufficient allowance for maintenance in the early years makes the operating costs per revenue passenger abnormally low and, in so far as maintenance was not taken care of by an increase in the investment, the service was impaired later. Very few of the roads made any allowance for depreciation over and above maintenance and the addition of this charge in later years also increased operating expenses.¹ The whole question of maintenance and depreciation is a tangled one and is reserved for discussion in the next chapter. The scope of the present chapter is confined to a consideration of the relation between density of traffic and the cost of service as represented in the reported accounts.

The relation between density of traffic and the cost of service is worth studying very largely because of the importance of overhead cost in the street railway industry. We are concerned here with two uses of this distinction between overhead and variable costs. In the first place certain costs may be constant and others variable within certain limits of variation in the *expected* output. This is the result of a discontinuity in the application of resources. Two street railways may make the same expenditure for ways and structures per mile of track even though their expected density of traffic may vary considerably. However their investment for rolling stock may be more closely adapted to the density of traffic. For this variation of expected output then, the investment in ways and structures is a fixed investment and the investment in rolling stock is variable. In the second place, within the life time of the plant and equipment, a deviation between the expected and the actual output may increase or diminish the constant cost per unit of output. This second distinction between constant and variable costs is a function of time. In the short period the durability

¹ When it was not included in fixed charges as it sometimes was.

of plant and equipment forbids that adjustment to output which may become possible over the longer period as the plant and equipment wear out.

In the street railway industry constant costs in both the above uses of the term are extremely important. The nature of the plant and equipment makes a close adaptation of the investment to the expected demand difficult. Furthermore, the effect of a great decline in the demand for street railway services has been that the investment in anticipation of expected traffic was far greater than actual traffic could justify. Consequently street railways have been afflicted with a heavy burden of costs which did not decline with a decline in output.

If the investment in electric traction were divisible into small units, a perfect adaptation of output to expected demand and of costs to expected output under all conditions would be possible and the density of traffic would have little bearing on the cost per unit of service. Total cost would tend to be constant per unit of expected output.¹

As it is, different parts of the investment have a different divisibility and, consequently, the various costs have a different relation to the volume of output. A slight increase in the volume of traffic might be cared for without increase in costs of any kind. A further increase might necessitate an increase in the number of car miles without an increase in the number of cars. A still further increase would, perhaps, necessitate an increase in the number of cars but no increase in track or power plant facilities. With respect to all variations in output certain expenses are variable or operating expenses and certain are fixed or overhead expenses.

The street railway industry, then, in common with other public utilities, is an industry in which the proportion of constant to total costs is high. Any measurement of this relation, however, is difficult if not impossible. The ratio of investment in street railways to gross revenues and the ratio of operating expenses to operating revenues are occasionally referred to as indicating the proportion of constant to total costs. In this connection it is interesting to observe the effect of the introduction of electric traction on these ratios for certain representative Massachusetts properties.

¹ Except perhaps as the technique of production varied with the volume of output.

76 THE STREET RAILWAY IN MASSACHUSETTS

RELATION OF INVESTMENT TO GROSS REVENUE
1885 (Horse railways)

	Investment	Gross revenues	Ratio of investment to gross revenues
Lynn and Boston ...	\$ 734,402	\$ 368,669	1.98
Springfield	199,980	75,225	2.66
New Bedford	174,294	78,685	2.21
All Massachusetts			
Street railways ...	14,186,080	5,194,438	2.73
1890 (Electric traction)			
Lynn and Boston ...	\$10,863,770	\$1,945,414	5.58
Springfield	2,419,004	686,049	3.53
New Bedford	1,072,309	249,640	4.31
All Massachusetts			
Street railways ...	98,700,074	21,387,640	4.61

OPERATING RATIO FOR MASSACHUSETTS STREET RAILWAYS
TAKEN AS A WHOLE (1885-1900)

1885	80.02	1890	74.80	1896	71.16
1886	80.04	1891	76.13	1897	68.95
1887	82.81	1892	71.74	1898	69.01
1888	81.07	1893	69.26	1899	68.20
1889	78.40	1894	69.51	1900	65.80
		1895	68.93		

The above tables clearly indicate that the proportion of investment costs to total costs increased rapidly with the introduction of electricity and it is a matter of common knowledge that this ratio in the street railway industry is high in comparison with the ratio between investment and value added by manufacture in most manufacturing industries.¹ It is, moreover, probably true that the importance of overhead cost in an industry varies directly with the ratio of investment to gross revenue and inversely with the operating ratio since a heavy investment usually indicates a long average lifetime of and a considerable discontinuity in the application of resources. It by no means follows, however, that the investment ratio can be taken as a measure of constant cost. The so-

¹ L. R. Nash, *Economics of Public Utilities*, publishes on pp. 17-18 a table of illuminating data on this matter. As a matter of fact the investment to gross-revenue ratio for public utilities is, perhaps, not quite comparable with the investment to value-added-by-manufacture ratio in manufacturing industries. Certain public utility expenses might be considered to be raw material costs and hence subject to deduction from gross revenues.

called fixed charges are not constant costs in this sense nor are operating costs variable.

If investment costs were true constant costs the investment per mile of track, all other conditions being equal, would be about the same for different companies regardless of differences in expected density of traffic. Similarly the investment in rolling stock, structures, power plant and other forms of equipment would vary little with the expected density. Fixed charges, including taxes on the capital investment, and ignoring differences in the cost of financing, would be fixed in a narrow sense of the word. As a matter of fact, this is not so. Investment can be and is partially adapted to the density of traffic. On properties with a low density of traffic the investment in track, rolling stock, structures, power plant and other forms of equipment tend to be less per mile of track than for properties with a higher density of traffic.

Investment costs are not truly constant nor are operating costs truly variable except within particular time and volume of output variations. Under ideal conditions it would be possible to correlate the costs of various parts of street railway plant and equipment and the separate costs of operation with the different densities of traffic lying within Massachusetts experience. Such a correlation would lay bare the extent of variation of each type of cost and would enable us to explain the effect of the different lengths of lives, and the discontinuity in the application of, resources in the street railway industry. Actually we must accommodate ourselves to a somewhat less expansive outlook. Something may, however, be done with the data at hand. But before proceeding to a statistical treatment it will be necessary to consider the nature of the available measures of density of traffic.

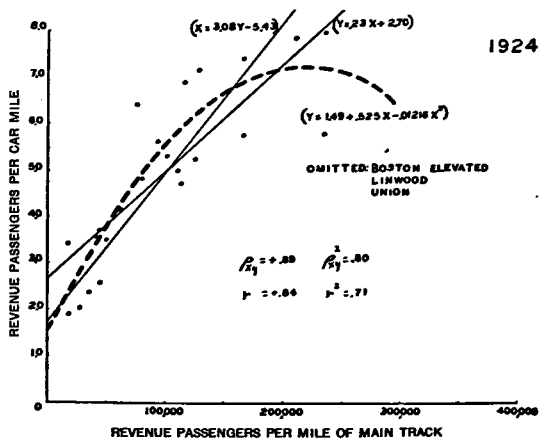
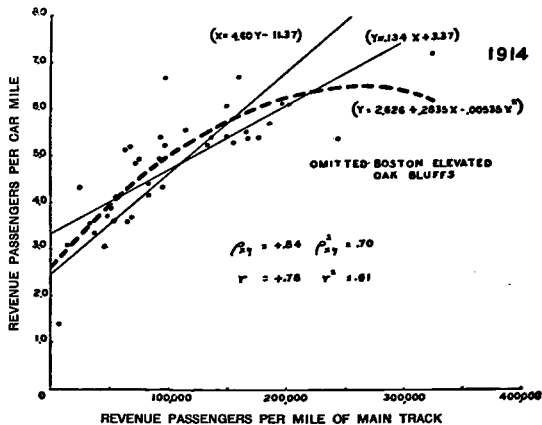
DENSITY OF TRAFFIC AND COSTS

There are two measures of density of traffic in common use and easily calculable, revenue passengers per car mile, and revenue passengers per mile of main track. Both of these measures are seriously affected by differences in the average length of ride and, consequently, tend to minimise the service rendered on those properties whose average ride is long. In general, as we have already pointed out, the average ride tends to be long on those properties having a high density of traffic.

What we may call the track density of traffic equals what we

78 THE STREET RAILWAY IN MASSACHUSETTS

DENSITY OF TRAFFIC ON MASSACHUSETTS STREET RAILWAYS



may call the car density of traffic multiplied by the number of car miles per mile of track. On the whole there is a distinct correlation between track density and car density of traffic on Massachusetts street railways. On roads having a very low track density of traffic the car density tends also to be low. As the track density increases, however, the curve of car density tends distinctly to flatten out until for the larger roads great differences in track densities are accompanied by very slight differences in car densities.

The above diagrams indicate pretty clearly a relation between track and car densities of traffic. At the same time it is also clear that individual roads may vary considerably from the normal relation.¹ Under certain conditions these measures of density of traffic tend to vary in opposite directions; for example, an increase in passengers per mile of track can often be secured, but at the expense of passengers per car mile, by increasing the frequency of service. Vice versa, an increase in passengers per car mile can sometimes be secured, but at the expense of passengers per track mile, by the provision of a less frequent service.

It is clear that, in the course of the development of the industry, the correlation between these two density measures has become more perfect.² This fact in itself is of some significance. It prob-

¹ Jackson and McGrath (*Street Railway Fares*, p. 12) who made a similar study for a number of roads over the country for 1913 state the relation between track and car densities as follows: "There is no absolutely fixed relation between these two units. Of two roads which have the same number of revenue passengers per car-mile, one may carry a larger number of passengers per mile of track per annum than the other. In general, a high density of traffic in terms of the first unit will also be high in terms of the second, but this is not universally so."

² Coefficients of correlation for these two measures of density of traffic on Massachusetts street railways were calculated for 1894 and 1904 as well as for 1914 and 1924. The comparative results are as follows.

	1894	1904	1914	1924
Linear correlation				
r	+ .395	+ .60	+ .78	+ .84
r^2	.16	.36	.61	.71
Parabolic correlation				
Pxy	+ .394	+ .625	+ .84	+ .89
Pxy	.155	.39	.70	.795

In this calculation the returns for each street railway were weighted as one even though the roads showed a considerable variation in importance. The Boston Elevated, the largest company in the state, was, however, excluded in every case and, with the elimination of the smaller and weaker properties, the included roads became more equal in importance with the passage of time.

ably means that roads with high track densities and low car densities have had to increase their car densities by a more careful adaptation of rolling stock to the needs of traffic. Roads with high car densities and low track densities have been eliminated along with those roads possessing both low car densities and low track densities of traffic. In other words the street railway properties which have survived are those which have possessed relatively high car *and* track densities.

The tendency of variations in car densities to disappear in the upper ranges of track densities is probably to be explained by an approach to a maximum density per car mile determined by the length of the ride maintained in a city service and by the concentration of traffic in the rush hours.¹

The question, which measure of the density of traffic is more significant, as a criterion of the effective utilisation of the investment, is a difficult one. The authors of one of the best books on street railway costs vote for the car-mile unit without, however, any considerable analysis of the evidence.² The approach of car mile density to a maximum in city service, however, tends to destroy its value as an index over a considerable range of street railway experience. Passengers-per-car-mile would be a more adequate index if the average length of the ride were uniform and short for all kinds of street railway service. As it is, the more elastic passengers-per-track-mile measure is to be preferred.

The chief cause of differences in density of traffic on street railway properties is, of course, differences in population and in densities of population of the areas served, but there are many other variables. Roads serving a given population and operating within fare limits of given area may show different densities of traffic depending, among other things, upon the rate of fare, the economic employment of the population, the situation of the area's industrial and commercial enterprises with respect to the residential sections, the income per head of the population and the distribution of this income, the availability of alternative transportation agencies, and the attitude of the public and its governmental representatives toward the railway.

¹ This maximum is seriously affected by the standard of service demanded, the size of the cars and the distribution of traffic between rush hour and the non-rush hour service.

² Jackson and McGrath, *Op. cit.*, p. 13.

The preceding discussion of the importance of overhead cost in the street railway industry and the nature of the available measures of density of traffic may serve as an introduction to the tables presented below which present certain average annual operating statistics for all the Massachusetts street railways classified into four groups. Class A includes only those companies operating in metropolitan Boston, the West End until 1897, the Boston Elevated with its lines leased from the West End, from 1897 to 1922, and the Boston Elevated alone since 1922. Class B includes companies the major part of whose lines lay within a single city of more than 50,000 population in 1910. Four roads in this class have had a continuous operating existence as electric properties over the whole of the period considered, the Springfield, the Holyoke, the Worcester and the New Bedford. Class C is a mixed group of interurban properties each of which served, at some point in its network, a town of more than 50,000 population, census of 1910. The largest road in this group was the Bay State, now the Eastern Massachusetts. Class D is composed of roads serving towns and cities of less than 50,000 population. The only distinctly city property in this group is the Fitchburg and Leominster. Roughly speaking, the classification might be described as consisting of Boston lines, city lines outside of Boston, interurban lines, and country properties.¹

AVERAGE ANNUAL OPERATING STATISTICS BY DECADES

A. First Decade (1890-99)

	Class A	Class B	Class C	Class D
Revenue passengers per annum per mile of main track operated	586,262	207,768	152,402	83,297
Revenue passengers per car mile	6.371	4.994	5.013	4.021
Operating expenses per car mile	\$.2310	\$.1747	\$.1629	\$.1533
Gross income per car mile	\$.3207	\$.2496	\$.2583	\$.2207
Investment per revenue passenger per annum	\$.1558	\$.1868	\$.2615	\$.2648
Operating expenses per revenue passenger	\$.03626	\$.03501	\$.03251	\$.03813
Gross revenue per revenue passenger	\$.05034	\$.04998	\$.05153	\$.05489
Dividends (% of capital stock)	7.35	5.89	4.67	3.54

¹ For a list of the roads included in each class see Appendix G.

82 THE STREET RAILWAY IN MASSACHUSETTS

B. Second Decade (1900-09)

	Class A	Class B	Class C	Class D
Revenue passengers per annum per mile of main track operated	637,156	197,580	152,859	88,980
Revenue passengers per car mile	5.140	4.789	5.210	4.273
Operating expenses per car mile.	\$1.795	\$1.600	\$1.672	\$1.540
Gross income per car mile.....	\$2643	\$2443	\$2641	\$2201
Investment per revenue passenger per annum	\$1942	\$1924	\$2832	\$3182
Operating expenses per revenue passenger	\$03492	\$03340	\$03209	\$03607
Gross revenue per revenue passenger	\$05142	\$05101	\$05069	\$05151
Dividends (% of capital stock).	7.31	6.76	4.11	2.35

C. Third Decade (1910-19)

	Class A	Class B	Class C	Class D
Revenue passengers per annum per mile of main track operated	754,856	224,114	184,400 ^a	102,044 ^b
Revenue passengers per car mile	6.005	6.056	6.002 ^a	4.946 ^b
Operating expenses per car mile.	\$2336	\$2364	\$2653	\$2212
Gross income per car mile.....	\$3378	\$3224	\$3515	\$2823
Investment per revenue passenger per annum	\$2566	\$1884	\$2762	
Operating expenses per revenue passenger	\$03893	\$03901	\$04422	\$04469
Gross revenue per revenue passenger	\$05625	\$05324	\$05856	\$05708
Dividends (% of capital stock).	5.87	4.88	2.36	

^aOmitting returns of the Bay State and Bay State Receiver for 1918 and of the Bay State Receiver and Eastern Massachusetts for 1919. No count of passengers kept in those years.

^bOmitting returns of the Northern Massachusetts; Concord, Maynard & Hudson; and Connecticut Valley; for the years 1918 and 1919, when those companies kept no count of passengers.

D. Fourth Decade (1920-29)

	Class A	Class B	Class C	Class D
Revenue passengers per annum per mile of main track operated	862,187	247,371	103,413 ^a	114,163 ^b
Revenue passengers per car mile	6.612	6.398	5.277 ^a	5.212 ^b
Operating expenses per car mile.	\$4475	\$3955	\$4135	\$3706
Gross income per car mile.....	\$6266	\$4858	\$5272	\$4316
Investment per revenue passenger per annum	\$2869	\$2098	\$4864	\$5096
Operating expenses per revenue passenger	\$06770	\$06179	\$07831	\$07113
Gross revenue per revenue passenger	\$09477	\$07593	\$09991	\$08281
Dividends (% of capital stock).	6.42	3.62	2.48	.51

^aOmitting the Eastern Massachusetts, which kept no count of passengers.

^bOmitting several companies (see separate list) which kept no count of passengers.

The data on investment¹ presented above are put in the form of investment per revenue passenger *per annum*.² The annual cost of or the proper return on this investment per dollar varies, of course, with a number of conditions. The cost of borrowed capital, carried on the books as fixed charges, is divided into interest on the funded debt and discount on the unfunded debt to the banks. To these fixed charges a payment sufficient to induce the necessary investment in capital stock should be added as a capital cost proper to the operation of street railways. The cost per unit of invested capital is affected by the proportion in which the investment is secured by stock, bond and bank borrowing and this proportion as well as the cost per unit of the different forms is determined largely by the financial standing of the company. Data of this sort are, of course, unobtainable and cannot be calculated with any accuracy. In general it may be said that the figure used, investment per revenue passenger per annum, minimises the capital cost for Class C and D roads in comparison with Class A and B roads.

The statistics of operating costs also minimise the *proper* cost of operating with the low densities of traffic indicated for Class C and D roads. Class D included the major part of Massachusetts operating properties in every period and the average length of life per company in this class was by far the lowest. The result was that there existed at any given time a relatively large number of properties on the verge of discontinuing operations whose charges for maintenance were much below the requirement necessary for continued operation.

¹ Investment as used in this chapter means "Total permanent investment" and includes the book cost of roadway, track and line equipment, rolling stock and land and buildings. It excludes cash and current assets and miscellaneous assets both of which items for Massachusetts street railways represented a small proportion of total assets.

² Investment per revenue passenger, which is a different thing, and, perhaps for certain purposes more significant, cannot with any accuracy be calculated. To obtain it we should have to know the average life of the property represented by a particular investment. Estimates of the probable life of street railway property under certain assumed conditions are available but these conditions by no means cover the range of Massachusetts railway experience. Furthermore even though we possessed adequate data on the life of property, for all the conditions known to Massachusetts experience, it would be impossible from the figures of total investment to derive the investment per revenue passenger, for, as we have previously emphasised, the total investment does not represent with any accuracy the actual cost of the property in use at any time.

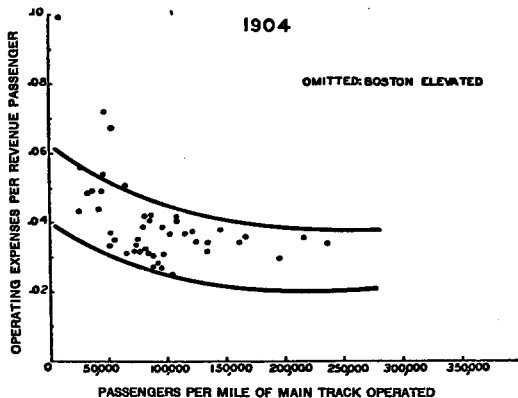
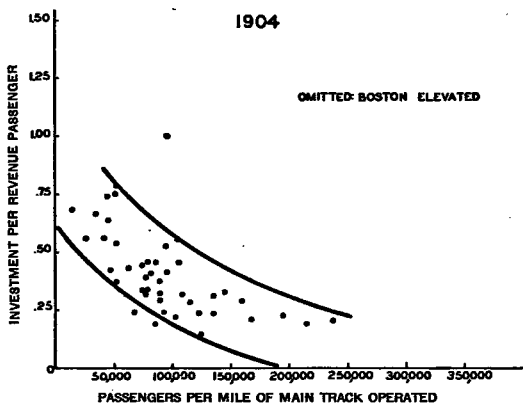
In the light of these considerations the evidence for Class D roads is decisive. In every decade both the track density and the car density of traffic was lower than for any other group of properties.¹ In consequence Class D roads showed the highest investment per revenue passenger in every decade, and the highest operating expenses per revenue passenger in every decade except the last. The average dividend paid declined with every year and became practically non-existent after 1915.

The abandonment of operation on mileage whose investment was still carried on the books of the companies was responsible for the great increase in investment per revenue passenger on Class C and D roads for the last two decades. This does not mean, of course, that the actual capital charges per revenue passenger increased proportionately. The return on capital stock was negligible and average fixed charges have been reduced by successive reorganisations. The investment per revenue passenger for these classes of roads was high during the first two decades also and the explanation of this lies, in all probability, in the impossibility of a close adaptation of street railway plant and equipment to the expected demand.

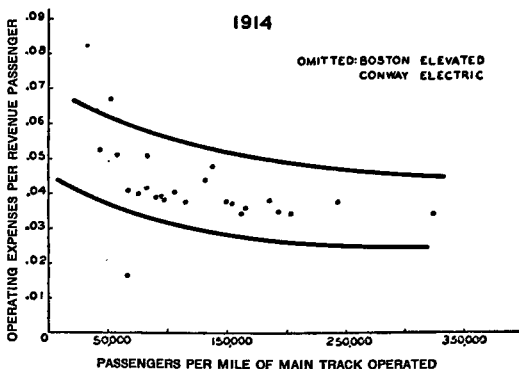
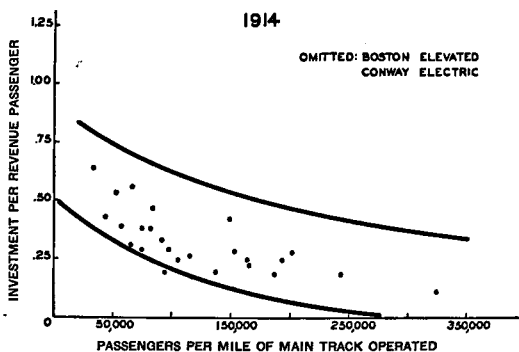
The considerable increase in the investment per revenue passenger on the Boston lines as compared with the properties in Class B is undoubtedly the result of the building of expensive rapid transit facilities. Rapid transit facilities were not introduced in Boston until 1897 and came too late in the first decade seriously to influence the investment per revenue passenger. An inclusion of the cost of subways built by the state in the later decades, on which the Elevated had to pay a rental charge, would make the investment per revenue passenger much higher than the figures indicate.

The variation in operating expenses per revenue passenger on groups of roads having different densities of traffic, is, as one would expect, not so great as the variation in investment, since operating expenses offer a greater opportunity of adaptation to output. The abnormally high operating expenses in group C-roads for the last decade is probably accounted for by the particular conditions affecting the Eastern Massachusetts, the dominant road in that group, which was operated by state trustees who have been more interested than private operators in the maintenance of a high standard of service.

¹ The track density appears to be higher than for Class C from 1920-29 only because the available statistics did not include the passengers per mile of track for the Eastern Massachusetts Street railway, the largest in group C.



The classification of all Massachusetts railways into four groups brings out in a rough sort of way the different types of properties operating in this state. In order to understand, however, the relation between densities of traffic and investment and operating costs,



it is necessary to study the returns of particular roads in representative years. The data presented in the above diagrams are for the years 1904 and 1914 and only those companies are included which reported power plant investments.¹

¹ The same data were collected for 1926 but are not presented for lack of space. The 1926 figures represent the same general relation between density of traffic and costs as do those of 1904 and 1914 but the operating companies

The above diagrams indicate a considerable deviation from the average both of investment and of operating expenses per revenue passenger for roads of approximately the same track density of traffic. Nevertheless, the general tendency of investment per revenue passenger, and to a less extent this is true of operating expenses, to vary inversely with the density of traffic is clear. For the range of variation in track density represented by Massachusetts experience it is apparent that some possibility of adaptation of investment to output existed. Otherwise the curve of average investment per revenue passenger would decline more sharply as the density increased. It is likewise apparent that operating expenses are not completely adaptable to changes in output. Otherwise average operating expenses per revenue passenger would remain constant as density of traffic increased. Both investment and operating expenses are constant over certain ranges of variation in the density of traffic and variable over others. But, on the whole, operating expenses show, as one might expect, greater possibilities of adaptation than investment.

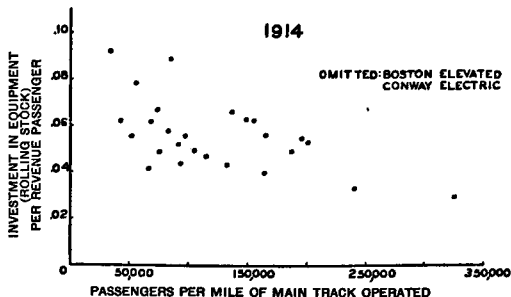
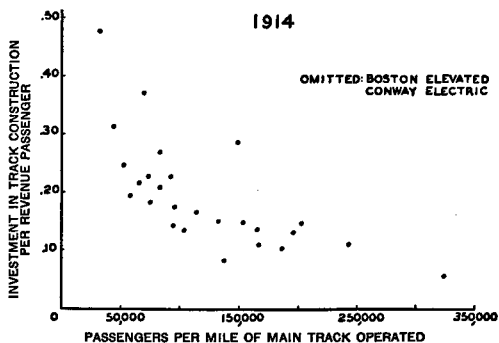
A more detailed analysis of the cost of transportation is necessary, however, to indicate the nature of its relationship to density of traffic. For this purpose the investment may be conveniently divided into four parts; investment in track and line construction which accounts for, roughly, from 50% to 70% of the total, investment in rolling stock which represents from 15% to 25%, power plant which represents from 10% to 20%, and investment in land and other buildings which represents from 3% to 10% of the total. The track and line equipment, which represents by far the largest item in this classification has, on the average, the longest life and, for technical reasons, is the form of property least adaptable to variations in the expected output. The cost of this investment tends therefore to be constant over a considerable range of variation in density of traffic. This appears clearly in the following diagrams which represent the relation between different types of investment per revenue passenger per annum and the track density of traffic for Massachusetts street railways in 1914.¹ The roads exhibiting

are so few that the conclusions are less reliable. Only those companies are included which operated throughout the year. Companies leased to or operated by or consolidated with another company are included with the latter.

¹ The same relationship has been studied for Massachusetts properties in 1904 and 1926. In 1904 the connection between various kinds of costs and

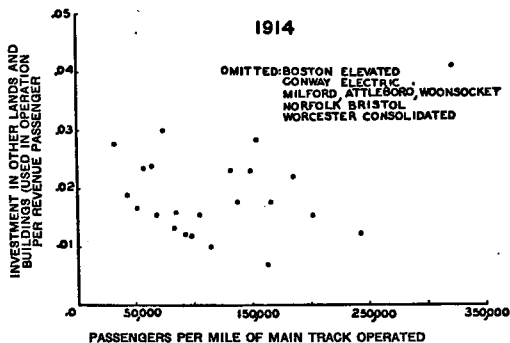
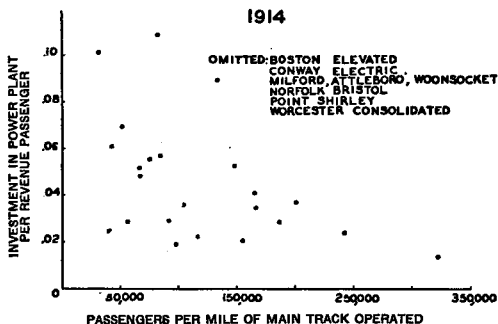
a high density of traffic exhibit a markedly low investment in track and line construction per revenue passenger.

The investment in rolling stock shows the same kind of behavior in relation to density of track though here the tendency is not so



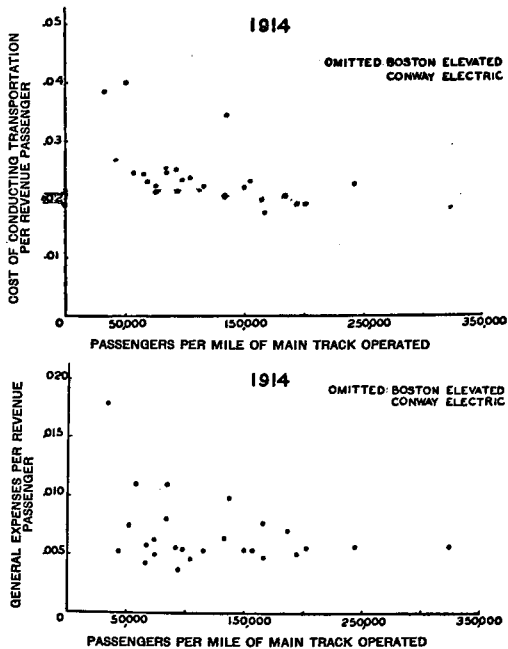
marked, nor, because this type of investment is less important, is it so significant. The power plant investment exhibits a variation the track density of traffic was not quite as well marked as in 1914, the scatter of points on the diagrams being great enough to make any clear conclusion somewhat difficult. In 1926 what evidence there is bears out the relationships indicated in the 1914 diagrams but the number of companies represented is small.

so great for roads of approximately the same density of traffic as to make the relationship between investment and density less certain. There seems to be no discernible relation between investment in lands and other buildings and track density.



The operating expenses of street railways are usually divided into general expenses, maintenance, and the expenses of conducting transportation. The first includes the salaries of the general officers, the salaries of office clerks, insurance and the costs of office supplies; the second is customarily divided into maintenance of track and

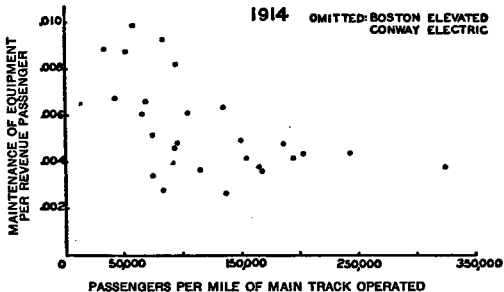
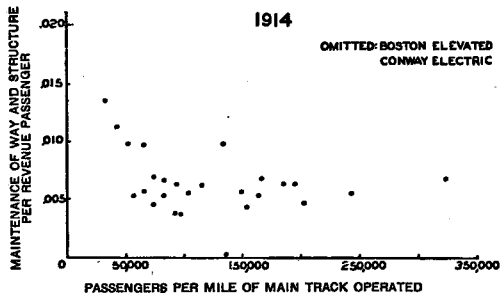
line equipment and the maintenance of rolling stock; the principal expenses of conducting transportation are, usually, the cost of power, the wages of motormen and conductors and the cost of the claims department, i.e., damages. Depreciation does not appear as a separate operating expense for Massachusetts street railways cus-



tomarily made no allowance for depreciation over and above maintenance.

It is obvious from even a cursory examination of these items that they must vary in different degrees with the density of traffic. Certain expenses, for example the cost of removing snow and ice,

which is usually included under maintenance of roadway and track, change with weather conditions and have no discernible relation to the density of traffic. Others, such as the payment of damage claims, have perhaps a relation to density of traffic, but exhibit great discrepancies between roads in other respects similar. Operat-



ing expenses are reported in greater detail by some companies than others. But, of course, in the general accounting procedure which has emerged with the development of the industry and has been shaped by the needs of public regulation there has been no attempt to separate out those costs which vary with the density of traffic and those which do not. For these and other reasons there would be little point in making a study of the relation of each separable

operating cost to the density of traffic even if complete uniformity of accounting procedure enabled us to do so.

General expenses, the maintenance of roadway and track, the maintenance of rolling stock and the cost of conducting transportation are expenses which represent approximately the same items for all companies. General expenses include between 12% and 20% of the operating expenses for most companies, maintenance of roadway and track between 10% and 20%, maintenance of equipment between 8% and 16% and conducting transportation between 40% and 60%.

The diagrams presented above indicate the relation between these classes of expenditures per revenue passenger per annum and the track densities of traffic of Massachusetts roads in 1914.

In general all the diagrams indicate some tendency of operating expenses to vary inversely with density of traffic. Without a more detailed analysis, however, than the conditions both of space and the available data permit, it is impossible to separate that type of operating expenditure which is clearly adaptable to variations in output from that which, within limits, is not.

CHAPTER 5

STREET RAILWAY COSTS HISTORICALLY CONSIDERED

The preceding chapter was concerned primarily with the significant relation between density of traffic and cost per revenue passenger. Profitable operation depends, of course, on the cost per unit of plant and equipment as well as the density of traffic. Two roads with the same track and car mile densities of traffic *may* show a considerable difference in the cost per revenue passenger as a result of differences in the investment per unit of plant and equipment, owing to differences in topography, track layout, methods of raising capital, municipal restrictions and the like. These differences also seriously affect at least one of the principal operating expenses, the cost of power. It is probably true, however, that large differences in the cost of plant and equipment, *installed at approximately the same time*, under the fairly uniform conditions of construction existing in Massachusetts, are to be accounted for by differences in ballast, rails, size of cars and other types of materials and these differences are to be explained very largely by differences in the expected density of traffic.

Costs of construction and operation, however, show a great variation *over time* which has nothing to do with the density of traffic and this leads us to the principal matters of the present chapter, changes in the technique of operation and in the prices of labor and materials over the four decades of street railway history.

EFFECT OF TECHNICAL CHANGES ON THE COST OF SERVICE

Change in the conditions of construction and operation in the industry have been very rapid over the whole period, but there is a considerable difference between the sort of changes introduced during the era of expansion, and the sort of changes introduced in the era of contraction. Technical innovations introduced between 1890 and 1910 came almost entirely from outside the industry. Between 1890 and 1896 or '97 the construction of practically all

types of electrical equipment was revolutionised.¹ The revolution in electrical equipment was accompanied and followed by changes almost as significant in the size and construction of the cars and, consequently, in the weight of the rail and structure of the roadway.

Manufacturers of rolling stock and electrical equipment made continual improvements in their products and thrived on the unlimited optimism of an expanding industry which provided a ready market for them in installations on new properties and the continual re-equipment of old ones. Street railways were "building for the future." The problem which presented itself to the typical street railway operator was the preparation for an increase in the volume of traffic whose yield per unit appeared to be satisfactory.

Means of increasing the volume of traffic were adopted almost indiscriminately; lines were lengthened, heavier cars introduced, service was made more frequent and decidedly more comfortable. The obvious economy of labor cost incident to the use of larger cars was later seen to have been heavily overestimated when taken in conjunction with the increased cost of track construction and maintenance which the heavy car entailed.

Careful consideration of economic advantage on the part of railway operators would have forbidden the introduction of technical changes unless the total cost of service with the new method were less than the direct cost with the old method. But the combination of a large proportion of overhead to total costs and the expectation of a rapidly increasing volume of traffic turned the scales heavily in favor of the new method. It was easy to see that the direct cost of operating with the new method would be lower than the direct cost of operating with the old and, with a continually increasing volume of traffic, the increase entailed in overhead cost per unit of output might well become less than the saving introduced per unit of output in operating expenses.

The rapid rate of technical change occasioned, of course, a rapid rate of obsolescence. This ought to have been provided for by the addition to operating expenses of a high charge for amortisation. As a matter of fact it was not. It was represented in the books of Massachusetts Street railways and street railways elsewhere as an addition to the investment, on which the earnings were

¹ On the nature and rapidity of this technical change the evidence of W. J. Clark is interesting. Fed. Elec. R. W. Com. I: 137.

to be maintained and increased by the increase in the volume of traffic.

The failure of the expected increase in the volume of traffic to materialise, the rise in street railway costs, the difficulty of borrowing in a capital market in which traction securities were definitely losing favor, served to put a sharp curb upon the demand for railway equipment. The buying of street railways was limited to necessary replacement and replacement, even when necessary, became impossible for a considerable section of the industry. Street railways offered a small market for innovations requiring an increase in investment.

It is quite clear that, after about 1910, the improvements and economies introduced into street railway operation came largely from within the industry rather than from without. The technical changes, moreover, which have been made during the period of decline, have, in general, involved no considerable increase in the investment. The one man car, a reduction in the weight of cars, fare collecting devices, the skip stop, improvement in public and employee relations, electric meters for cars, traffic counting, improvements in cost accounting, the reclamation of worn out parts, the use of lighter rails and a wider spacing of ties made possible by light weight cars, and many other economies introduced during the decline of the industry, have come about principally through the initiative of street railway operators themselves.

The problem presented to the ordinary operator during the period of decline has been a reduction of the cost per unit of carrying a volume of traffic whose yield has become unsatisfactory. Careful inquiries were made as to the cost of particular services. As a result fare limits were reduced, certain lines and parts of lines abandoned; attempts were made to adjust the supply of rolling stock to fluctuations in the demand for traffic and, by differentiating between different densities of traffic, to supply different types of rolling stock.¹

If expansion of the volume of traffic was the keynote of the first period, reduction of costs has been the keynote of the second.

The net effect of all these innovations in street railway service

¹ The attempt to adapt service to fluctuating needs in New Bedford is interesting in this connection. New Bedford is a one industry town. "Cotton cloth manufacture is the industry and its prosperity or depression greatly affects the demand for street railway service. The traffic department of the

has probably been a reduction in the operating cost per passenger carried.

OPERATING COSTS PER REVENUE PASSENGER
Adjusted for variations in the price of labor and materials for certain
representative Massachusetts properties. 1900-1929*

Average annual data for five-year periods

	1900- 1904	1905- 1909	1910- 1914	1915- 1919	1920- 1924	1925- 1929
Boston Elevated	\$.0407	\$.0375	\$.0344	\$.0303	\$.0338	\$.0338
Springfield .....	.0415	.0380	.0371	.0316	.0293	.0327
Worcester .....	.0371	.0336	.0340	.0287	.0357	.0396
Holyoke .....	.0415	.0362	.0381	.0287	.0251	.0276
New Bedford .....	.0400	.0353	.0311	.0266	.0210	.0261

* Adjustment made by means of the index of street railway operating costs. See Appendix B.

The above data are only rough approximations and must be taken with a grain of salt. The index of operating costs by means of which the costs at different periods is made comparable is, of necessity, a general index made up of *average* prices whose weights are assigned on the basis of the *average* importance of these prices to a large number of operating companies. The operating conditions of each of these five companies may, and probably does, differ somewhat from the average. Furthermore the whole of the indicated reduction in cost should not be attributed to changes in the technique of operation. The density of traffic on all these roads increased in the period before 1920 and has declined since; and as we have seen in the previous chapter, density of traffic influences the operating cost per revenue passenger.

Nevertheless, the data create a strong presumption that changes in the technique of operating have reduced operating costs and this presumption is strengthened by a consideration of the changes in the nature of the passenger ride. The heating of cars has railway checks constantly the morning and evening rush hour riding in order that only the necessary service be supplied.

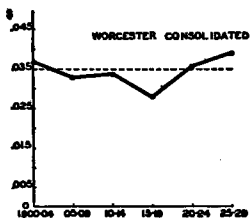
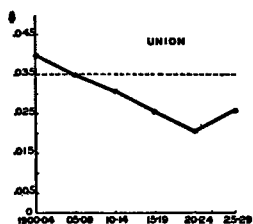
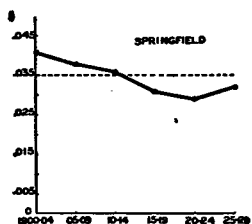
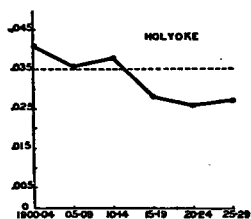
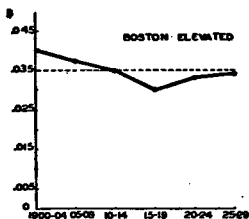
"The problem is complicated by the fact that the requirements may be less in the later, than in the early part of the week due to week-end curtailment of employment in the factories.

"The resultant periods and areas of non-employment vary, but, through the use of graphic charts and statistical averages, the department is able to prepare for the fluctuation." A. E. R. A. *Electric Railway Practices* in 1923, p. 23.

COSTS HISTORICALLY CONSIDERED

97

OPERATING EXPENSES PER REVENUE PASSENGER DEFLATED TO 1913 LEVEL OF COSTS

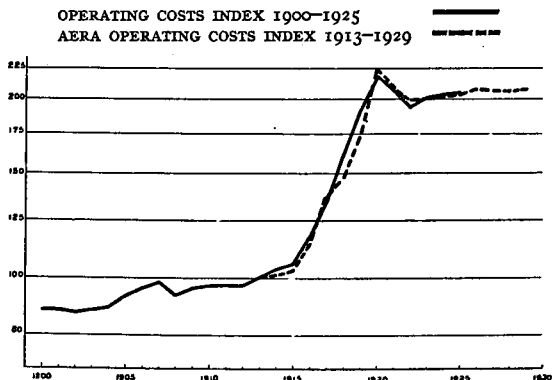


improved and signal systems, waiting rooms and other devices have been installed in the interest of safety and comfort. The number of passengers per car mile has increased but this probably does not indicate more crowded service because traffic studies have permitted

a more successful adaptation of rolling stock to the demand. It is true that, in recent years, the length of the ride has been reduced but this probably less than compensates for the steady increase in the length of ride before the war. Everything considered, the service on these five roads was probably better, on the average, during the last five year period than during the first.

COST INDICES

Throughout the whole period labor and material costs were rising. Adequate cost indices are available since 1913 and present with sufficient clarity the general picture during the years of greatest change.



The catastrophic rise in wage rates and the price of materials between 1916 and 1920 is almost enough of itself to explain the general collapse of the street railway industry in this state and elsewhere. But street railways had had to face the fact of rising costs before 1913. The fate of a large part of the mileage in this state had been, in a sense, determined before that date and the catastrophic changes of the war period served only to hasten the inevitable. It is therefore important to devise an index of street railway costs running back at least to the years when an increase in operating costs began to be significant.

Such an index was presented in Chapter I and is charted above in comparison with the A. E. R. A. operating cost index.¹

The close agreement between these indices after 1913 creates a strong presumption that they would show the same agreement before 1913 and may be taken as indicating that the rise in street railway operating costs after 1900 is fairly represented.²

THE COMPOSITION OF OPERATING COSTS

Changes in the technical conditions of operation and in the prices of labor and materials have occasioned a marked alteration in the composition of operating expenses. Maintenance, power and the wages of transportation employees have, between them, accounted for at all periods from seventy to eighty per cent of street railway operating expenses. The table on page 100 indicates the variation in the relative importance of these items for a number of companies which generated their own power.

The power costs for the first two five year periods are not comparable with later data for Massachusetts properties were not yet completely electrified. The wage data for at least the first period are likewise of little significance.

The figures for the last three decades indicate that the proportion of power expenses to total operating expenses has remained stable or declined slightly, that the proportion of wages paid transportation employees to operating costs has declined considerably and that the relative importance of expenditure for maintenance has greatly increased. Wages paid transportation employees are, of course, considerably less than total wages, for a large part of the maintenance expenses represents payment to laborers, and power plant labor is included in the cost of power.

Separate data on the proportion of total wages paid to total operating expenses is not available except for a few companies for a few scattered years but what evidence we possess indicates that this proportion has remained fairly constant and is in the neighborhood of from sixty-five to seventy per cent.

The importance of maintenance, transportation wages and power

¹ The A. E. R. A. operating cost index is a combination of the indices of electric railway wages and electric railway materials giving the former a weight of 625 and the latter a weight of 225. See *Electric Railway Journal*, January, 1930, p. 12.

² The construction of the index is discussed in Appendix B.

100 THE STREET RAILWAY IN MASSACHUSETTS

OPERATING EXPENSES OF PRINCIPAL MASSACHUSETTS STREET RAILWAYS
(Percentages of total operating expenses over 5 year periods)

	1890-4	1895-9	1900-4	1905-9	1910-4	1915-9	1920-4	1925-9
<i>All Mass. Companies</i>								
Maint. and Deprec...	23.0	27.1	20.2	22.9	26.8	27.5	31.8	31.5
Wages	46.1	41.0	42.1	38.7	31.4	30.6	28.6	27.9
Power	11.4 ^a	11.3	16.2	16.9	15.0	16.6	16.2	13.2
<i>Boston Elevated</i>								
Maint. and Deprec...		27.5 ^b	21.0	23.2	26.5	28.8	30.8	32.0
Wages		43.3 ^b	46.8	42.6	33.1	31.5	29.8	28.4
Power		7.0 ^b	10.8	13.1	11.1	12.5	13.6	10.2
<i>Brockton-Old Colony</i>								
Maint. and Deprec...	20.2	29.1	17.9	22.3	25.4 ^c			
Wages	52.2	38.7	38.1	37.2	33.2 ^c			
Power	12.0 ^a	11.9	22.7	16.7	15.0 ^c			
<i>Fitchburg & Leominster</i>								
Maint. and Deprec...	16.7	20.8	19.5	18.5	24.2	26.4	25.0	28.4
Wages	40.5	40.2	38.1	34.4	30.1	28.8	31.7	20.0
Power	15.0 ^a	16.7	19.7	21.5	20.3	23.2	23.9	20.0
<i>Globe</i>								
Maint. and Deprec...	16.8	23.0	17.2 ^d					
Wages	43.9	45.9	43.5 ^d					
Power	9.2 ^a	11.8	13.4 ^d					
<i>Holyoke</i>								
Maint. and Deprec...	17.9	26.2	30.6	33.6	30.4	28.6	33.2	21.4
Wages	44.3	44.2	39.3	35.3	30.4	30.1	31.1	36.1
Power	18.7 ^a	12.2	15.3	16.1	16.9	19.3	18.8	20.0
<i>Lynn & Boston-</i>								
<i>Boston & Northern-</i>								
<i>Bay State-</i>								
<i>Eastern Massachusetts</i>								
Maint. and Deprec...	21.2	28.5	18.0	21.0	26.0	27.3	38.8	35.9
Wages	46.0	43.1	40.8	38.5	32.6	30.5	23.2	24.5
Power	11.9 ^a	11.2	17.0	16.0	13.2	17.0	18.1	17.6
<i>Springfield</i>								
Maint. and Deprec...	17.6	25.0	25.2	28.0	28.5	23.7	27.3	26.9
Wages	49.0	52.2	43.6	35.9	34.2	36.0	38.6	36.5
Power	16.9 ^a	12.0	20.2	19.2	17.5	17.5	11.3	13.5
<i>Union</i>								
Maint. and Deprec...	17.8	13.3	17.1	23.4	25.2	23.0	23.8	22.4
Wages	45.1	50.2	43.8	45.0	32.6	31.0	37.2	35.9
Power	6.3 ^a	10.9	16.7	13.4	13.1	18.4	18.0	12.5
<i>West End</i>								
Maint. and Deprec...	21.7	32.7 ^e						
Wages	46.8	40.1 ^e						
Power	9.0 ^a	9.5 ^a						
<i>Worcester Consolidated</i>								
Maint. and Deprec...	16.0	18.3	21.0	21.5	20.5	28.5	31.1	29.2
Wages	43.2	33.8	34.7	32.8	28.8	33.0	31.3	30.6
Power	18.1 ^a	20.2	23.2	23.6	21.2	18.2	17.1	15.8

^a 1893 and 1894 only (power expenses not separately reported prior to 1893).^b 1898 and 1899 only.^c 1910 and 1911 only.^d From Oct. 1, 1899, to Jan. 19, 1901, only.^e 1895, 1896, and 1897 only.

as operating expenses and the extent of the variation in their relative importance over time requires an examination of the nature of these items and the causes of the change.

1. Maintenance and Depreciation. The problem of the proper charge for maintenance and depreciation on street railways is a difficult one and was not, practically speaking, faced by Massachusetts properties before 1914 to 1915. The item depreciation rarely appears on the accounts of street railways in this state before that date. In 1915 when the Public Service Commission ordered reports in the form of the standard system of accounts for street railways devised by the Interstate Commerce Commission and, in addition, asked for a statement of the basis on which depreciation charges were calculated, the diversity of method was staggering. Furthermore, it was evident that few of those responsible for the reports had any clear meaning of the term depreciation. Considering the number of ways in which this term was used in the industry, by the Public Service Commission and by outsiders, this is not surprising.

It was the practice of street railways in this state, up to 1914 at least, to charge to maintenance actual outlays on repairs and replacements. However, the whole of replacement expenditure was not by any means to be found in the maintenance account. It is pretty obvious from the growing investment per unit of plant and equipment during the first decade at a time when the prices of equipment were falling rapidly that many street railways were meeting the cost of replacement from new investment. As we have seen, the Board of Railroad Commissioners had no adequate control of accounts before 1902 and it is highly probable that this practice continued for some time after 1902. Occasionally the better situated properties wrote off the value of abandoned property or wrote down the value of old and obsolete equipment, but the value written down in any one year was never considerable. The chairman of the Public Service Commission was representing the facts fairly when he said of Massachusetts street railways in this period, "The general rule has been to pay operating expenses first, fixed charges next, dividends next, and last of all, if anything is left over, to care for depreciation."¹

Under certain circumstances and for certain kinds of enterprise this would not necessarily be a bad policy. In an industry with

¹ Statement of F. J. Macleod before the *Street Railway Commission* of 1917.

stable or improving prospects and for a large and well seasoned property the operating outlay on maintenance and repair might well cover the whole annual cost of replacement. The sole purpose of a depreciation reserve, in connection with operation, is to maintain a fairly uniform ratio of operating expenses to gross earnings for those properties whose replacement expenditures show a considerable annual variation. In a large and long established property the use of such reserve might be negligible.¹

Massachusetts street railways, however, with the possible and doubtful exception of the Boston Elevated, were not in this position. The roads in this state were largely built and equipped in the decade falling between 1890 and 1900. The expenses for maintaining these properties were bound to be small for the first few years, but, allowing a life of from twenty to twenty-five years for rails, ties, cars and line equipment, the expenditure for replacement promised to be extraordinarily heavy a couple of decades later. Under these circumstances the failure to accumulate a depreciation reserve was a failure to maintain the property.

The data on maintenance and depreciation presented above show a low percentage of operating expenses in the first decade of the century. The percentage was particularly low on the Old Colony and the Boston and Northern where it is evident that the holding company interested in floating its securities was maintaining a high dividend rate at the expense of maintenance.

Although it is easy to see that Massachusetts railways pretty generally neglected maintenance and depreciation, it is very difficult to determine what the proper charge should have been. All sorts of rules of thumb for determining this charge have been suggested. In the Middlesex Rate Case the Public Service Commission asserted that, "Among some well managed street railway companies in other states it has, of recent years, been customary to cover depreciation by charging about 20% of gross revenue to the maintenance of way, structures and equipment."²

It was the practice of Stone and Webster, before the war, to allow about 25% of gross revenue to maintenance and depreciation. J. A. Beeler, who examined the Boston Elevated for the Public Service Commission estimated that a depreciation charge of 3%

¹ See A. E. R. A. *Engineering Association* 1926: 374. Address of H. E. Rigg.

² P. S. C. 1914: 135.

on two-thirds of the investment in addition to from 15 to 20% of the gross revenue ought to be sufficient.¹ The reports of Massachusetts roads to the Commission in 1915 show depreciation charges, in addition to maintenance, ranging all the way from ½% on the investment to 5% on equipment and 2½% on ways and structures.

The Committee on the Life of Railway Physical Property of the American Electric Railway Association has consistently denied the possibility of laying down standard life tables applicable to different operating conditions. "Too many factors must be taken into consideration notably, the degree of maintenance, preservation, obsolescence, and depreciation. All of these are certain to vary more or less in each individual case and should be separately investigated."²

Nevertheless it would be admitted by most street railway men that given the density of traffic and a certain standard of maintenance the life of the property and equipment can be calculated for any particular property with a fair degree of accuracy, if we eliminate considerations of obsolescence. And it is probably true that, excluding rolling stock, the rate of obsolescence on street railway property for the last quarter of a century has not been high except in so far as the development of motor transport may be held to render obsolete all forms of electric railway plant and equipment.

On the basis of this estimate of the life of the property for particular situations, what we might call a proper charge for depreciation could be determined. If such a charge were made from the beginning of operation it would result for the first few years in the accumulation of a reserve for accrued depreciation which would become constant only when the property had attained a state of "normal average" depreciation, at which time the annual expenditure for replacement would tend to equal the annual depreciation allowance. Under such circumstances the accrued depreciation reserve would presumably equal the cost of the property new minus the book value of the depreciated property. In case the practice of setting up depreciation reserves was begun by an old company the allowance for depreciation would have to be in excess of average annual replacement in order to accumulate a proper reserve for

¹ Fed. Elec. R. W. Com. II: 1684.

² A. E. R. A. *Engineering Association* 1912: 522. Report of the Committee on Life of Railway Physical Property.

accrued depreciation. Under these circumstances the proper allowance for depreciation would not be determinable unless a definite time were set within which the required reserve for accrued depreciation should be attained.

All these considerations, however, assume a continuous and profitable operation of the enterprise as a street railway and this assumption is invalid at the present time for the majority of street railway enterprises. With the demand for street railway services falling rapidly and continuously a reserve should be accumulated large enough to retire road bed as it is abandoned and supplanted by bus service, to retire generating plant as it becomes cheaper to buy power, to retire old rolling stock of a heavy sort and newer and lighter stock is installed, etc. Even this assumes that the enterprise will continue to supply transportation. The only prospect open to many companies is the entire scrapping of the plant. Under these circumstances the reserve should cover everything except salvage value and should probably be as high as eighty to ninety per cent of the investment.

It is obvious from the foregoing considerations that the proper charge for depreciation on certain types of property is enormously high, higher in all probability than any Public Service Commission would allow, and certainly too high to be covered by any practicable fare. Whatever the proper charge for depreciation, it is certain that the depreciation policy on street railways of this sort does not take it into consideration. If the stockholders still have an interest in the enterprise it is probable that they will get what they can out of it while running the property down. In most of the smaller street railways still operating, however, the stockholders no longer have an interest and, consequently, the bondholders are following the same policy.

Enough has been said to show that no given percentage of gross earnings, operating cost or investment can measure the proper charge for depreciation on the different Massachusetts street railway properties.¹ For those companies which have continued in operation the charge for maintenance and depreciation has increased rapidly during the last two decades as replacement, unnecessary in the earlier period, has come due. As the data given

¹ Figures are given in Appendix H of the percentage of maintenance to gross revenue and of depreciation allowance to investment for a number of Massachusetts street railways.

on page 100 indicate, the maintenance and depreciation charges for the Boston Elevated and Eastern Massachusetts, operated by public trustees, is high. Some consideration will be given to the depreciation policy of these particular roads in the chapter on Public Ownership and Management.

2. Wages of Transportation Employees. The hourly wages of motormen and conductors have more than doubled since 1913 and have practically tripled since 1900 on street railways in Massachusetts and in the country as a whole. The minimum and maximum hourly rates for certain representative Massachusetts companies in 1897, 1907 and 1917 are given below.¹

	1897		1907		1917		Percent- age of maximum rate 1917 over 1897	Increase hourly rate 1917 over 1897
	Min.	Max.	Min.	Max.	Min.	Max.		
Bay State	15 ¹	20 ¹	21	25	27½	33	25	65
Boston Elevated..	19 ²	19 ²	23 ³	25 ³	29½ ⁴	34¾ ⁴	32	79
Holyoke	17½	20	22	25	27	33	25	65
Springfield	15 ⁵	20 ⁵	20 ⁵	25 ⁵	28	35 ⁷	25	70
Union	18	20	20	25	27	34	25	70

¹ Daily wage of \$1.50 to \$2.00 for ten hours work.

² Daily wage of \$2.25 for not over twelve hours work.

³ Daily wage of \$2.30 to \$2.50 for ten hours work.

⁴ Because of allowances paid, the actual wage rate per hour worked exceeds these rates by ¼ to 7 cents per hour.

⁵ Daily wage of \$2.00 for ten to thirteen hours.

⁶ Daily wage of \$2.00 to \$2.50 for ten hours.

⁷ Daily wage of \$2.555 to \$3.105 for nine hours.

On the following chart the A. E. R. A. index of street railway wages since 1913 is supplemented by an index of wages since 1900.²

It should be noted that apart from a slight recession in 1922 and 1923 street railway wages have been maintained and even slightly increased since the war.

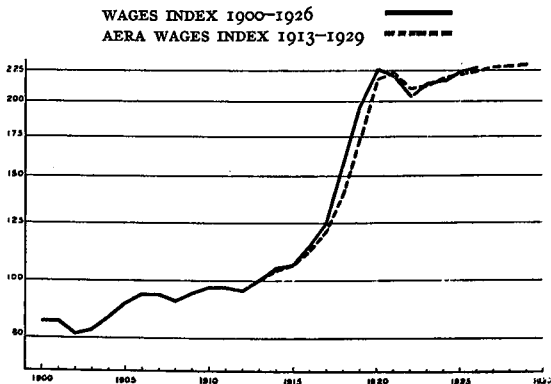
Street railway employees were organized shortly after the turn of the century on a number of important Massachusetts roads and, after a severe struggle, on the Boston Elevated in 1912. The unions succeeded in pushing wages up rapidly during the war upon the findings of successive war labor arbitration boards and have maintained their advances since. The arbitration boards refused to take account of the financial position of the companies, probably rightly, and, consequently, the awards were often followed by demands on the part of the companies for increased fares. In granting the

¹ Mass. Sen. Doc. 300, 1918, p. 178-79.

² See Appendix B.

Middlesex Company an increase in fare to compensate for a higher wages award the Public Service Commission remarked:

"No one denies that fares ought to be adequate to pay a living wage to efficient and faithful employees. This method of settling wages disputes, by submitting the controversy to an arbitration board is one clearly entitled to public approval and support. We accept this award as doing no more than justice to the employees; we doubt not that the patrons of this company will likewise accept it and the consequent increased cost of transportation as a proper charge."¹



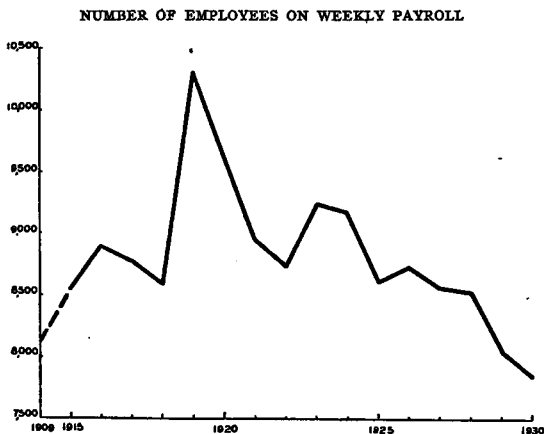
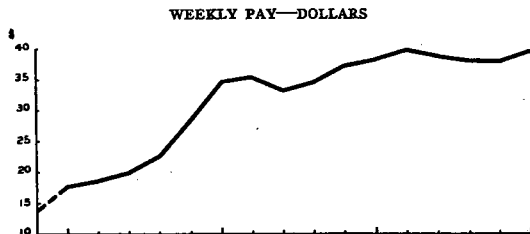
If acceptance of the award meant that the patrons of the Company would continue to use its service at the higher fare, the Commission was somewhat optimistic. As we shall see in the next chapter an increase in fare always meant a curtailment of traffic. With rates of fare fixed either by law or by the apparent elasticity of the demand for transportation, wage increases were a serious handicap to profitable operation. The wage award of 1913 really marked the turning point in the history of the Boston Elevated under the five cent fare limitations.² In 1920 the Berkshire tem-

¹ P. S. C. 1914: 142. Middlesex Rate Case.

² This was also the opinion of J. B. Eastman. See his testimony before the *Committee on Metropolitan Affairs and Street Railways*, 1928.

porarily discontinued service on all its mileage owing to an inability to meet the demands of its employees for higher wages.¹

Despite the rapidity of the increase in labor costs, the data presented on page 100 indicate that the wages of transportation em-



ployees represent a declining percentage of operating expenses. This is not true, however, of total wages of street railway employees. The principal cause of the decline in the importance of transporta-

¹ P. S. C. 1920: 191.

tion wages was the deliberate attempt on the part of street railway operators to save labor costs by changes in technique. The size of the cars was increased, trailers were introduced and in Boston a queer contraption known as the articulated car was used. There is some reason to believe that the labor saved on transportation was lost on maintenance for the heavier cars wore out road bed and track. After 1915 the one man car came into extensive use. By 1922 the Boston Elevated was operating about 20%, and the Eastern Massachusetts approximately 96% of its surface car mileage with such cars.¹ Since then there has been a considerable increase in the size of the car susceptible to one man operation and, at the present time, nearly all the surface mileage in the state is so operated.

Among the other causes of the decline in the percentage of transportation wages to operating costs must be mentioned the successive failures of smaller companies showing high ratios of wages to operating expenses and low ratios of maintenance to operating expenses. A further cause has undoubtedly been the expansion of rapid transit facilities, which show a lower percentage of labor cost to total cost, in the metropolitan area.

3. Power Costs. Most of the roads which changed from horse to electric traction or commenced operations in the decade from 1890 to 1900 built their own power stations. The economies of large scale operation of power were not as important then as now. A more weighty reason was the difficulty of transmission. Power could not be satisfactorily transmitted for street railway operation over a greater distance than about ten miles. Only those lines therefore which were built in close proximity to power plants with surplus current to sell could dispense with their own generating facilities.

Around 1900 when alternating current began to replace direct current in street railway operation and the distance of feasible transmission increased the situation was changed. Street railways became increasingly able to purchase their power from central stations located at a considerable distance. The result was that the majority of properties commencing operation after 1900 elected to buy their power. In 1904, of the twenty-five independent operating companies which purchased all their power, nineteen had commenced operation after January 1, 1900. In 1914, of the ten op-

¹ P. S. C. 1922: 12.

erating companies having no power plant investment all but two came into existence after 1900.

The tendency has been during the last two decades, in Massachusetts as in other states, for street railways equipped with generating plants to purchase an increasing proportion of the power used. The generation of power on a large scale is so much cheaper per unit than in the small and often obsolete street railway power plants that the cost of purchasing is often less than the mere operating cost of generating it.

The cost of street railway power shows a considerable variation as between companies and this variation is reflected in the different percentages of power to operating expenses indicated on page 100. In the special report on street railway power presented by the Public Service Commission, some of the elements which are mentioned as affecting unit generating costs are, "size of the railway; compactness; density of traffic; and topographical conditions."

Since 1900 the proportion of power expense to total operating expenses has shown a slight decline for the principal Massachusetts street railways.

Before proceeding to a discussion of taxation, a general summary of the material presented on street railway costs may be of assistance to the reader. Taking as the most feasible unit of product the revenue passenger we have seen that there is a considerable variation in the investment and in the operating cost per revenue passenger as between different companies. A part of this difference is to be explained by differences in topography, distribution of the population, size of the property, and other variables more or less independent of density of traffic. But the principal causes may be summed up and expressed in differences in the density of traffic which we have sought to measure in terms of passengers per car and track mile. For large variations in the density of traffic certain costs are relatively fixed and others relatively variable which is to be explained by those technical necessities imposing a discontinuity in the application of resources and by the durability of parts of the investment. The importance of overhead cost in the industry explains in large part both the differences in investment and the differences in operating costs per revenue passenger. The extent of variation of different investment and operating costs with variations in output we have attempted to examine in the latter part of Chapter 4.

Street railway costs have, furthermore, been seriously affected over time by changes in the technique of operation and in the prices of labor and materials. We have summarised the important changes in technique and have roughly measured the changes in prices. These changes have substantially altered the relative importance of different operating costs the most important of which are maintenance and depreciation, the labor cost of transportation, and power.

STREET RAILWAY TAXATION

Taxes paid to the state and federal government appear on the books of a street railway as a charge against the net revenue of operation and, for the roads of this state, the proportion of net revenue exhausted by this charge is large.¹ There has been a tendency in various other states to regard municipal transportation companies as a peculiarly fit subject for taxation; as a God given means of relieving the rest of the community from the burden of supporting local government.² On the whole this has not been true in Massachusetts though the development of highway transportation and the particular conditions under which grants of location were often made has imposed upon the industry a tax burden which the nature of electric traction does not perhaps justify.

The horse railway caused a heavy wear upon that part of the highway embraced within the rails and the original street railway acts of incorporation, quite rightly, placed the cost of maintaining this section of the pavement upon the companies, a principle which was carried over into general legislation.³ The particular causes of this wear and tear were removed with the introduction of electric traction but the cost of paving and maintaining the pavement remained. Furthermore, numerous and often heavy obligations were placed upon street railways by local governments as a condition of the grant of location. These obligations varied from locality to locality.

¹ See Chart 20, Appendix I.

² Apparently the situation of street railways in Pennsylvania has been, at times, at least, as bad as that of street railways anywhere. At one time street railways in Pittsburgh were required, among other things, to pave the street from curb to curb and keep it in a state of perpetual repair; to scrape it and clean it as often as the local authorities order; to pay a toll of \$125 a car per year for crossing a public bridge; to pay the city of Allegheny 5% on all dividends and the state of Pennsylvania 5% on all dividends and 10% on gross receipts. *Am. St. R. W. Ass.* 1888-89: 79.

³ See Public Statutes 1882 C. 113, Sec. 31.

The variation in the nature of these arrangements and, in particular, the division of responsibility for the care of the highway, between the railways and the local authorities, which these arrangements entailed, led the Street Railway Commission of 1898 to suggest the substitution of a commutation tax which was to be a percentage of gross revenue.¹ The tax was to be collected by the state and divided among the localities in proportion to their street railway mileage. This suggestion was immediately enacted into law.²

Unfortunately, in many cases, the new tax turned out to be not a substitution for, but an addition to, the former obligations. While providing in general that street railway companies should not thereafter "be required to keep any portion of the surface material of streets, roads and bridges in repair," the new law added the condition that they should "remain subject to all legal obligations imposed in original grants of location."³ A number of roads continued to expend money in fulfilling local obligations while paying the new commutation tax, although gradually the municipalities, on seeing street railway service disappear, have relieved the companies and have even made contributions.⁴

It was the opinion of the Commission of 1898 that the existence of a street railway adds to the cost of paving and to the repair and maintenance of the highway; hence the commutation tax, which was to compensate the local government for this cost. It was demonstrated in the course of the 1917 investigation that, in a number of cases, small towns received from the commutation tax an amount more than sufficient to maintain all the public highways lying within their boundaries, and that, in other cases, the contribution from the street railways was more than enough to cover the difference in the cost of highway maintenance occasioned by the

¹ The division of responsibility often led to absurd results. According to the Commission of 1898, "the singular spectacle has not infrequently been witnessed of one gang of men, in private employ, shovelling snow from a track, while another gang of men, in public employ, shovelled it immediately back." House Doc. 1898: 475, p. 28.

² Acts of 1898. C. 578.

³ Acts of 1898. C. 578, sec. 11. See on this matter the special report of the Public Service Commission relative to the repair and maintenance of public ways and places in which street railways are located. P. S. C. 1916: 406.

⁴ In 1916 the Bay State paid over \$100,000 for the maintenance of paving in addition to its excise tax of \$215,000. Mass. Sen. Doc. 1918: 300, p. 34.

presence of the rails.¹ In the light of this evidence the Public Service Commission in its Special Report of 1916 advocated the abolition of the commutation tax and recommended "that the burden be placed upon the companies of paying for the work actually done each year by any city or town in maintaining and repairing such portions of any paved streets, roads and bridges as are occupied by railway tracks and similar portions of unpaved public ways plus eighteen inches on each side thereof."²

The Department of Public Utilities would appear to deny that the existence of rails adds to the cost of maintaining the highway. In its report of 1922 we read, "the operation of the electric car causes little or no damage to the highways, either on the outside or between the tracks. The continuation of this tax is simply assessing a burden upon the street railway car riders for the benefit of those who use the highways with other vehicles."³ The tax, however, was assessed until its repeal in 1928.⁴

In addition to the commutation tax, which was based upon gross receipts but varies with the receipts per mile of main track operated, street railways have paid, during the whole period of electric traction, a property tax and, during the greater part, a corporate franchise tax. The property tax is assessed upon real estate and machinery by the local authorities, but the value of rails, wires, poles, etc., in the public highway is excluded. The corporate franchise tax is assessed by the State Tax Commission and is determined by subtracting from the fair cash value of the capital stock, (a) the value of capital stock proportionate to the extent of line lying outside the commonwealth; and, (b), the value of real estate, machinery, etc., subject to local taxation.

After these deductions the remainder, known as the corporate excess, is taxed at the same rate as applies to all corporations in the state, which rate has been continually increasing. The tax collected from each company is apportioned among the various cities and towns in proportion to the length of track operating in each. The corporate franchise tax varies with the market value of street railway stock and its yield has fluctuated from \$1,236,855, its high point in 1911, to \$199,042 in 1919.⁵

¹ Mass. Sen. Doc. 1918: 300, p. 35.

² P. S. C. 1916: 419.

³ Dept. of Public Utilities. Report of 1922, p. 12.

⁴ Mass. Acts of 1928, c. 138.

⁵ For data on the corporate franchise tax see Appendix I.

STREET RAILWAY COSTS CONSIDERED 113

Speaking generally the commutation tax is a tax on gross earnings, the corporate franchise tax is a tax on net earnings and the property tax is a tax on the investment. The commutation tax has been separately reported from its beginning but the property tax and corporate franchise tax only since 1915. Figures for the latter, however, running back to 1903 have been secured from the office of the Tax Commissioner. The federal taxes, which, except for the income tax paid by the Boston Elevated, were insignificant in amount have been included in the total for the table presented in Appendix I as has been the "compensation" tax paid by the Boston Elevated in lieu of a commutation tax. The total figures are inadequate, however, particularly for the period before 1900, for the expenditure on highway maintenance, made usually at the solicitation of local authorities, has generally been included in maintenance expenses but not separately reported.¹

¹ See Appendix I on Street railway taxation in Massachusetts for statistics on taxes paid.

CHAPTER 6

STREET RAILWAY REVENUES

The preceding chapters have suggested what is, after all, a matter of common knowledge, that street railway net revenues, squeezed between rising costs on the one hand and motor competition on the other, have, within the last fifteen years, shrunk to painfully emaciated proportions. In the parlance of the economist the demand schedule for street railway transportation has shifted to the left. And rising rates of fare have discovered an elasticity of demand which has increased with the development of alternative means of transport.

Gross passenger revenues are a product of the volume of traffic and the average fare per revenue passenger. The volume of traffic exhibits certain daily, weekly, seasonal, cyclical and secular variations which are more or less independent of the average fare. On the other hand changes in the average fare affect the volume of traffic, and very differently in different transportation areas. The average fare, moreover, is not a simple thing but the product of rate structures of varying degrees of complication presumably designed, within the limits permitted by regulation, to yield a maximum of net revenue. It is the purpose of the present chapter to consider, although briefly, the available evidence concerning the volume of traffic and its variation, the relation of the volume of traffic to the rate of fare, and the nature of the rates of fare prevalent in Massachusetts.

THE VOLUME OF TRAFFIC AND ITS VARIATION

The hourly variation of street railway traffic is well marked, easily predictable and a familiar phenomenon. It is not ascertainable, however, from data readily available and must therefore be determined by special studies and traffic counts. Most street railways supplying a heavy rush hour service find it profitable if not necessary to calculate rather carefully the normal hourly variation by means of such studies. The amplitude of the hourly variation

STREET RAILWAY REVENUES

115

is determined by a number of economic and social causes governing the riding habits of the population, varies considerably from city to city, and seriously influences street railway costs. The greater the amplitude, other things being equal, the greater the cost per unit of service, since the peak load necessitates an investment in rolling stock and equipment which cannot be effectively utilized and a high wage expenditure per unit of labor product. A heavy peak load, moreover, is an effective deterrent to the substitution of motor busses for electric cars because of the greater carrying capacity of the latter.¹ A daily volume of traffic which is stable from hour to hour can easily be handled by motor busses, but cannot be so handled if it exhibits a great hourly variation.

The daily variation of street railway traffic within the week is also well marked and predictable but has shown considerable change with the increase of privately owned motor cars. Twenty years ago the Saturday afternoon and Sunday traffic was comparatively heavy; now Sunday is usually by far the lightest day in the week for most street railways. The Boston Elevated has recently published some interesting figures on this subject.

REVENUE PASSENGERS CARRIED—BOSTON ELEVATED*

	Week day average	Saturday average	Sunday average	Holiday average	Total for the year
1930	1,025,036	1,050,111	488,101	590,810	342,694,905
1929	1,049,304	1,123,058	518,093	602,071	354,214,990
1928	1,067,980	1,143,250	539,813	631,016	362,005,033
1927	1,079,087	1,166,933	555,326	661,840	366,938,908
1926	1,086,544	1,191,342	576,701	666,258	371,218,401
1925	1,066,317	1,172,871	577,200	660,007	365,036,286
1924	1,109,861	1,216,132	630,755	727,191	382,888,848
1923	1,109,274	1,196,301	652,404	758,915	382,149,697
1922	1,030,303	1,144,320	617,148	691,890	356,593,942
1921	975,745	1,068,295	578,860	696,691	337,252,080
1920	960,737	1,072,319	591,063	703,634	335,526,561
1919	934,918	1,078,635	596,182	706,429	324,758,685
1918	985,384	1,147,809	658,902	775,634	348,664,700
1917	1,073,943	1,249,588	728,847	857,902	381,017,338
1916	1,050,038	1,218,749	718,804	832,962	373,577,908
1915	992,283	1,140,046	685,726	846,860	352,469,586

* Annual Reports of the Public Trustees of the Boston Elevated Railway. 1930, p. 9. 1928, p. 11.

¹ This was a more serious influence when the ordinary seating capacity of a bus was twenty-four to thirty than it is now when forty passenger busses are common. Even so, however, Massachusetts legislation limits the number

116 THE STREET RAILWAY IN MASSACHUSETTS

The change brought about in the seasonal variation of street railway traffic by the increased use of motor cars is even more pronounced. Twenty years and more ago many street railways carried their heaviest volume of traffic in the summer months and encouraged this traffic, though not always wisely, by a considerable investment in open cars which stood idle half the year. Now street railways in Massachusetts and elsewhere count upon the revenue of the winter months to recoup, if possible, the loss in providing fair weather service. And the street railway demand for open cars is mainly limited to summer climes.¹

	1900 %	1905 %	1910 %	1915 %	1920 %	1925 %	1930 %
January	7.65	7.57	7.86	8.13	8.48	9.12	9.46
February	6.82	6.95	7.10	7.34	7.44	8.17	8.40
March	7.74	7.99	8.25	8.29	8.69	8.86	9.10
April	7.94	8.10	8.24	8.23	8.40	8.49	8.59
May	8.69	8.80	8.65	8.73	8.71	8.58	8.64
June	9.15	8.87	8.60	8.41	8.29	8.01	7.73
July	8.94	8.71	8.78	8.21	7.94	7.43	7.21
August	8.47	8.39	8.31	7.97	7.65	7.21	6.95
September	8.47	8.45	8.38	8.30	8.05	7.61	7.79
October	9.00	8.96	8.85	8.87	8.76	8.74	8.88
November	8.40	8.49	8.29	8.60	8.57	8.46	8.20
December	8.73	8.72	8.69	8.92	9.02	9.32	9.05
	100	100	100	100	100	100	100

In 1900 the heavy traffic was carried in the summer months; in 1930 the reverse was true.

In addition to these pronounced and predictable daily, weekly and seasonal variations in traffic there are certain fortuitous and unpredictable variations. Changes in the weather, for example, introduce an important and incalculable element into street railway operation. Traffic tends to be abnormally heavy in bad weather. If preparation for such contingencies is adequate, the average cost per unit of service is high; if preparation is inadequate, the cost of service may be lessened but the riding public is irritated and disaffected.

of standing passengers in a bus to twenty-five per cent of the seating capacity while there are no legal limits affecting street cars and the physical limit seems extraordinarily elastic.

¹ The change in the seasonal variation in traffic on a city property, the result chiefly of the privately owned motor car, is indicated in the following percentages of the annual traffic carried in each month by the Boston Elevated, 1900-1930.

Street railways experience also, in common with other industries, a certain cyclical fluctuation in the demand for service. It has been proverbial in the industry, however, and probably rightly, that urban transportation is *comparatively* stable through periods of prosperity and depression. To measure accurately the amplitude of cyclical fluctuation in the volume of traffic requires an analysis of secular trend, a matter which we shall have to consider presently. But certain evidence bearing on the cyclical stability of the volume of traffic may be presented at this point.

The Board of Railroad Commissioners pointed out in their report for 1894 that, "street railways have suffered in their traffic from the general business depression far less severely than the railroads. While the number of passengers on the railroad lines (in Massachusetts) fell off 8.64 per cent and the freight tonnage nearly twice as much, . . . there was a gain of 3.24 per cent in the volume of street railway traffic."¹ On the other hand it must be remembered that street railway mileage increased in this state by 54.7 miles in 1894.

The business depression of 1907 and 1908 checked the rapidity of growth in the volume of traffic in Massachusetts but there was no absolute diminution. The evidence of this period is particularly important for motor competition was negligible, street railway mileage was nearly constant and there were no fare changes of importance.

REVENUE PASSENGERS CARRIED ON MASSACHUSETTS
STREET RAILWAYS

1904	520,056,511
1905	532,731,017
1906	581,450,906
1907	600,695,816
1908	602,400,874
1909	624,532,753

In subsequent periods of depression, the statistics are vitiated by increasing motor competition, numerous and important fare changes and, since 1920, by a rapid abandonment of line. It is interesting to note, however, that on the lines of the Boston Elevated, the depression years of 1920 and 1921 witnessed an increase in the volume of traffic though here again the significance of this increase

¹ B. of R. R. Com. 1894: 97.

is diminished by the fact that local traffic was encouraged in the latter year by a fare reduction. The figures for 1929 show a 2 per cent decrease from those of 1928 and the figures of 1930 less than a 4 per cent decrease from those of 1929, a very slight cyclical recession as compared with typical enterprises in most industries. The effect of the depression appears even slighter when it is considered that the trend of traffic on the elevated lines is probably downward.¹

THE RATE OF FARE

The importance and regularity of the daily, weekly and seasonal variations in the volume of traffic on street railways, together with the heavy proportion of overhead to total cost in the industry, would apparently favor a rate structure designed to encourage various types of off peak business. Furthermore, it would appear, a priori, probable that a larger volume of traffic, and hence a more effective utilisation of the heavy fixed investment, could be secured by a fare differentiation between passengers based on the length of the ride, encouraging short riders at a low rate. Other public utilities, the electric light and power and the telephone industries in particular, have succeeded by means of an intricate system of rate differentiation, both in utilising effectively their investment of fixed capital and in avoiding, in general, the provision of service at prices insufficient to cover costs.

The expansion of the electric railway, however, in Massachusetts as elsewhere in this country, proceeded on the basis of a 5 cent flat rate of fare. To a certain extent this was an inheritance of the horse car era. But the electric railway carried the practice further than the horse railway had ever gone. Zone fares still persisted, for example, on the Cambridge Street Railway until its consolidation with other Boston properties into the West End Railway. After the consolidation, in 1887, although a 5 cent fare covered passage regardless of length on any one line, an 8 cent exchange check was utilised for continuous passage between different parts of the system which had formerly been separate roads. It was not

¹ The treatment, in A. E. R. A. publications, of the cyclical fluctuation of street railway traffic is limited to the presentation of annual data without attempt at the elimination of trend and the effect of fare changes and other influences. It is understood, however, that a study is in process at present whose object is the isolation of the effect of cyclical fluctuations.

until the whole system was electrified that free transfers were introduced.

The 5 cent flat fare within large areas apparently met with the approval of both railway men and the public authorities. "This policy of a flat rate within reasonable limits," declared the Public Service Commission in the Middlesex Rate Case, ". . . has been the policy of the Commonwealth for many years. It really underlies the 5 cent fare provision of the Elevated and West End Companies in metropolitan Boston."¹

When the former company was chartered in 1897 not only the state but the company insisted upon writing the 5 cent flat fare into the provisions.²

Both the Board of Railroad Commissioners and the Public Service Commission considered it an institution of great social value which helped to prevent the congestion of population in the cities and all the social and moral evils caused by congestion. "A sound transportation policy," said the Commission, "requires consideration of the relations between transportation facilities and living conditions. The tenement house and the 'three-decker' with all that they involve of undesirable living conditions and fire risk are closely related to the problem of adequate transportation facilities."³

The maintenance of the flat fare policy was easy because the street railway industry approved of the institution. It was held that the conditions of electric traction made the collection of small fares for short zones impossible. Large cars, a high rate of speed and crowded service during rush hours all militated against this method. There is, of course, a certain amount of truth in this contention but it seems to have blinded operators to the fact that there are limits to a profitable passenger haul and that a lucrative off peak business might be developed by carefully devised concessions from the flat rate. Before about 1910 the street railway industry extended fare limits, granted transfer privileges and favored consolidation, which did both these things, with almost a sublime indifference as to the length of the profitable ride. Nor was any

¹ P. S. C. 1914: 117.

² "Said corporation may establish, and take a toll or fare, which shall not exceed the sum of five cents for a single continuous passage in the same general direction upon the roads owned, leased or operated by it; and this sum shall not be reduced by the legislature during the period of twenty-five years from and after the passage of this act." Mass. Acts of 1897 c. 500, sec. 10.

³ P. S. C. 1914: 117.

considerable attempt made to encourage off peak or discourage peak riding by fare differentiation.

The Board of Railroad Commissioners recognised that the issue of free transfers had been overdone as early as 1905. "The original purpose of these transfers, to place travel by way of connecting lines upon the same footing as travel over direct lines, has sometimes dropped out of sight and transfers have been issued simply to extend the distance of travel for a five cent fare."¹

The Boston and Northern, a road which during its whole period of existence never earned a proper return on its investment by any accurate system of accounting, made, between 1900 and 1914, approximately 200 changes in fares, fare limits and transfer conditions to the advantage of its patrons, and, during the same period, only 13 changes to its own advantage.²

Nor was this, and similar situations on other roads, by any means entirely the fault of regulation. The Board of Railroad Commissioners, it is true, professed certain principles which ran counter to rate differentiation on the basis of cost of carriage. The Board usually insisted upon a 5 cent fare from one part to any other part of a city or town and a 5 cent fare between adjoining city and town centers.³ On a number of occasions the principle was laid down that the cost of service on particular lines or parts of a system was not a proper basis for fare determination.⁴ Nevertheless, the companies themselves were in the main responsible for indiscriminate increases of service at a fixed fare and showed surprisingly little initiative in experimenting with differential fares for different types of passengers.

The American Electric Railway Association, disturbed by the increase in street railway costs, appointed a Fare Committee in 1911 to inquire into the limits of a profitable length of haul at a 5 cent fare.⁵ In 1914 the Massachusetts Public Service Commission, after

¹ B. of R. R. Com. 1905: 85.

² P. S. C. 1914. Joint Report. Appendix 9.

³ B. of R. R. Com. 1905: 85.

⁴ B. of R. R. Com. 1906: 81. "We cannot agree that the separate receipts and expenditures upon each line of a railway system (assuming that they can be in all cases definitely ascertained) should be the controlling factor in determining what is a reasonable fare over each line." Quoted with approval by the Public Service Commission 1914: 117. Middlesex Rate Case.

⁵ This Committee made important reports in 1911 and 1912 and suggested formulæ for determining the proper length of the ride for a given fare. See

a rough calculation, estimated that on the lines of the Boston Elevated an average passenger ride of around $4\frac{1}{4}$ miles represented the limit at the then existing costs of transportation.¹ Before this time very little attention had been paid to the subject.

The first attempt of any importance at adapting the fare to the length of the ride was the introduction of a modified zone system by the Milwaukee street railways in 1914. Only a few attempts had been made before this date to encourage off peak riding by fare reductions or to differentiate between the regular and transient passenger traffic.

From this time on, however, the rapid rise in costs forced the industry to experiment with every possible means of increasing the revenue and in Massachusetts, as elsewhere, every variety of fare was given a trial within a relatively short period of time. Among others was the continental system of small fares for short zones. In 1917 the Concord, Maynard and Hudson and the Boston and Worcester introduced a so-called "copper zone" system with charges of 2 cents a mile, raised by the latter to $2\frac{1}{2}$ cents in 1918.

The results of this fare system were disappointing.² In general the short zone, small fare scheme has not been successful under American conditions. It requires more transportation employees per unit of service than the flat fare method and the wages of these employees are high. The nature of American cities yields in general a heavier peak load than is met with in Europe and the zone fare is difficult to collect in crowded cars. Furthermore the American coinage system seems not to be suited to the collection of zone fares; anything less than a nickel is a rather impractical fare.³

Whatever the reason the zone system in Massachusetts and in the United States has yielded to a modified plan of charging by distance. A flat fare is usually charged within a relatively large central zone and additional fares for passage outside this zone.

Street railways in Massachusetts, however, more perhaps, than in any other part of the country, attempted to increase revenues by an increase in the flat fare without appreciable changes in fare limits. Massachusetts was the home of the 6 cent fare which

Proceedings A. E. R. A. 1911 and 1912. The formulæ are unsatisfactory and are adequately criticised by Jackson and McGrath. *Op. cit.*, p. 135.

¹ P. S. C. 1914. Joint Report. Appendix 16.

² See Boston and Worcester Rate Case, P. S. C. 1918: 110-116.

³ See Jackson and McGrath, *Op. cit.*, p. 104.

was introduced on a country property, the Warren, Brookfield and Spencer, as early as 1905. The fare was raised from 5 to 6 cents on a number of small town roads before 1910. Remarkable on increasing street railway costs the Commercial and Financial Chronicle asserted, in 1909, that Massachusetts was the only state doing anything about it.¹

The Public Service Commission, constituted in 1913, was slow to grant increases in flat fares, and threw its influence in the direction of shorter fare zones and differentiation in the treatment of different kinds of traffic, but the pressure of events forced a widespread concession of 6, 7, 8 and even 10 cent fares by 1918. The Chairman could say rightly in 1917, "For better or for worse, Massachusetts undoubtedly has gone further in the direction of higher street railway fares than any other state in the union."²

THE ELASTICITY OF THE DEMAND FOR SERVICE

The effect of fare increases before 1915 on the volume of traffic, during the period, that is, before motor competition had become important, suggests that, for certain of the properties represented, the elasticity of the demand for street railway transportation was considerable. The Public Service Commission, combating an increase of flat fares as a solution for the problem of inadequate revenues, collected the following data for this period.³

VOLUME OF TRAFFIC

Company	Last year of 5 cent fare	First year of 6 cent fare	Per cent of decrease
Blue Hill	1,680,543	1,525,154	9.8%
Boston and Worcester	11,143,040	10,481,902	5.9
Brockton and Plymouth	2,255,320	1,856,723	17.6
Concord, Maynard and Hud- son	1,146,088	969,621 *	15.4
Connecticut Valley	3,714,765	3,357,857 †	9.6
Lexington and Boston	2,766,618	2,688,114	2.8
Newton and Boston	1,402,385	1,315,947	6.2

* 5 months at 5 cents; 7 months at 6 cents.

† 3 months at 5 cents; 9 months at 6 cents.

¹ *Electric Railway Section* Feb. 1909, 88: 2.

² Statement of F. J. Macleod, p. 10, before *Committee on Street Railways*, 1917.

³ P. S. C. 1915: 134.

These figures in reality, however, tell us little about the effect of the fare increase alone on the volume of traffic. In order to estimate the elasticity of demand on these various properties for the given price change we should have to know what volume of traffic would have been carried in the second year had the fare remained five cents. It might appear that this figure could be easily calculated by a consideration of the trend of the volume of traffic during the last years of the five cent fare but a careful examination of the existing data indicates that the estimation of such a trend is impossible. The number of miles operated changed considerably and the character of the service was altered in such a way as to make proper allowance for these changes in the statistics of the volume of traffic impossible.

During the years when fare changes were most numerous, that is from 1915 to 1920, an accurate estimate of the effect of these changes on the volume of traffic is quite impossible. The rapid increase in privately owned motor cars was causing a constant shifting of the demand, the effect of which it is impossible to estimate without detailed knowledge of the increase in the number of cars in the territory of each company, the condition of the roads, the nature of the street railway service and a number of other variables. Furthermore this was the period of active "jitney" competition, independent motor bus companies were coming into operation, a considerable migration of population as a result of war conditions was in process, money incomes were changing rapidly and the volume of street railway traffic was seriously affected in at least one year by the influenza epidemic.

The contemporary interest among economists in the construction of statistical demand curves and the calculation of elasticity of demand, and the very great practical importance of this problem in the street railway industry itself, combine to make a study of the relation between fare changes and the volume of traffic valuable. But considerable investigation of this problem, at least under Massachusetts conditions, has convinced the writer that the separation from fluctuations in the volume of traffic of all other important causes save a change in the rate of fare is impossible. In the analysis of the trend of traffic there are too many large and incalculable influences.¹

¹ The statistical department of the A. E. R. A. has made a number of studies of the effect of fare changes on the volume of traffic for various

A further difficulty which adds to the complexity of the problem is the fact that fare changes were usually accompanied by changes in the nature of the service. Fare limits were changed, an altera-

American street railways. (See A. E. R. A. bulletins, numbers 116, 226 and 232.) The method employed is simply to compare the totals and the daily average of passengers carried per month under the old fare with the totals and daily average under the new fare. In a street railway fare case in 1928 before the California Railroad Commission the president of the Key System Transit Company sought to supplement this type of evidence, presented in Bulletin 116, by discovering, from the street railways studied, what influences *other than the fare changes* had affected the volume of traffic. Among the factors mentioned by the representatives of the companies solicited were, increase in the number of privately owned automobiles, abnormal business conditions, bus competition, city ordinances affecting jitney conditions, improved street railway schedules and service, rapid growth of population, aggressive publicity campaign, street railway consolidation, abnormal weather conditions, changes in fare limits, and "the very general habit of walking for slim figures, health and to show off clothes."

The questionnaire sent out by the Key System included also the following questions:

"(a) Will a 10¢ fare produce more revenue than a 5¢ fare."

"(b) Will a 7¢ fare produce more revenue than a 5¢ fare."

The answers to these questions were various, most of the replies emphasizing the necessity of taking into consideration a number of other influences. The answer from the president of the Dallas Railway and Terminal Company, however, was specific.

"We believe that if 100 passengers paid a 5¢ fare, at least 75 of them would pay a 10¢ fare, in which case the 10¢ fare would produce 50% more revenue.

"We believe if 100 passengers paid a 5¢ fare, that 90% of them would pay a 7¢ fare, in which case the revenue would be increased 26%."

At the present time certain officials of the A. E. R. A. are engaged in a study of the effect of fare changes on volume of traffic in which an attempt is made to isolate this from the other influences. With a careful selection of street railways such a study may produce results but the application of these results to other street railway situations should proceed with great care.

In 1929, J. G. Hunt of the Engineering Department of the California Railroad Commission made a study, *The Effect of Fare Changes on Street Railway Operations in California*, embracing 17 street railways. He took the number of passengers carried before and after the fare change and made corrections for the trend of traffic previous to the change. It is not said, however, for how long a period the trend was calculated and, from the evidence presented, it appears obvious that the trend was changing daily. His conclusions were as follows: "In reviewing the records of the seventeen street car companies during recent years, the conclusion seems clear that the private automobile competition is the dominating influence on revenue at this time. The operators who have met this competition by increasing city-wide fares, without adjustment for distance, have seen substantial portions of their patrons turn

tion was frequently made in the number of miles operated, increased money fares were accompanied by concessions in the shape of cheaper tickets for habitual users, transfer privileges were curtailed, and the like. It might appear at first blush that a solution to these difficulties could be found in taking the average fare paid per revenue passenger and considering the effect of changes in the average fare on the volume of traffic. But a little reflection accompanied by an examination of street railway experience is enough to convince one that a wide variety of possible rate structures could produce the same average fare with very different resulting volumes of traffic or, on the other hand, the same volume of traffic with different average fares.

A study of the history of Massachusetts street railways during the period of rapid fare changes leads to the conclusion that street railway managers themselves, with all their detailed knowledge of the peculiarities of their particular territories, were often sadly wrong in their estimates on the probable results of fare changes on the volume of traffic. The increases in fares on the Bay State, in 1916 and 1917, for example, which were expected to yield an increased revenue of \$1,120,000 did yield, as a matter of fact, \$236,492.¹ In general the Public Service Commission, as might be expected, was inclined to see in the increased fares the chief cause of the decline in street railway traffic while the operators tended to attribute it to motor competition, weather conditions, the departure of young men for war service, the thrift campaign and a number of other variables.² Certainly there was no consensus of opinion among those in close connection with the industry as to the quantitative importance of the different influences.

An examination of the facts bears out certain conclusions with respect to the elasticity of demand for street railway service which to walking or the use of the automobile, and in many cases have not secured the anticipated increased revenue. This appears to be true in the larger cities as well as the smaller. In those cities where rates were unchanged, revenues and travel have been but slightly affected. Those who have met the growing automobile use through rates based on competition and on distance have not experienced any substantial loss in revenue, but in all cases there has been an increase in the volume of traffic.³

Copies of this study and of the replies to the questionnaire submitted by the Key System are to be found in the offices of the American Electric Railway Association, New York City.

¹ P. S. C. 1918: 51.

² See P. S. C. 1918: 156. Middlesex and Boston Rate Case.

are evident *a priori*. Other things being equal the elasticity of demand varies inversely with the average length of the ride. Other things being equal the elasticity of demand varies inversely with the speed and comfort of the service. Other things being equal the elasticity of demand varies directly with the availability of alternative means of transport. On city properties where the length of the average ride was long and the quality of the service good the effect of a fare increase on the volume of traffic was in general much less than on small town properties having a short average length of ride and a poor quality of service.

Evidence was offered to the Federal Electric Railway Commission in 1919 that on properties where the average length of the ride is less than $1\frac{1}{2}$ miles any increase in the flat fare decreases the gross revenue, which suggests that under these conditions the elasticity of demand is greater than unity.¹ It is impossible to test the validity of that generalisation for Massachusetts conditions owing to a lack of traffic studies indicating the average length of ride. What is certain, however, is that the elasticity of the demand for transportation depends upon other things than the length of the average ride, principally upon alternative facilities for transportation.

Fare increases on the Boston Elevated, on which property the length of the average ride has been estimated at something over $4\frac{1}{4}$ miles, occasioned a relatively small decline in the volume of traffic. The fare was raised from 5 cents to 7 cents on August 1, 1918, to 8 cents on December 1, of the same year and to 10 cents on July 10, 1919. The alteration in volume of traffic in these years was as follows:

Year ending December 31	Volume of traffic Total revenue passengers
1917	381,017,338
1918	348,664,700
1919	324,758,685
1920	335,526,561

Assuming an average increase in the number of revenue passengers of 14,141,446 (the average for the 5 years preceding 1917) for the 3 years after 1917, produces an estimated volume of traffic of 423,441,676 for 1920 had the fare remained 5 cents. In all probability the volume of traffic on a 5 cent fare, were such a fare pos-

¹ Fed. Elec. R. W. Com. I: 31. Evidence of Gaylord C. Cummin.

sible without impairment of service, would have been less than this estimate, for the intervening years witnessed a rapid increase in motor competition. If the estimate is assumed to be accurate, however, the conclusion is that a 100 per cent increase in fare led, approximately, to a 21 per cent decline in traffic. Undoubtedly the narrowness of Boston's down town streets and the relatively large proportion of the traffic carried at a high rate of speed on rapid transit lines helps to explain the relatively inelastic demand for street railway transportation in this city.¹

Beginning in 1921 the Elevated attempted to encourage traffic by granting a 5 cent fare for suburban riding with very considerable success. The average length of ride between residential and shopping districts in the outlying towns lay between 1 and 2 miles and for these distances the volume of riding shows itself responsive to fare changes. The necessity of changing in 1924 and 1925 from 5 cent local fares to 6 and 6¼ cent tickets and tokens apparently caused a minor reduction in local traffic but no definite statement is possible for other influences were at work.²

REVENUE PASSENGERS CARRIED—BOSTON ELEVATED

Year	5 cent fares	6 and 6¼ cent fares	10 cent fares	Total revenue passengers
1921	23,915,742		307,624,243	337,252,080
1922	71,425,347		279,851,313	356,593,942
1923	94,170,518		283,660,762	382,149,697
1924	85,218,967	9,549,775	283,569,003	382,888,848
1925	3,853,807	55,937,785	299,107,782	365,036,286
1926	1,936,219	58,803,057	304,378,164	371,218,401
1927	2,355,682	58,890,542	299,340,854	366,938,908
1928	2,743,742	57,785,211	295,168,018	362,005,033
1929	2,612,980	56,272,366	288,789,514	354,214,990
1930	24,123,763	36,295,851	275,612,705	342,694,905

JITNEY AND MOTOR BUS COMPETITION

During the period when rising costs were affecting the industry adversely street railways were forced to contend with a serious and comparatively unregulated jitney and motor bus competition. The manner in which this competition was handled by public authority throws considerable light upon certain aspects of regulation;

¹ See Blake and Jackson, *Electric Railway Transportation*, p. 187.

² The statistics overestimate this reduction for a change in the method of counting passengers was introduced with the ticket and token fare.

furthermore the episode deserves some consideration in a discussion of street railway revenues.

Motor cars and a few experimental motor busses were doing a small passenger business in various Massachusetts cities and towns as early as 1910 or 1911. But the jitney proper originated on the Pacific Coast in the summer of 1914 and swept across the country in the following year.¹ By the middle of 1915 large numbers of them were carrying passengers at the customary 5 cent fare in most of the cities of this state. In the fall of the same year when the Inspection Department of the Public Service Commission made an investigation of the situation, 570 jitneys were in irregular operation in Fall River, 293 in New Bedford, 64 in Lawrence, 65 in Salem, 113 in Holyoke, 403 in Springfield, 113 in Brockton, 90 in Worcester, and many others in the smaller towns and cities of the state.² They never made an appearance in Boston probably because the Police Commission could find no authority for issuing licenses for jitneys except by classifying them as sightseeing busses, and this required a minimum seating capacity of eight.³

The effect on street railway revenues of such competition was large and immediate. During the summer season of 1915 the Bay State estimated that its loss in revenue from this source averaged \$700 per day; the estimated cost to the Union Street Railway of New Bedford was \$200 a day, to the Springfield Company \$67,000, roughly, for the summer, and other companies were similarly affected.⁴

The ordinary "jitney" was a cheap or second-hand touring car and the period of most active operation lay in 1914 and 1915 when a large number of unemployed ran "jitneys" in lieu of other occupation. War prosperity checked the spread of this method of transportation but, as the Public Service Commission reported in 1919, "Since this first reaction jitney service in various sections of the country has shown marked fluctuations in volume, alternately increasing and decreasing, for reasons that are not always easy to discover."⁵

¹ The Public Service Commission has a fairly extensive account of the history of jitney competition in its 1915 report. Cxli and below.

² P. S. C. 1915: Cxlv.

³ *Ibid.*, Cxlii.

⁴ *Ibid.*, 1915: Clvii-Clx.

⁵ *Ibid.*, 1919: 194.

It became obvious later, and it ought to have been obvious at the start, that the jitney represented, under its usual conditions of operation, a totally reprehensible and unjustifiable form of competition to street railway service. Instead of acting as feeders to the street railways, the jitney routes usually paralleled railway lines and skimmed the cream of the summer traffic while contributing very little to the problem of carrying passengers in bad weather. On cold, stormy or otherwise unpleasant days the whole jitney service tended to disappear, leading to the overcrowding of a street railway service which had been adjusted to meet the competition. Moreover the jitney operators were often, if not usually, irresponsible, they paid nothing or very little towards the upkeep of the highway, and were insufficiently insured against injury to their passengers.

Nevertheless local sentiment frequently favored the jitney and most of the municipalities in Massachusetts showed no willingness to lighten the burden of this competition to the already overloaded street railways. Department stores financed jitneys which brought passengers to their doors. One department store in Salem loaned \$29,000 for the purchase of jitneys for this purpose.¹ The protests of street railways passed unheeded and the use of jitneys was attributed to the inadequacy of rail service.

Wherever jitneys were required to pay their fair share of the maintenance of highways, to insure against risk of injury to passengers and to maintain a constant and reliable service, requirements which street railways were forced to meet, jitney competition immediately disappeared. After the passage of an ordinance with such requirements in Dallas, Texas, the receipts of the local street railway went up at once \$1,000 per day.² The regulation of jitney traffic in most Massachusetts towns was ridiculously lax. In New Bedford, which had probably the best street railway service in the state, jitney competition was particularly severe since the only requirement placed on the jitney operator was the payment of a license fee of \$1 and a police inspection fee of \$1.³ Other municipalities imposed heavier, but utterly inadequate, burdens.

On the recommendation of the Public Service Commission the

¹ Fed. Elec. R. W. Com. II: 1645. Evidence of Homer Loring.

² P. S. C. 1915: Cxliii.

³ *Ibid.*, 1915: Cxlv. There was also a limitation on the number of passengers to be carried.

General Court passed an act in 1916 (Chapter 226 of the General Statutes of 1916) giving municipalities authority to regulate jitney operation but the statute was quite ineffective. A number of cities and towns refused to accept the act, in those which did accept it the regulation was often inadequate, and where the terms of regulation were adequate they were given insufficient enforcement.¹ In the autumn of 1918, 4 years after the jitney had first made its appearance in this state, the War Labor Board estimated that there were 993 in operation in Massachusetts. In the following year jitney competition was described as more acute in this state than in any other part of the country. In February 1919 this competition was costing the Bay State, then in the hands of receivers, something like \$16,600 a week or over \$860,000 a year.² The widespread use of jitanys was in part caused by high fares and poor street railway service in Massachusetts but the Public Service Commission is correct in asserting that the main cause is, "The fact that Massachusetts has not kept pace with the rest of the country in subjecting jitanys to reasonable and proper regulation."³

A law was passed in 1918 upon the recommendation of the Public Service Commission (Chapter 226 of the General Statutes of 1918), declaring the jitney a common carrier and providing for an appeal from the terms of local regulation to the Commission. In passing upon the first appeals under the act brought by street railways the Commission defined its attitude toward jitney competition. "We believe that a candid investigation of the conditions of jitney operation wherever it has been tried is bound to lead to the conclusion that while jitney service may supplement or destroy the street railway, it cannot take its place. . . . The idea that the constant demands of city traffic can be wholly met by a group of independent, individual jitney operators furnishing service without any coördination or guarantee of reasonable permanence, is a palpable delusion, and no such claim, it is fair to say, has been advanced by any of the jitney operators in the present case."⁴

In conformity with this judgment the Commission recommended more adequate regulation and offered certain suggestions for carrying these recommendations into effect. Local regulation became

¹ P. S. C. 1919: 194.

² *Ibid.*, p. 198.

³ *Ibid.*, 1919: p. 199.

⁴ *Ibid.*, p. 197.

more stringent the following year and by 1921 the Department of Public Utilities could report that jitney operation had been seriously curtailed and was now limited for the most part to territory not served by street railways.¹ The policy of the Commission and the Department throughout this period was partial regulation and not prohibition. While admitting the jitney could not perform the services of the street railway, while admitting that imposing proper costs and responsibilities on the jitney would drive it entirely out of business, both the Commission and the Department, when given power, refused to take this step.

The public trustees of the Bay State (Eastern Massachusetts) in whose territory jitney competition was particularly menacing, met the problem simply and squarely. They soon made it evident to local authorities that the municipalities would have to choose between street railway and jitney service and, as a result, the jitney quickly disappeared.

Meanwhile the jitney proper, a totally inadequate and expensive means of transport, was being supplanted in other parts of the state by the motor bus. In many communities motor busses operated in competition with the street railway. A law of 1918 (Chapter 226) had, however, authorized street railways to purchase and operate busses and, in the course of time, assisted by a hesitating and slowly developed policy of exclusion of competition adopted by state and local authorities, the public transportation facilities of each locality were concentrated in the hands of a single agency.

A majority of the early bus operators seem to have been as irresponsible as the ordinary jitney operator. When in 1922, in response to a demand from the state senate for information on the comparative cost of motor bus and street railway transport, the Department of Public Utilities sent out questionnaires to the 98 independent bus operators in the state, repeated solicitation and personal visits elicited only 23 returns and of these only 10 "contained information sufficiently complete to be of value."²

From 1914 to 1922 the street railway industry in this state encountered a severe and irresponsible motor competition for which the state and local authorities offered an utterly inadequate regulation. It came at a time when rising costs and replacement requirements necessitated a considerable increase in fares and was, in

¹ D. P. U. 1921: 22.

² 1922 Sen. Doc. 287, p. 7.

large part, responsible for making the fare increases actually granted ineffective.

The replacement of rail by motor service over a considerable part of street railway territory was, of course, inevitable. But the decision between these alternative methods of transport ought to be made on the basis of their comparative costs. Such a decision is impossible under a system of regulation which imposes heavy burdens and responsibilities on one type and not upon the other. Furthermore there are great economies to be had in concentrating the operation of all public transportation facilities within a locality in one company. Public regulation in Massachusetts appears to have been unnecessarily slow in recognising these facts. We shall have occasion to return to this matter again in the next chapter.

CHAPTER 7

THE REGULATION OF STREET RAILWAYS IN MASSACHUSETTS

Many references have been made in previous chapters to legislation and to the attitude and policies of the Massachusetts regulatory commissions respecting the financing, consolidation and fare structures of street railways in this state. It is now time to draw these scattered remarks together in an attempt to evaluate the effects of regulation upon the growth and decline of the industry.

It is not the purpose of this chapter to expound the Massachusetts system of public utility control. This has already been done and recently.¹ We are concerned exclusively with the regulation of street railways. Furthermore the questions of law and administration which deserve first place in a study of utility control are here subsidiary to the economic question of the effect of regulation upon the development of the industry and the character of its services to the community. More particularly, three primarily economic problems deserve attention; did the regulation of incorporation, location, security issue, consolidation and service in this state lead to a development of transportation facilities in the public interest; was the control of fares and fare structures, particularly during the period of rising costs, pursued in the public interest; has public regulation held the proper balance between the street railway and alternative means of transportation?

MUNICIPAL REGULATION

When electrical traction was first introduced in this state, in 1888, the methods of state control of street railway organisation and operation had already passed through an extensive period of development.² The first roads had been incorporated by special legis-

¹ See Irston R. Barnes—*Public Utility Control in Massachusetts*, New Haven, 1930. Also an unpublished Harvard Ph.D. thesis by Melvin DeChazau—*Some Chapters in the Regulation of Electric Utilities in Massachusetts*.

² Until 1874 every street railway was incorporated by special act.

lative acts in terms which indicate considerable doubt in the minds of the legislators as to the utility of this method of transportation. This doubt was removed by experience, however, and in 1864 a general law regulating street railways was enacted. When the railroad commission was established in 1869 the twenty-two roads then in operation were placed under its jurisdiction and in 1871 the law of street railways was codified in a form which changed very little before the period of electrification.¹

Street railway companies were organized under a state charter but held their location in the streets under a municipal permit "perpetual in theory, though in point of fact revocable at any time."² The famous Street Railway Commission of 1898 evaluated this so-called Massachusetts "indeterminate permit" and found it good. In fact it has met with the approval of both the companies and the authorities and regulation in this state has been possible without a single revocation of permit.

The power wielded by municipal authority was large and its exercise has been subject to three important and oftentimes justifiable objections. In the first place it resulted in a divided control of the streets with frequently deplorable results. The ludicrous picture of street railway employees removing snow from the tracks to the highway while municipal employees removed snow from the highways to the tracks has already been referred to. The solution of Charles Francis Adams was municipal ownership of the roadway and tracks, to be leased to private companies which had invested in rolling stock and power plant facilities. The alternative suggestion, offered by his committee of 1898, a suggestion immediately enacted into law, was the imposition of a commutation tax upon street railways in lieu of their obligations for cleaning, paving and repairing the streets. The municipalities were to undertake this obligation thereafter. However, as it has already been pointed out, municipalities oftentimes continued to demand and to receive assistance from the railway companies in maintaining the streets, while collecting in addition the commutation tax. The economic justification, moreover, both of the obligations and of the tax designed to replace them largely disappeared with the horse car. They have

¹ For a discussion of regulation during the horse railway period see R. H. Whitten, *Public Administration in Massachusetts*. New York 1898. Ch. VIII.

² *Report of the Street Railway Commission of 1898* (C. F. Adams, Chairman) p. 13.

remained to accelerate the dissolution of the street railway and to hamper the industry in its competition with alternative means of transportation.

In the second place municipal control, though advantageous while street railways were limited to one municipality, often led to an irksome and ineffective variety of impositions upon street railways whose lines extended through many municipalities. It became possible for the single town strategically situated in a proposed or existing street railway network to make undesirable conditions contingent upon its grant of location.¹

In the third place street railways, for a number of reasons, have oftentimes fallen too easy a prey to municipal officials anxious to hold down tax rates or to increase local expenditures by imposing the cost on the utility. During the period of rapid street railway building it was the consensus of opinion among the citizenry that the companies were receiving valuable rights in the public highways for inadequate consideration and this opinion undoubtedly strengthened the demands of municipal officials. This was not the view of the Board of Railroad Commissioners,² nor was it the opinion of the Street Railway Commission of 1898 which reported that, "a more careful investigation fails to disclose those Massachusetts franchises of great value given away without consideration, or unduly large profits on the part of the companies as a whole, or more than exceptional cases of vicious financing, or a deceptive general system of bookkeeping."³

As a matter of fact the shoe appears distinctly to have been on the other foot. Street railway promoters in the active competition for locations frequently submitted to municipal impositions which jeopardized the prosperity of the companies.⁴

¹ See R. E. Whitten—*Op. cit.*, p. 121-122. New York, 1898. Columbia Studies, Vol. 8. The Board of Railroad Commissioners commenting upon this situation said, "An examination of the conditions and restrictions under which street railway locations have been granted shows a range of grant from that in the nature of a gift to that upon conditions calling for extraordinary expenditures by the company. Grants to the same railway are often radically unlike in the different towns through which it passes." 1901: 54. See also P. S. C. 1915: LVII.

² B. of R. R. Com. 1895: III-113.

³ *Report of Com., of 1898*, p. 36.

⁴ *The Commission of 1898* reported (App. A.73): "The promoters of the road are in most cases ready to accept almost any condition in order to get the chance to build, relying upon the probability of finding purchasers for

Furthermore, once a considerable investment has been made, municipal officials were not above imposing onerous terms in connection with any subsequent grants of location.¹

It would be difficult to maintain that the conditions imposed by municipalities in connection with grants of location seriously hampered street railway *construction* in this state. It is obvious that street railway building outran the need for transportation and that even before the introduction of the motor car the mileage was too great. Moreover, in certain respects the conditions imposed by municipalities were not as onerous as in other states. The franchise was never sold for money and Massachusetts street railways have not had their capitalisation inflated by such charges.²

Nevertheless the character of municipal regulation in Massachusetts has adversely affected the *operation* of street railways in a number of ways. The mayor and aldermen have the statutory power to determine the streets in which railway tracks may be laid, the distance from the sidewalk, the grade and gauge. They have power also to regulate the rate of speed, the mode of use of the tracks and the removal of snow and ice therefrom.³ But in addition to these considerable powers municipal authority has arrogated to itself others by making the grant of location contingent upon their recognition by street railway companies. Many of the grants of location contained a 5 cent fare requirement. In a long line of decisions Massachusetts has held these fare provisions not to be binding upon the railway.⁴ But the companies were not so fortunate in ridding themselves of the effects of other requirements. Occasionally the grant of location was made contingent upon the

their shares and bonds, and planning to get their profit out of this transaction rather than from the operation of the road."

¹ P. S. C. 1915: lvii. See also the discussion of municipal impositions in the New Bedford and Onset Rate Case. P. S. C. 1915: 97. *Report of 1898 Appendix A*, p. 66.

² To the considerable public demand for a system of money payments for franchise privileges the Board of Railroad Commissioners in 1895 (p. 111-13) replied, "Under the existing financial conditions of electric railway enterprise, with the small margin of legitimate profit which it has been shown to yield, there is strong reason to apprehend that the actual, if not the necessary, result of the proposed new system would be either to increase the charge for transportation, or to impoverish the service."

³ Mass. Acts of 1874, c. 29. Subject to the changes introduced by the commutation tax of 1898, which we have already noted.

⁴ See I. R. Barnes, *Op. cit.*, p. 102, note 79, for a list of these decisions.

construction or paving of the entire width of the highway occupied by the tracks.¹ On other occasions the requirements of highway repair and maintenance were heavy and have had the effect of increasing operating expenses or fixed charges or both. Certain of these conditions, exceeding the power of the municipal authority, were illegal but the cost of bringing suit and a recognition of the unfavorable effect of evading the conditions of location even by legal means has frequently prevented street railway companies from taking action. All in all, regardless of the intention of the law, the acquisition of rights of location has frequently meant a considerable addition to the cost of construction of street railways in Massachusetts and to their cost of operation.

The exercise by municipalities of their legally granted powers has also on occasion hampered the proper operation of street railways. They have frequently been required to lay track on the side of the street where, as the Public Service Commission pointed out, "the surface water flows upon and along the rails, which softens the roadbed, leaving the tracks in bad surface and alignment, while thawing and freezing weather in winter seriously affects the operation of cars."² Oftentimes the companies have been required to replace their tracks when they still have considerable wear in them.³

These requirements, of course, were usually motivated by considerations of public convenience and, frequently, of public safety. But street railway transportation also was, and still is, a matter of public convenience and a proper estimate of the financial burdens which the roads could pay while continuing to furnish adequate service, seems frequently to have been left out of the calculations.

The attitude of municipal authorities toward motor competition, commented upon in the preceding chapter, also affected adversely the operation of street railways. During the early period of jitney and motor bus competition the regulation of these agencies was entirely in the hands of the municipalities and the failure of the latter to insist upon financial responsibility and proper conditions of operation seriously reduced street railway revenues. It was not until 1920, when the railways were permitted to appeal from municipi-

¹ P. S. C. 1915: 97. *New Bedford and Onset Rate Case.*

² *Ibid.*, 1915: lvii.

³ *Ibid.*

pal regulation to the Department of Public Utilities, that this handicap was removed.

THE BOARD OF RAILROAD COMMISSIONERS

The Board of Railroad Commissioners which exercised certain regulatory powers over street railways from 1869 till the creation of the Public Service Commission in 1913 was a so-called "weak" commission. Although it had extensive control over street railway accommodation, its control over fares was very limited. Prior to 1898 it might order fare reductions provided the return on the actual investment would not thereby be reduced below 10 per cent.¹ In 1898, upon the recommendation of the Street Railway Commission of that year, the Board was prohibited from reducing fares, without the consent of the company involved, below the amount charged for similar service on other properties.² Both before and after 1898 the question of fare reduction came before the Board on petition of the aldermen of a city, the selectmen of a town or of fifty voters of a city or town. In 1901 the fare provisions of the Act of 1898 were repealed and the Board permitted to recommend fare changes directly but not to compel them.³

The first chairman of the Public Service Commission summarised the situation before 1913 as follows: "The old railroad commission simply had a power to deal with rates upon complaint and never really took any active part in matters of rates at all; and the most that was done in the whole period of the existence of the old railroad commission was to put in a few little minor rate adjustments at certain points, not, however, based upon any valuation of the company or any determination as to how much money the company was entitled to earn, but upon the basis of making the fares between points A and B consistent with the general fare scheme which the company itself voluntarily had put into effect for its entire system; in other words, merely to correct discriminations."⁴

Under this lax system of regulation the interests of the public were certainly not sacrificed. Fare limits were steadily extended,

¹ Mass. Acts of 1871, c. 381, sec. 34. The only mandatory power over rates possessed by the commission concerned the determination of rates on the carriage of milk. Mass. P. S. C. 112: § 192-194.

² Mass. Acts of 1898, c. 578, sec. 23.

³ Mass. Acts of 1901, c. 180, sec. 1.

⁴ Fed. Elec. R. W. Com. II: 1446.

the average length of the ride per unit fare continually increased and the profits of Massachusetts street railways could by no stretch of the imagination be called exorbitant. When the Board did recommend fare changes, and such recommendations were not infrequent, it was upon a calculation of what alteration in fare limits would make the largest contribution to the public service without curtailing the return on the investment.¹

There is some reason for believing that, had it not been for the existence of the Board and its favorable attitude, the rather numerous and, in every case, necessary increases of fares on small country properties between 1902 and 1912 would have met with considerably more public opposition than was encountered.²

The Board's powers of control over accommodations and conditions of service though limited at first to recommendation were largely extended after the introduction of electric traction and seem to have been effectively exercised, although regulation was handicapped in the early years of the electric railway by the lack of a staff of inspectors. The Commissioners had power to regulate the heating of cars,³ the installation of fenders,⁴ the construction of railway crossings,⁵ the joint use of tracks,⁶ and could require the provision of additional accommodation whenever it was judged

¹ The nature of typical fare decisions by the Board of Railroad Commissions is indicated in the following opinion regarding a revision of fares on the Plymouth and Kingston Street Railway. Reports 1895: 181. "It appearing, after due notice and a public hearing, at which hearing the said company was represented by its treasurer and superintendent and fully heard, that the fares now established by said company are not, in the judgment of the Board, adjusted with due and reasonable regard to the public convenience; and that a re-arrangement of the routes or distances covered by said fares would tend not only to increase the volume of travel on said railway, but also to enlarge rather than diminish the probable income of the company from the operation thereof," etc.

² Cf. Proceedings of A. E. R. A. 1909: 180. Address of J. H. McGraw on "Publicity and Street Railway Problems." The Board expressed itself on the fare situation in 1904 as follows: "Upon some railways fares have been raised, and with encouraging results, but this action is usually unpopular and is often taken at the risk of lessening the volume of business. . . . If, however, this is the remedy, it is better that it be applied than that the public lose the benefits which the railways bring." Reports 1904: LXVIII.

³ Mass. Acts of 1895, c. 136.

⁴ *Ibid.*, c. 378.

⁵ *Ibid.*, c. 426.

⁶ Mass. Acts of 1888, c. 278.

proper.¹ But it was not until 1897 that the duties of railroad inspectors were extended to street railways and not until 1907 that a special staff of street railway inspectors was appointed. In 1911 the number of inspectors was increased and the basis of appointment changed from 1000 to 750 miles on both railroads and street railways.

Before 1897 the sale, lease or consolidation of street railways required a special act of the General Court but in that year, on the recommendation of the Board, it was given power to refuse or to authorise these acts.² The terms of the law limited consolidation to contiguous properties and provided that the capitalisation of the consolidation should not exceed the sum of the capitalisations of the individual companies. The Board as a matter of practice insisted upon the further condition that consolidation should not be accompanied by fare increases or restriction of fare limits. Within these limitations regulation favored consolidation and the attitude of the Board on this matter profoundly influenced during the next few years the development of the street railway industry in Massachusetts.

The Commissioners encouraged the merging of small adjacent properties on the ground that it "might often result in securing greater economy and efficiency of management, and in thereby giving to the public a more convenient and in some cases a cheaper service."³ It certainly gave the public, temporarily at least, a cheaper service, for consolidation was almost invariably accompanied by an increase in fare limits. It is clear also that, through union with stronger city properties, a number of suburban companies were enabled to continue service long after it would have been impossible for them to do so unsupported. But, on the other hand, as we have seen in Chapter 3, consolidation weakened the city properties, made fare increases necessary sooner than might otherwise have been the case, and probably was in part responsible for an inferior service in the cities. Furthermore the Board in its enthusiasm for consolidation gave its consent to combinations which were uneconomically conceived and destined to fail.

One of the significant powers of the Board of Railroad Commissioners it possessed from the start, the power to secure necessary

¹ Mass. Acts of 1897, c. 213, 269.

² *Ibid.*, c. 213, 269.

³ B. of R. R. Com. 1896: 106.

information from the companies. Street railways supplied the Board annually with a balance sheet, income statement and traffic statistics in a form prescribed by the Commissioners and this information was published by companies in the yearly report. In addition the railways were required to report all accidents, the investigation of which was one of the chief duties of the Board.

REGULATION OF SECURITY ISSUE

The most important powers of the Board of Railroad Commissioners during the electric railway era were concerned with those functions which have been considered, and rightly, to lie at the center of the Massachusetts system of public utility control, the regulation of security issue. This matter has been frequently and extensively treated.¹ We are concerned here primarily with the effect of the administration of these functions on the organization and operation of street railways.

Public Utility Commissions have possessed significant powers over the security issue of street railways only since 1893 but pretty much the whole of electric railway financing falls within the period since that date. Moreover, the "anti-stock-watering" laws of 1893 and 1894 merely altered and amplified certain principles of security regulation which have controlled public utility financing since street railways were first introduced in this state. The essential characteristic of the "Massachusetts system" is that securities shall be issued only for cash and at a figure not less than their par value. In consequence the par value of the outstanding securities has had an importance in the regulation of public utilities in this state which it has not often possessed elsewhere.

The securities regulated have been stocks, bonds, coupon notes and other evidences of indebtedness of more than twelve months duration. The par value of capital stock was fixed at \$100,² the shares to be sold at not less than par and only for cash. It has been the policy of the Massachusetts regulatory commissions to refuse to allow the issue of stock for purposes of capitalising bond discount, the compensation of promoters or surplus earnings and

¹ The best treatment of this subject is still C. J. Bullock's article, "Control of Capitalization of Public Service Corporations in Massachusetts," *American Economic Association*. Publications, April, 1909. More recent discussions are contained in I. R. Barnes, *Op. cit.*, and M. C. DeChazeau, *Op. cit.*

² In 1923 an act was passed permitting the issue of stock at pars of \$100, \$50 and \$25. Mass. Acts of 1923, c. 491, sec. 2.

they have frowned upon the issue of stock for the provision of working capital.¹ Until 1873 no restrictions appear to have been placed on the issue of additional stock, after incorporation, as long as this stock was issued at par. In that year, however, an act was passed requiring street railways, when their stock was selling above par, to offer the new shares at public auction and in order to prevent these sales from depressing the price below par the number of shares to be offered in any one day was limited to 2000.² These legislative limitations on stockholders' rights provoked such criticism from the companies and from the Board of Railroad Commissioners itself that an act was passed in 1879 giving stockholders the privilege of subscribing for their quota of new stock at par, the remainder, if any, to be sold at public auction. Thus the matter stood until the passage of the "anti-stock-watering" laws of 1893 and 1894.

The amount of street railway funded indebtedness seems not to have been limited until 1889 when it was provided that the size of the issue must be approved by the Board of Railroad Commissioners and that approval should be denied unless the value of the property, excluding franchise, should equal or exceed the par value of the outstanding capital plus the debt.³ The absence of a limitation on the relation of funded debt to outstanding capital was criticised, however, by the Board of Railroad Commissioners and in 1906 it was provided the bonds, notes and other indebtedness exceeding one year's duration should not exceed the par value of the capital stock.⁴ In 1908 this law was relaxed to permit the addition of premiums paid in on capital stock,⁵ and in 1914, to meet the street railway crisis, the funded debt was permitted to exceed the paid in capital by 20 per cent.⁶

The "anti-stock-watering" laws of 1893 and 1894 subjected the issue of street railway securities to more stringent limitation and placed greatly increased powers in the hands of the Board of Railroad Commissioners. Since 1874 the companies had been required to obtain the approval of the Board for any stock issue

¹ In 1909 an act was passed permitting street railways to issue stocks or bonds not exceeding 5 per cent of the par value of the stock outstanding to provide working capital. *Mass. Acts of 1909*, c. 485.

² *Ibid.*, 1873, c. 305.

³ *Ibid.*, 1889, c. 316, sec. 1.

⁴ *Ibid.*, 1906, c. 463, part III, sec. 108.

⁵ *Ibid.*, 1908, c. 620.

⁶ *Ibid.*, 1914, c. 671.

exceeding the limits set by legislative act.¹ In 1893 the Board was given control of the amount and purpose of all street railway security issues.² The "anti-stock-watering" laws provided, furthermore, that whenever a company increased its stock issue the stock was to be offered to the stockholders at a price to be determined by the Board, which price was to be not less than par or, if the market price was above par, at not less than the market price.³ In case the issue was less than 4 per cent of the stock outstanding the company was at liberty to sell it at auction without offering it to the stockholders. An act of 1908 permitted the stockholders to price the new issue subject to the approval of the Commissioners,⁴ but the policy of the Board has been in general to insist upon the highest price at which the new issue could be sold.

Massachusetts street railways were not permitted to issue preferred stock before 1902 but that year an act permitted the issue of such stock, with the approval of the Board of Railroad Commissioners to an amount not exceeding at any time the amount of the common stock then outstanding.⁵ The determination of par value and issuing price is left by this statute to the company. An act of 1913 permitted, on the vote of two-thirds of the common stockholders and the approval of the Railroad Commission, the substitution of preferred for outstanding common stock provided the par value of outstanding securities was not thereby increased.⁶

Prior to 1900 there was no provision in Massachusetts street railway law for the incorporation of a company to take over the assets of a bankrupt property, or for the determination of the security issue justified in such a situation. This omission was repaired by a statute authorising the incorporation of such companies and fixing the amount of the capital stock at a figure, approved by the Board of Railroad Commissioners, but which shall not exceed the fair cost, as determined by said Board, of replacing the railway and property so acquired, less the amount of any outstanding mortgages to which said railway and property may be subject in the hands of the new company.⁷

¹ Mass. Acts of 1874, c. 29, sec. 15.

² *Ibid.*, 1894, c. 463.

³ *Ibid.*, 1893, c. 375.

⁴ *Ibid.*, 1908, c. 636.

⁵ *Ibid.*, 1902, c. 441.

⁶ *Ibid.*, 1913, c. 764.

⁷ *Ibid.*, 1900, c. 381, sec. 4.

It was the practice of companies organised to take over assets to ask the Board for a determination of replacement cost for purposes of capitalisation. When the Middlesex and Boston purchased the South Middlesex at receiver's sale at a price which the Public Service Commission alleged to have been \$125,000 in excess of cost of replacement, this excess payment was disallowed as part of the valuation on which the company could expect to receive returns.¹

The primary purpose of this comprehensive scheme of security regulation, was to keep the par value of outstanding securities at as low a figure as possible. A long series of legislative acts prohibited stock dividends in any form. Such regulation, it was pretended, was in the interests both of the investors and of the general public; of the investors because it limited the claims on the earnings of the enterprise to those who had actually invested cash; of the general public because it limited the capitalisation on which returns were legal and justifiable.

It would be difficult to deny that both of these aims have, to a considerable extent, been realised. Under the Massachusetts system of security regulation, public utility companies have been, on the whole, soundly financed and have enjoyed an enviable reputation as stable enterprises. The statistics on capitalisation of street railways in Massachusetts and other states, presented in chapter two, indicate clearly enough that the stock watering practices so prevalent in the industry elsewhere have been largely avoided.²

On the other hand the Massachusetts system has been severely and justly criticised at many points and there is no doubt that in certain particulars it has adversely affected both the public and the private interest. While stock issues and evidences of indebtedness of more than one year's duration were strictly regulated, Massachusetts law and commission control has, strangely enough, left untouched the amount of current liabilities of its public utility companies. Nor has the purpose of short time borrowing been scrutinised with care. Apparently this neglect is to be explained by the tacit assumption that the private interest of the companies was a sufficient check on short term borrowing. Not only, however, has this assumption proved invalid, but the very strictness with which the issue of stock and bonds has been regulated, has often-

¹ P. S. C. 1914: 100. Middlesex and Boston Rate Case.

² See page 26.

times forced street railways to excessive borrowing from the banks. As Professor Bullock remarks, "Apparently the state has been watching the front door of the stable so intently that it has forgotten the very existence of the back door."¹

Although the figures presented in the chapter on street railway financing² indicate that an excessive proportion of current liabilities in the capital structure of street railways was not a condition limited to Massachusetts but a weakness characteristic of the industry, at least in certain stages of its development, it still remains true that many companies in this state carried their dependence on current financing to a dangerous extreme. And for this situation too stringent limitations on other forms of borrowing were in part responsible. The absence of any restriction on current borrowing led certain companies, furthermore, to borrow for illegitimate purposes, to provide for depreciation and to pay dividends on the stock outstanding.

Certain justifiable outlays necessary to make the company a going concern, for example the payment of promoters' expenses and the provision of working capital, ought by all rights to have been capitalised, but the legal prohibition on the issue of stock for this purpose drove the companies either to bank borrowing or to avoidance of the prohibition by one or another of a large number of more than dubious practices. These limitations on the amount and purposes of stock and bond issue were the more easily avoided since the Board of Railroad Commissioners until 1902 were dependent on company engineers for figures on the cost of construction.³ Under such circumstances it was a comparatively easy matter, by a judicious padding of accounts, to capitalise not only the legitimate expenses connected with the establishment of a street railway as a going concern, but, oftentimes, a handsome "rake off" for the promoter besides. This lack of control over the expenditure of the proceeds of security issue led at times to a divergence between the volume of security issue and the money "prudently invested"

¹ C. J. Bullock, *Op. cit.*, p. 393.

² See page 27.

³ P. S. C. 1915: 99. *New Bedford and Onset Rate Case*. "The records of this office show that these stock and bond issues were approved by the Board of Railroad Commissioners at a time when it had no power to employ an expert of its own for valuation purposes and was largely dependent upon appraisals made by engineers employed and paid by the companies themselves, a situation which was remedied by chapter 432 of the Acts of 1902."

of which the Commissioners have felt compelled to take account.¹

The legal prohibition on the issue of stock at less than par, while in the main probably justifiable, admits of occasional exceptions and has affected street railways with peculiar severity. The small suburban or country property having reached its limit of bond issue and of its line of credit at the banks, has been denied thereby any possibility of rehabilitation through the issue of additional stock to be sold at less than par to those willing to take a chance on its future. Such companies have been forced to sell out to adjacent and stronger city properties in order to continue operation. The laws regulating the capitalisation of consolidations has, moreover, as we have already seen,² produced the same effect as a stock issue at less than par, though by devious means. For consolidation has been permitted without any reduction of the sum of the par values of the capital stocks of the consolidated companies, regardless of the price paid for the subsidiaries. The stronger city properties have been provided with the opportunity of acquiring subsidiaries cheaply and at the same time of indulging in a bit of legal stock watering.

The provisions of the law of 1893 that additional stock must be issued at the market price to be ascertained by the Commissioners has also had certain unfortunate effects. Since this law went into effect, 235 applications made by street railways for permission to issue additional common stock have been approved and in 60 cases the stock was issued at a premium. Since 1915 there have been only 4 applications and no street railway has issued its stock at a premium. Since 1920 only one street railway, the Boston Elevated, has increased its stock at all.³

The responsibilities put upon the Commissions of determining the price of issue have been extremely difficult to administer. During the period when street railway stocks were still issued at a premium,

¹ See Bay State Rate Case.

² See page 42.

³ Including preferred stock the figures are as follows:

	At par	At a premium	Total
Number of permits to date	184	67	251
Number of permits since 1915	9	0	9
Number of permits since 1920	1	0	1

No preferred stock was issued by street railways in this state before 1908. Beginning in that year the difficulty of selling common stock made it a rather frequent practice, there having been 16 issues altogether.

the Board of Railroad Commissioners had to steer an impossibly narrow course between the interests of the stockholders and the interests of the public. On a number of occasions the price set was too high, and either the company decided not to issue stock or the stock, if issued, could not be sold.¹ There is little doubt, furthermore, that the existence of these limitations on the issue of stock, had the effect of "thinning the equity" and of forcing street railways into methods of borrowing less advantageous to themselves and, in the long run, to the public.

On the whole it would be difficult to say that the Massachusetts system of security control hampered the building of street railways. It might be more seriously argued that it encouraged the building of a large number of small and weak properties at the expense of the extension of stronger city properties because the difficulties of new stock issue were not as serious as those of an increase in the issue for a company whose stock was selling at a high price in the market. But the rapidity of the building even of city properties into outlying and often sparsely settled territory is a pretty good indication that the regulation of security issue did not seriously curtail street railway construction.

On the other hand the system of security control has affected adversely the *operation* of street railways in this state in a number of respects. Their capital structure has contained as a rule far too large a proportion of current liabilities and the equity behind both current and funded debt has been without doubt considerably less than it would have been had the issue of common stock been subject to less stringent regulation. Restriction on both bond and stock issues, furthermore, frequently prevented the rehabilitation of properties which, for one reason or another, did not provide for this rehabilitation an adequate depreciation allowance. Finally security control frequently compelled consolidation as the only way out of financial difficulty for weak roads. And the Board of Railroad Commissioners lent its influence to the consolidation movement without always scrutinising carefully the economic feasibility of joint operation.

¹ In 1907 an issue of West End street railway stock (par \$50) was set at \$85. It was not fully subscribed at this price and another issue the same year was priced at \$70. B. of R. R. Com. 1907: 139-140. In 1908 the Board refused to allow the Fitchburg and Leominster to issue new stock at par and in consequence the company decided not to issue stock. *Ibid.*, 1908: 153-54.

Careful as the control of security issue has been, moreover, it has not wholly prevented the watering of stock. Water has seeped in, quite legally, in the process of consolidation, and, not as legally, through the lack of Commission control, in early years, over expenditures on construction.

VALUATION AND RATE REGULATION

The second important problem demanding discussion in a consideration of the economic effects of regulation, is the question of the control of fares and fare structures. As we have seen, the rate powers of the Board of Railroad Commissioners were slight. The question, moreover, of fare changes was of relatively small importance during its tenure. The creation of the Public Service Commission in 1913, on the other hand, established a body with full control over fares and fare structures. As it happened its creation coincided with a crisis in the street railway industry. During the whole period of the Commission's existence, from 1913 to 1919, the problem of street railway fares was of primary importance, and its policy on this matter was of great significance in the development of the industry.

The Massachusetts system of public utility rate regulation, as usually interpreted, envisages as its objective the determination of rates which permit a fair return on the money reasonably and prudently invested in the enterprise. This so-called "prudent investment theory" occupies an historic position in valuation theory and Massachusetts Commissions have taken their stand upon its economic validity. "Under Massachusetts law," runs a characteristic pronouncement of the Public Service Commission, "the honest and reasonably prudent investment, represented under normal conditions by the capitalisation, must be taken as the basis of reckoning fair and reasonable rates. Reproduction cost may be considered but is not to be taken as the determining basis."¹

Defending prudent investment as against the principal alternative, reproduction cost, the Commissioners said, on the same occasion, that, "Undoubtedly in rate cases and other cases involving the conflicting rights of the rate-paying public and the investing public, the cost of reproduction may frequently be a fact desirable to be ascertained, and sometimes it illuminates important aspects of the problem presented; it is often the best method of checking

¹ P. S. C. 1914: 99. *Middlesex and Boston Rate Case.*

up unsatisfactory accounting, particularly when dealing with depreciation. But as a fundamentally controlling principle, no theory could work out grosser injustice, to the rate paying public in some cases and to the investing public in other cases, than the reproduction cost theory."¹

The opinions of the Commission as recorded in the numerous street railway rate cases decided during its tenure of office indicate that the words "prudent" and "investment" were both given fairly definite and clear cut meaning. Prudence did not refer to the wisdom of an enterprise or an investment as demonstrated by its economic outcome, but merely to the manner in which the organization and operation of the enterprise was undertaken.

"It is not the enterprise itself to which this word (prudent) relates so much as the manner in which it has been carried out. Whatever imprudence may be involved in risking capital in new and uncertain ventures is not in itself detrimental to the public welfare. On the other hand, if, in the carrying out of an enterprise, capital is used in a wasteful or foolish way, the contrary is clearly true."²

On occasion, however, the Commission was inclined to hedge a bit, at least to the extent of reversing its usual principle that the profits of the more profitable sections of a street railway system should be used to support the less profitable. Considering the situation of the Readville branch of the Blue Hill Street Railway it is asserted that, "in view of the economic value, in general, to the commonwealth of even street railway lines whose existence seems hardly justified from the point of view of traffic, the commission is not disposed to deny a return upon investment on the ground that an extension was built 'contrary to the dictates of reasonable prudence and sound business judgment,' except in the

¹ P. S. C. 1914: 107. Middlesex and Boston Rate Case.

² *Ibid.*, 1916: 38. Bay State Rate Case. Explaining this statement the Commission continues, "If a railroad is built with due economy in a territory where financial results are not promising, it may prove impossible to earn a return upon the investment, but there is no reason why the opportunity should be denied. But if a railroad is built in any territory for far more than it should reasonably have cost, its owners have no just claim even to the opportunity of securing from the public a return upon that portion of the capital which has been squandered." In the Norfolk and Bristol Rate Case (P. S. C. 1915: 112) the Commission decided that the total capitalisation in stocks and bonds represented capital "honestly and prudently" invested (p. 122) though the company had earned practically no net income.

clearest cases. The line in question, however, seems on the evidence presented to be of so little economic value to anybody that we should hesitate to approve an increase of rates upon the other lines merely for the purpose of enabling the company to earn a return upon the investment in this branch."¹

The meaning of the second word in the phrase "prudent investment" is more intricate of statement but has likewise evolved with some clarity out of the development of the law and policy of utility regulation. Granted prudence in the conduct of the enterprise, the investment, properly defined, has been accepted by Massachusetts commissions as the rate base with respect to which the prices of utility services must be controlled. It is important that this be established as a fact for in a recent and carefully documented study of the Massachusetts system of public utility control² the opinion is expressed that valuation in this state is not determined by prudent investment in any proper or recognised sense of the term and, more specifically, that regulatory practice proceeds without consideration of a rate base.³

The author of this study gives three principal reasons, or groups of reasons, to support his rather surprising denial of the commonly received opinion that the basis of the Massachusetts system of rate regulation is prudent investment. In the first place Massachusetts commissions have failed "to make any finding as to the appropriate rate base in the vast majority of cases. . . . Hence, in the matter of vagueness and uncertainty, it would seem that the Massachusetts practice has been a more serious offender against the fundamentals of the prudent investment theory than the federal present fair value rule which has been made the object of attack and ridicule both by the Massachusetts Commission and the advocates of prudent investment."⁴

In the second place Massachusetts practice has refused to include in utility valuation a number of elements, among them re-invested earnings, working capital (with exceptions), and certain overhead charges and going concern values, which the principal representatives of the prudent investment theory, more especially Brandeis, Eastman and Bauer, have been willing to take account

¹ P. S. C. 1915: 78.

² Irston R. Barnes, *Op. cit.*

³ *Ibid.*, p. 156.

⁴ *Ibid.*, p. 194.

of.¹ It might be asked parenthetically why Justice Brandeis, Mr. Eastman and Mr. Bauer must be regarded as peculiarly the custodians of the prudent investment theory or why, in other words, the Massachusetts commissions are not entitled to their own interpretation of the meaning of prudent investment.² Certainly the Public Service Commission was under the impression that the rule it was applying in the street railway valuation cases which occupied practically the whole of its time and energies during its tenure was the prudent investment rule. And, as it happened, Mr. Eastman was a dominant member of that commission.

In the third place in the determination of the rate of return it is alleged that the spokesmen for the prudent investment theory envisage considerations somewhat different from those which have occupied the Massachusetts commissions.

The result of this reasoning is the conviction that "there are more points of difference between the Massachusetts practice and the prudent investment theory than there are points of resemblance; and that those who have held up Massachusetts regulation as an example of the application of the prudent investment theory are in error, if the theory of prudent investment is employed in any strictly defined sense."³

It lies outside the purpose of this study to consider in extenso the Massachusetts system of public utility valuation and rate regu-

¹ See J. Bauer, *Effective Regulation of Public Utilities*. Opinion of Justice Brandeis in the case of *Southwestern Bell Telephone Company v. Public Service Commission* 262 U. S. 276. Opinion of Joseph Eastman, *Interstate Commerce Commissioner, Excess Income of St. Louis and O'Fallon Railway Co.* 124 I. C. C. 49-59. These are the particular sources to which Barnes refers in his exposition of the meaning of the prudent investment rule.

² Barnes quotes, on the other hand, a statement of a member of the Massachusetts Department of Public Utilities, Henry G. Wells, made before the National Association of Railroad and Utilities Commissioners (Proceedings 1927, p. 113-4) to the effect that prudent investment was used in only one Massachusetts valuation and on that occasion prudent investment was in excess of reproduction cost. To substantiate this opinion all the street railway rate cases decided by the Public Service Commission would have to be ruled out of consideration. A more recent statement by another Massachusetts commissioner indicates that the Department of Public Utilities still stands by prudent investment on the ground, principally, that the Massachusetts system permits of a rapid and economical calculation of the rate base. See Lewis Goldberg, "The Massachusetts Proposals for Public Control." *Proceedings of the Academy of Political Science*, May 1930, p. 102.

³ Barnes, *Op. cit.*, p. 195.

lation. We are concerned only with the regulation of street railways and in this connection valuation and rate determination have appeared as important problems mainly during the life of the Public Service Commission. But within these limits, which are broad enough to include practically all the important rate cases to which street railways have been a party, the prudent investment rule in a perfectly legitimate sense of the phrase has been applied. Moreover, despite the remarks of Commissioner Wells referred to above (Page 151, Note 2), the Public Utility Commission was under the impression that prudent investment was the Massachusetts rule and, upon a number of occasions, took up the cudgels in defense of this rule.¹

Massachusetts Commissions have never undertaken the valuation of a street railway property.² But this does not mean that the calculation of a rate base has not been an essential part of the Massachusetts system of rate regulation. The essence of the Massachusetts interpretation of the prudent investment rule is that the rate base is determined by the amount of money prudently invested in the property. Normally the par value of the securities outstanding plus premiums on the stock, if stock has been issued at a premium, may be taken as evidence of the amount of money invested, and has been so taken by the Public Service Commission and the Department of Public Utilities. If securities have been issued before the period of effective security control and, if, furthermore, there is reason to believe that these issues were excessive or were used to capitalise investments which were imprudent or fraudulent in character, then the rate base determined may be less than the par value of the securities outstanding plus premiums. In the Bay State Rate Case and the Boston and Middlesex Rate Case the Public Service Commission found evidence of excessive issue of securities and took account of this in their determination of the rate base.³

¹ See, e.g., P. S. C. 1914: 111, 112, Middlesex and Boston Rate Case; *Ibid.*, 1915, 72-73, Blue Hill Rate Case; 100, 101, New Bedford and Onset Rate Case; *Ibid.*, 1916: 13, 33, Bay State Rate Case.

² In the Bay State Rate Case, however, the Public Service Commission hired experts to check at various points the valuation figures presented by the company's engineers and this has been done in other cases.

³ P. S. C. 1914: 100. *Ibid.*, 1916: 33. In the Blue Hill and the New Bedford and Onset Cases, among others, the Commission stated that the approval of past issues of stocks and bonds by the public authorities of the common-

The only exception to the principle that money prudently invested determines the rate base on which the utility is entitled to earn a return is the refusal of Massachusetts commissions to include in the investment reinvested earnings. This exception has been of small importance in the street railway industry since the roads have, in general, distributed all, and more than all, their net earnings to the stockholders. In at least one case, however, the exception was clearly stated. The Springfield Street Railway, finding it impossible to raise funds by security issue, curtailed dividend payments and reinvested its earnings in the property. The Department of Public Utilities in conformity with its policy and that of its predecessors refused to consider the reinvested earnings a part of the investment though it approved the fare increase petitioned for as obviously necessary.¹

When earnings are reinvested at the expense of a complete cessation of dividend payments, as in this case, or even at the expense of a curtailment of dividends below what the regulatory authorities consider a fair return, there seems little doubt but that the reinvestment should be considered a part of the investment and taken account of in the rate base. This does not mean necessarily that the reinvestment of excessive earnings should be calculated in the rate base nor should the failure of the Massachusetts commissions to do so be considered an abandonment of a fundamental principle of the prudent investment rule. Obviously, however, the distinction between reinvestments which ought and ought not to be included involves serious administrative difficulties. As it happens these difficulties have not been of significance in street railway regulation.

The fact that in street railway and other rate cases Massachusetts commissions have often declared for rates which will permit the utility to market its securities at par and have even considered this to be a prime desideratum does not mean, as Barnes appears at times to think,² that the commissions have abandoned the prudent investment rule or are determining rates without consideration

wealth must be regarded as "conclusive evidence, so far as the commonwealth and this Commission are concerned, that the stocks and bonds so issued represented legitimate investment not excessive for the purpose." P. S. C. 1915: 700.

¹ *Federated Civic Clubs v. Springfield Street Railway Com.* Decided September 19, 1924.

² As, for example, *Op. cit.*, p. 156 and 193.

of a rate base. For if the par value of the securities outstanding plus premiums is a close approximation of the money prudently invested, then par value may be taken as the rate base without further parley and the rates called for are those which will permit the maintenance of market value of stock at or somewhat above par. One, if not the most important, advantage of the prudent investment rule is that it makes possible the determination of a rate base without the costly and time consuming process of valuation.

The second reason advanced in support of the thesis that Massachusetts regulation is not based upon prudent investment is that the practice in this state fails to take account of certain costs necessary to the establishment of a utility enterprise as a going concern.¹ In particular working capital and promoters' expenses and profits, admitted by most exponents of a prudent investment theory as costs properly capitalised are not so treated in Massachusetts. This has certainly been a defect of the Massachusetts system of security regulation but can hardly be charged against the commission's rate policy. For neither the Public Service Commission nor the Department of Public Utilities has ever refused to allow a return on such costs even though legislative enactment forbids their capitalisation.² The Commissions have insisted, and rightly, that bond discount shall not form a part of the valuation on which returns may be expected for such discount represents no investment. Bond discounts should be authorised and the cost of amortisation is properly treated as an operating expense and has been so recognised by the regulatory authorities. Appreciation in land values which forms a part of the value of a utility property in the cost of reproduction analysis has been consistently eliminated from the rate base in Massachusetts regulation but this is, of course, perfectly compatible with any interpretation of prudent investment.³

¹ *Op. cit.*, p. 194.

² With respect to working capital, the law was changed in 1909 to permit a street railway to issue stocks and bonds not exceeding 5 per cent of the par value of the stock outstanding for this purpose. And even though promoters' expenses and perhaps certain other necessary expenses of organisation could not be capitalised, regulation did not refuse a return on banks borrowing for this purpose.

³ Cf. P. S. C. 1916: 37. Bay State Rate Case. "Considering this appreciation upon its own merits, car riders cannot fairly be expected to pay higher

The treatment of depreciation in Massachusetts street railway rate cases has not only been consistent with the prudent investment rule but with that interpretation of the rule which permits a determination of the rate base without valuation procedure. The attitude of the Commissions, succinctly expressed, has been that in the absence of evidence of mismanagement or the payment of excessive dividends, no deduction for depreciation, obsolescence or even improper maintenance should be made from the par value of outstanding securities plus premiums. Regulatory authorities realised, of course, that the rapid rate of obsolescence in the street railway industry had led to abandonment of equipment never charged off the property accounts and that furthermore most of the companies in this state had never made proper charges for depreciation and had even neglected maintenance. In the Bay State Rate Case, for example, the property was alleged to have depreciated to the extent of \$12,000,000 and the remonstrants urged that this be deducted from the valuation.¹ The Public Service Commission refused on the ground that depreciation is a proper cost of transportation which if not included in operating expenses should only be deducted from the rate base in case of demonstrated mismanagement or payment of excessive dividends.²

Finally, it is alleged that in the determination of the proper rate of return there is a sharp divergence between the Massachusetts and prudent investment procedure. "Thus, from beginning to end, the Massachusetts practice is influenced by the necessity of maintaining the credit of the company in such condition that it can easily and readily sell additional issues of securities at or above par. The actual value of the property placed at the service of the company is given practically no weight. No attempt, other than a verbal one, is made to relate the fair return to the valua-

fares because land has increased in value, nor ought they to pay lower fares if it should decrease. If the company wishes to sell such property it is, of course, entitled to whatever profit it is able to make; but so long as land is employed in the street railway business it is dedicated to a public use and held subject to the conditions fairly attaching to such use."

¹ P. S. C. 1916: 39.

² Cf. *Ibid.*, 1915: 75. Blue Hill Rate Case. "But, under a consistent application of the investment theory, it would seem in general that deduction should be made for the depreciation which comes from age and use in so far only as the failure to make provision for it is due to the payment of unwarranted dividends or is otherwise attributable to mismanagement."

tion of the company's property or even to any specific rate base."¹

The "value of the property" from the viewpoint of prudent investment is identical with the amount of money prudently invested in the enterprise and if the issue of securities and the expenditure of the funds derived therefrom is properly regulated there is no occasion for a valuation of the property. Both the rate base and the "value" of the property for purposes of regulation, and of course these are merely two names for the same thing, are ascertainable from an examination of the par value of the securities plus paid in premiums. The only purpose of direct valuation in a prudent investment system of regulation is to ascertain the cost of that part of the property which represents investment in a period prior to the control of security issue.

It is the peculiar merit of the prudent investment method of public utility control that it provides a rate base without the exorbitant expenditure of time and money involved in a valuation of the property. It avoids not only the periodical revaluation necessitated by cost of reproduction calculations but any valuation whatsoever providing the regulating authority can take the security issue plus premiums as evidence of money prudently invested. It may be fairly claimed, I think, that regulation in Massachusetts possesses this merit.

Despite these advantages, however, which belong to the Massachusetts system, the control of street railway fares during the only period when such control was important is subject to serious criticism. The lack of foresight of the Public Service Commission, its slowness in responding to a situation whose facts were obvious, and a tendency to substitute its judgment for that of utility executives in matters of management characterised and adversely affected the operation of street railways from 1913 to 1920, the period of the Commission's tenure.

It was obvious in 1913 when the Public Service Commission was created that street railways in this state, with very few exceptions, were earning no, or very inadequate, returns. It was further recognised that what dividends were declared were possible in most cases only through a neglect of the proper operating expenses of maintenance and depreciation. Furthermore it was explicitly stated by the Commission itself that in the existing situation street

¹ Barnes, *Op. cit.*, p. 156.

railway securities could be floated at par only if earnings were maintained at a high level.¹ Finally the Commission saw clearly that the majority of the properties were badly in need of rehabilitation and that the maintenance of their credit in the capital market was an essential condition of rehabilitation. "As a broad proposition it is in the public interest that railway companies should earn and pay such dividends as to keep the market value of their stock at par or a little above par." In 1913 and 1914 the stock of very few Massachusetts Street railways was selling at anywhere near par.

This was the evident and admitted situation before the period of the rapid rise in costs. It would appear to have called for an immediate and considerable increase in street railway fares. The false optimism of street railway operators, it is true, together with their fear of the effect of a dissemination of the information demanded in a rate case on their credit position, and, possibly too, their reluctance to depart from the tried and popular 5 cent fare, were largely responsible for the failure of many Massachusetts roads to ask for an increase in fares before this date. But once this hesitation and reluctance had been overcome by continually rising costs the serious street railway situation should have called for quick action on the part of the Public Service Commission.

The action of the Commission in the important cases which came before it in 1914, 1915 and 1916 was anything but quick. Fare increases were granted with reluctance or denied pending the presentation of further evidence. The dilatory behavior of regulatory authorities was in large part responsible for putting the largest railway system in the country, in point of mileage, in the hands of a receiver at the end of 1917, though in justice it must be said that a receivership for this company was probably inevitable eventually regardless of the action of the Commission. After the second Bay State Rate Case in 1916 the Commission accelerated its decisions in rate cases, granted fare increases more generously and exhibited less inclination to question the decisions of operators as to what type of fare structure was likely to prove most remunerative.

The Commission's justification for its deliberate attitude is given

¹ P. S. C. 1914: 144. Middlesex and Boston Rate Case. In the '90's when street railways were in high favor 4% was sufficient to carry stocks above par. Now nothing less than 6% is adequate.

in the course of its opinion in the Bay State Case. "With respect to the burden of proof, it is sufficient to say that in a case like this the company must satisfy the Commission that additional net income is needed in order that a fair return may be earned upon capital honestly and prudently invested; it must satisfy the Commission that the needed income cannot be secured through more efficient management and operation; and it must further satisfy the Commission that there is at least a reasonable prospect that the change in fares desired will result in an increase in revenue and in no larger increase than is reasonably needed. No presumption exists with respect to any question of facts."¹

During the 379 days which the Commission required for an examination of these facts the net revenues of the company entirely disappeared. It must be admitted, however, that regulation in Massachusetts met the street railway crisis better than regulation in most other states.² Certainly larger fare increases were granted and the average time consumed per rate case was less than elsewhere.³

The Massachusetts method of determining the rate base or valuation was certainly largely responsible for this. The chief criticism which must be brought against the Commission is that it did not utilize the advantages of the Massachusetts system to the full and spent its time in deliberating upon situations whose salient facts were obvious. At least this was true before 1917 and street railway operators were in the main justified in their criticism to this effect presented before the committee of investigation in 1918.⁴

This judgment is, of course, offered in the light of certain facts which were not obvious to the Public Service Commission. There was no means of knowing at the time whether the rise of prices of 1915 and 1916 was temporary or permanent. The Commission, on a number of occasions, acted on the assumption that it was temporary and approved inadequate returns for street railways on the ground that the companies could recoup themselves and reap ex-

¹ P. S. C. 1916: 14.

² See the evidence of W. K. Taft, Fed. Electric R. R. Com. I: 9.

³ In the twenty street railway rate cases coming before the Commission between 1913 and 1918, the average time consumed in hearings and rendering decisions was slightly over four months. See also P. S. C. 1918: XXVI, XXVII.

⁴ Street Railway Committee of 1918, Sen. Doc. 300, p. 20. In his evidence before this Committee M. C. Brush, president of the Boston Elevated, pre-

THE REGULATION OF STREET RAILWAYS 159

traordinary gains when the trend of prices and costs had reversed itself.¹ Disregarding, however, the inability of the Commission or any other agency to foresee the subsequent rise in prices, it remains a fact that practically all street railway companies in Massachusetts in 1913 were earning inadequate returns and had been for some years previous. In the light of this situation the action of the regulatory authority in this state seems to have been by much too deliberate.

It was only after the two most important street railway systems in the state, the Boston Elevated and the Bay State, came under the control of public trustees by special acts of the General Court that prompt and drastic action on street railway fares was taken. With this example of public action before its eyes the Commission sent the following table of petitions for increased rates from the date of the passage of the Public Service Act to June 30, 1917.

Company	Petition filed	Action	Elapsed time
Providence and Fall River.....	Jan. 1, 1914	Granted	71 days
Middlesex and Boston	July 3, 1914	Part granted	117 days
Norfolk and Bristol	Mar. 13, 1915	Part granted	149 days
Blue Hill	Mar. 19, 1915	Part granted	133 days
New Bedford and Onset.....	Apr. 14, 1915	Part granted	147 days
Berkshire	Company withdrew petition		
Bay State	Sept. 7, 1915	Part granted	358 days
Case Reopened	May 16, 1917	Part granted	47 days
Massachusetts Northeastern	Oct. 1, 1915	Part granted	379 days
Bristol and Norfolk	Dec. 20, 1915	Part granted	254 days
Norwood, Canton and Sharon...	Oct. 27, 1916	Granted	186 days
Worcester and Warren.....	Jan. 17, 1917	Part granted	71 days
Ware and Brookfield	Feb. 21, 1917	Granted	36 days
Concord, Maynard and Hudson..	Apr. 5, 1917	Part granted	50 days
Milford and Uxbridge.....	May 3, 1917	Granted	97 days
Middlesex and Boston	May 24, 1917	Part temporarily granted	77 days
Holyoke	June 5, 1917	Pending	
Boston and Worcester	June 25, 1917	Pending	
Norton, Taunton and Attleboro..	June 29, 1917	Pending	

¹ Cf. Mass. P. S. C. 1915: 133. Norfolk and Bristol Rate Case. The Supreme Court of Massachusetts supported the attitude of the Commission in the case of Donham, receiver Bay State Street Railway, vs. Public Service Commissioners, 232 Mass. 309. On that occasion the court expressed itself as follows, "we are of the opinion that, whereby all parties in interest the times are recognised as abnormal and the particular period as one of transition so that both the receiver of the Street Railway and the Public Service Commissioners by their words and conduct agree that any substantial return upon the capital honestly and prudently invested must, even under wisely economical management, be suspended temporarily . . ." etc.

sion became less timid. By this time the street railway situation was hopeless. Since the establishment of the Department of Public Utilities in 1919, regulation has imposed no practical check on street railway fares. The elasticity of the demand for street railway transportation, conditioned by the existence of alternative means of transport, has made such a check unnecessary.

THE REGULATION OF ALTERNATIVE MEANS OF TRANSPORT

The inability of street railway revenues to keep pace with costs had, by the end of the war, led to such a situation that the citizens of Massachusetts were witnessing the disappearance of their street transportation systems before their very eyes. The number and variety of solutions to the problem were great. Some saw in the jitney an adequate substitute for the street car. Others proposed legislating the jitney out of existence to increase street railway revenues. Street transportation was declared to be the concern not of the car rider alone and it was suggested that the state or the municipalities contribute directly to the support of the companies. Another proposal was that the roads be relieved from all taxation. Various forms of public ownership and management appeared the remedy to many. In the words of the special street railway commission of 1919, "It is worse than idle to declaim against public management when the choice is between public management and no management at all. It is a condition and not a theory which confronts us."¹

To a certain extent this chaotic situation was the result of a breakdown of public regulation confronted by a crisis in the shape of an unparalleled rise in costs.² In 1918 the two most important roads in the state were withdrawn from Commission control and

¹ Washburn Committee 1919, p. 53.

² "It is perfectly obvious," said D. F. Wilcox (Analysis of Evidence presented before Federal Electric Railway Commission, p. 406), "that legislative and commission regulation, whether running tandem or abreast, although at no time seriously embarrassed by restrictions of local franchise contracts, failed to keep the electric railways of Massachusetts in such a condition, either physically or financially, as to give the investors full protection or to assure the public of the continuance of adequate service at attractive rates. The Public Service Commission of Massachusetts itself recognises this failure, and has officially pointed to public ownership as probably the only policy by which the credit of the electric railways of Massachusetts can be restored."

For the attitude of the Public Service Commission in 1918 on the question of public ownership see P. S. C. 1918: XXXI.

put in the hands of public trustees¹ who incontinently raised fares until revenues showed some signs of covering expenses. A general act of the same year authorised municipalities to contribute to the support of street railways to an amount not exceeding one dollar per \$1000 assessed valuation in towns and not more than 50¢ per assessed valuation in cities.² In a few districts groups of business men and landowners interested in the preservation of street railway transportation offered financial support to the companies. The transportation areas act of 1920 permitted municipalities to acquire the ownership of street railway companies.³

To a much greater extent the situation lay outside the scope of public regulation. The roads in the more sparsely settled communities were destined to extinction under any conditions. In other cases a rise in fares sufficient to cover the rising costs, even if permitted, would have led to the disappearance of the demand for this type of transportation. The extension of the use of the motor car was continually narrowing the field of feasible rail transport. The street railway was a declining industry; in most of its territory the Public Service Commission could not prevent its extinction nor was such prevention desirable.

By 1920, as we saw in the previous chapter, legislation and regulation had the vicious and irresponsible jitney competition under control. An act of 1918 had already authorised street railway companies to own and operate motor vehicles.⁴ Gradually lines were abandoned and supplanted by motor busses and the Department of Public Utilities has encouraged this process by reserving transportation rights in their territories to the already existing companies.⁵ At the present time there are a number of

¹ Mass. Special Acts of 1918, c. 159 and c. 188.

² General Acts of 1918, c. 288. Under this act a number of towns contributed to the support of street railways. See D. P. U. 1921: 114. A special act of the same year, c. 188, sec. 20, prohibited municipalities from requiring street railways to construct, repair or alter the street or paving during the war or for a period of two years thereafter.

³ Acts of 1920, c. 599.

⁴ General Acts of 1918, c. 226.

⁵ An act of 1925 requires the operator of a motor vehicle for the carriage of passengers to obtain a license from the city or town council and a certificate of "convenience and necessity" from the Department. Mass. Acts of 1925, c. 280, sec. 1 & 2. The Department has used this Act to exclude competition on public highways served by street railway companies. See also Mass. Acts of 1926, c. 368, sec. 6 and c. 392, sec. 2. Mass. Acts of 1927, c. 268, sec. 1.

"street railway" companies in Massachusetts which operate busses but not a single mile of track.

This preservation of the essentially monopolistic character of public transportation on the highways has given rise to some rather difficult problems, particularly when the transportation facilities offered are those of a worn and battered street railway operating at infrequent intervals. The patrons have occasionally, under such circumstances, been unable to see why they should not be allowed the use of the facilities of a bus company which promises rapid and comfortable service if permitted to operate in this territory. The attitude of the Department of Public Utilities has been definitely that public transportation is monopolistic in character and that this character should be preserved by regulation. Furthermore it has tended to support the existing company providing that it offered service of some sort.

It is to the interest of a street railway, of course, that it supplant its rail service by busses as soon as the total cost of motor transport per passenger is less than the operating cost per passenger by rail. But the purely operating cost of rail transport can be held low particularly if the service offered is mediocre and, at times, it tends to be very mediocre indeed. Consequently if the decision to install busses is left to the street railway this installation may be indefinitely postponed.

The issue raised here is essentially how long and to what extent regulatory authority should allow the street railways to recoup themselves for the cost of their plant and equipment while supplying service which is less adequate than that which is immediately available. The economic decision is clearly that if rail transport cannot provide a service as frequent, rapid and comfortable as bus service at operating costs at least as low as the total cost per passenger by busses, assuming that the busses pay their fair share of the cost and maintenance of the roadway, then the rails should be abandoned. Whether the state as a matter of justice owes it to the investors in street railways to permit them to recoup as much as possible of their investment while rendering inadequate service is another question. It seems probable, however, that the Department of Public Utilities at the present juncture is uneconomically retarding the decline of the street railway and its replacement by a more satisfactory method of transport just as the Public Service Commission, in its period of tenure, uneconomically accelerated the decline.

CHAPTER 8

PUBLIC OWNERSHIP AND MANAGEMENT OF STREET RAILWAYS IN MASSACHUSETTS

The street railway crisis of 1915-1920 was a crisis in public regulation as well as a crisis in the industry. We have seen how, in 1918, the two most important roads in the state were put under the management of public trustees who were to establish rates of fare sufficient to cover the cost of service. An act of 1920 authorised cities and towns throughout the state to establish transportation areas and to lease or purchase and operate street railway lines within their territories.¹ It is the purpose of the present chapter to consider the operation of Massachusetts street railways under public management and public ownership.

Public ownership in the field of urban transportation, however, was not unknown in Massachusetts even prior to this date. In 1894 the same Act which chartered the Boston Elevated Company authorised the construction by the Boston Transit Commission of the Tremont Street Subway. The subway thus constructed was leased to the Elevated for a period of 20 years at a minimum rental of 4 $\frac{7}{8}$ %. Since that date all of Boston's subway construction has been undertaken by the city with the exception of the Cambridge subway. In 1918 when the Elevated came under the operation of the public management act the total investment of publicly constructed transit facilities was over 35 million and the annual rental charge on the company was \$1,516,047.

The turning point in the fortunes of the Boston Elevated came, as we have already seen, shortly after 1912, when its employees organised and were successful in their demand for increased wages. This rise in costs was a part of a general movement particularly disastrous to the company because of the "iron clad" 5 cent fare provision written into its 25 year contract with the Commonwealth in 1897. The situation became so acute that in May, 1916, the Company wrote to the Governor of the state that it could no

¹ Mass. Acts of 1920, c. 599.

longer operate on a 5 cent fare and keep itself in sufficient credit to secure new capital for improvements. The stock of the Elevated was selling at that time around 75, under the terms of Massachusetts law new stock could not be issued except at par, and the bond issue of the company was close to its legal limit.

The Governor appointed a special commission of inquiry, the committee found the situation as represented, and recommended, as a temporary solution, the return of \$500,000 deposited by the company with the Commonwealth, the public acquisition of the Cambridge subway, the lowering of the existing subway rentals and the abolition of the compensation tax.¹ The first and fourth recommendations were enacted into law but the second and third, the first of which would have put the company in funds sufficient for rehabilitation and the second of which might have lessened appreciably the heavy burden of fixed charges, were rejected.²

The situation went from bad to worse, the Governor appointed a committee to make an extensive survey of the whole street railway situation, and at the same time, the Public Service Commission was ordered to make a special study of the Boston Elevated, at the Company's expense. The Commission employed a highly esteemed consulting engineer of long experience in the street railway industry, John A. Beeler, and authorised him to make a thorough-going investigation of the state of the Elevated's plant, operation and management. The report described the property as run down and, in part, obsolete, made a few suggestions as to improvement in operation and vindicated the management as "virile and aggressive." The results of the Commission's investigation were obvious, no management could continue the service and maintain the property at a 5 cent fare. Consequently the Commission, after recommending a 6 cent fare, purchase of the Cambridge subway and a number of operating changes, suggested a cost of service contract.³ The special street railway committee reported at about the same time and to the same effect.⁴ The study of the operation of the Cleveland railways under a cost of service contract had impressed the Committee favorably.⁵

¹ 1917 Sen. Doc. 344.

² Special Acts of 1917, c. 373, sec. 1, 2, 12, 13.

³ 1918 House Doc. 1240.

⁴ 1918 Sen. Doc. 300.

⁵ *Ibid.*, p. 50.

Meanwhile the common stock of the Elevated had fallen to 27 and the Bay State had gone into a receivership, December 1917. The acuteness of the situation led to the passage of three acts, the first two of which put the Elevated and Bay State under trustee control governed by cost of service provisions, and the third of which extended the opportunity of cost of service contracts to other municipalities in the state under the control of the Department of Public Utilities.¹

The trustees of the Boston Elevated took office on July 1, 1918, the trustees of the Bay State on May 1, 1919. After a short experience with, first a 7 cent and then an 8 cent fare, the rate was put up to 10 cents on the Elevated. The trustees of the Bay State, now Eastern Massachusetts, instituted a basic 10 cent fare immediately. The important street railway commission of 1919 which had an opportunity to study the operation of these roads for a short period of trustee control made certain recommendations which were shortly afterwards enacted into law. Funds urgently needed for a rehabilitation of the Elevated were secured by state purchase from the company of the Cambridge subway at a price of \$7,868,000.² The Elevated thenceforth was to pay a 4½ per cent rental on this property. The Committee made several suggestions subsequently enacted, for the improvement of the Eastern Massachusetts Act, the most important of which were to enable cities and towns to contribute to the operation of the sections of street railway within their limits and to tax their citizens for this purpose.³ The same committee also made the recommendation for the extension of permission to establish cost of service contracts to other municipalities.

No other municipality availed itself of this opportunity, but in two cases, transportation areas, as envisaged by this act, took over the ownership of their defunct street railways. At the risk of digressing somewhat from the main theme of this chapter a short consideration of the experience of municipal ownership appears in order. The only two cases of state ownership of street railways in the history of the industry in Massachusetts are the Athol and Orange Transportation Area established in 1924 and the Greenfield and Montague Transportation Area established the same year.

¹ In the order named these Acts were Special Acts of 1918, c. 159 and 188, and Mass. Acts of 1920, c. 599.

² General Acts of 1919, c. 369.

³ Special Acts of 1919, c. 247.

PUBLIC OWNERSHIP

The towns of Athol and Orange were served prior to 1924 by the Northern Massachusetts, a consolidation of three small properties put together in 1913. This company, operating forty odd miles of track over hilly and sparsely settled territory in the north central part of the state, had never made money and, after 1918, had failed to meet its fixed charges. The only profitable section of the line was the six or seven miles originally operated by the Athol and Orange, a company which had paid dividends regularly from the date of its organisation in 1895 until the consolidation of 1913. The receiver of the Northern Massachusetts discontinued operation on all parts of the line except the Athol and Orange and concentrated the whole of the Company's rolling stock in this section. The transportation area acquired in 1924, 6.78 miles of track and line, thirty-five cars in various stages of dilapidation and accessory buildings and equipment for \$21,500. The towns of Athol authorised a bond issue of \$30,000, the additional \$8,500 being used to rehabilitate the track and line.

The five trustees elected by the town appointed as General Manager the experienced manager of the Northern Massachusetts, and divided the line into three zones with a 10 cent minimum fare and a 20 cent maximum. Although three of the years have shown a deficit of operating income below operating expenses, this has been approximately balanced by the surpluses of other years.

Street railway service was established in Greenfield and Turner's Falls in 1895 by the Greenfield and Turner's Falls Company, a road which paid dividends regularly until its consolidation with the Northampton and Amherst in 1905. Shortly afterwards this became a part of a larger consolidation, the Connecticut Valley, a road which was liquidated in 1924. This property had been unable to meet its fixed charges during the last four years of operation. The Greenfield and Montague Transportation Area was organised in 1924 and took over 8.52 miles of track in Greenfield and Turner's Falls, together with plant and equipment, for \$60,000. A further bond issue of \$100,000, \$60,000 for Greenfield and \$40,000 for Turner's Falls, was authorized for purposes of rehabilitation. Since the rolling stock was in bad shape \$56,000 of the proceeds were used for new cars. The four trustees established a zone system of fares, the minimum charge being 10 cents with a maximum of 15 cents.

When the decision to take over this property was made, in 1924, bus service was out of the question since the only part of the road on which busses could operate successfully in the winter time was on the car tracks from which snow was removed by the street railway. Shortly afterwards the state undertook the removal of snow from the state highways and one of the trustees has intimated that if the decision had been made in 1930 instead of 1924 the municipalities might have voted for busses. Nevertheless, the Transportation Area has been operated with success; a surplus has been earned in every year of operation after making the full charge for depreciation allowed by law.

The experience of these two Transportation Areas while interesting, throws little light on the general problem of public versus private ownership of street railways. The properties are the smallest street railways now operated in the state and have a density of traffic insufficient at existing, or any possible, fares to meet the full cost of service. The line and equipment were acquired at something close to salvage value and while, for the Greenfield and Montague, the proceeds permit a depreciation allowance adequate, probably, to retire the investment, it is probably not adequate to replace the property. There is considerable doubt, in the case of the Athol and Orange, as to whether revenues will be sufficient to amortise even the slight investment of \$30,000 before the property has to be scrapped.

The Athol and Orange is managed by public spirited trustees, local business men of experience and integrity, who receive nothing for their services. The remuneration of the trustees of the Greenfield and Montague Transportation Area is limited to \$300 per year and, as a matter of fact, each trustee receives only \$180. The trustees of both Areas were fortunate in securing the services of railway managers of long experience at considerably less salary than these same managers had received under private operation.¹ The rates of fare charged in both Areas is high, higher probably than a private company would dare to charge for similar service. The street railways, being community enterprises, are regarded with interest by the citizens and the number of rides per capita is probably somewhat larger than it would be were the properties privately owned. Even so, for reasons which have been suggested,

¹ Because these men had a "stake in the community" and would in any case, have found it difficult to turn their experience to other use.

it is probable that service can be continued only during the life-time of the existing roadway and track. And very considerable expenditure for replacement will probably put the Greenfield and Montague, and certainly the Athol and Orange, out of business. The Transportation Areas are temporary expedients undertaken because some system of public transportation was considered necessary. The nature of the undertakings made public ownership and operation a necessity.

SERVICE AT COST

Public management of street railways, to return to the main theme of this chapter, has been of considerably more importance and of longer duration in Massachusetts than public ownership. The state was forced to put the Boston Elevated and the Bay State in the hands of Public Trustees because, among other reasons, rate determination by the Public Service Commission was so inelastic and slow moving that transportation facilities necessary to the movement of population in metropolitan areas were endangered. Street railway fares should be sufficient to cover the cost of service and such fares, it was generally agreed, were possible over the greater part of the area covered by these two transportation systems. The problem was to discover these fares. This required experimentation and the power to experiment freely with fares could not be left to uncontrolled private management. Consequently the Commonwealth, in effect, leased the property of the Boston Elevated guaranteeing a return on the investment which, so far as possible, was to be met out of street railway revenues. In the more doubtful case of the Bay State the trustees were empowered to set rates of fare which so far as possible were to cover costs but no guarantee of a return on the investment was included.

The acts establishing trustee control were both essentially cost of service contracts. "Service at cost," according to the work on this subject published by the A. E. R. A., "is a term that has come to be quite generally applied to a plan for the conduct of electric railways as quasi-private enterprises, by which fares are made to respond automatically to the cost of providing the service, and it is in this sense that it is here applied.

"It is only to the extent that the regulation is automatic that the principle involved differs from that under which the rates of public utilities are regulated by State or local commissions

having jurisdiction over rates irrespective of franchise stipulations."¹

One may question the justice of a description of the behavior of trustees as automatic but the substance of the definition is correct. On both roads the trustees were directed to establish rates of fare considered adequate to cover cost of service within 60 days of taking office and to prepare alternative schedules above and below the established rate to take effect when and if this rate proved too low or too high for the purpose.²

The cost of service was defined in practically the same terms in both acts. It included operating expenses, taxes, rentals, interest on all indebtedness, such allowance as the trustees deemed necessary for depreciation and obsolescence, stated dividends on the preferred stock, and in the case of the Eastern Massachusetts, a 6 per cent return on the common stock. The common stock of the Boston Elevated was to receive 5 per cent during the first two years, 5½ per cent during the next two and 6 per cent for the balance of the period, ten years, contemplated by the Act. In general, cost of service was considered to include all expenses "which under the laws of the commonwealth now or hereafter in effect may be properly chargeable against income or surplus."³

The Acts, when accepted by the stockholders of the Boston Elevated and the West End and by the stockholders of the Eastern Massachusetts, a company to be organized to take over the assets of the Bay State, empowered the trustees to assume all managerial functions formerly exercised by the respective boards of directions, the trustees to be deemed as "acting as agents of the company and not of the commonwealth."⁴ The stockholders of the Elevated were required to raise \$3,000,000 by the issue of preferred stock to yield not more than 7 per cent cumulative, \$1,000,000 of which was to constitute a reserve for the payment of the cost of service during periods when revenues were temporarily insufficient, the other \$2,000,000 to be used by the trustees in rehabilitating the property. The stockholders of the Eastern Massachusetts required to pay \$1,000,000 in cash and to arrange for the immediate sale

¹ Harlow C. Clark, *Service at Cost Plans*. A. E. R. A. New York, 1920, p. 67.

² For the Boston Elevated 4 alternative schedules above and 4 below the prevailing rates; for the Eastern Massachusetts 2 above and 2 below.

³ Special Acts of 1918, c. 159, sec. 6.

⁴ *Ibid.*, c. 159, sec. 2.

of \$2,500,000 in serial bonds to provide for a reserve and rehabilitation.

Acceptance of the Acts by the stockholders secured the right to the Commonwealth to purchase the properties at any time during the period of trustee control upon the assumption of outstanding indebtedness and liabilities and the payment of an amount equal to the par value of the shares plus paid in premiums. In the event of state ownership this would be a valuable option. In any event the Commonwealth did not waive its right to acquire either property by eminent domain.

The Boston Elevated Act states that "it shall be the duty of the trustees to maintain the property of the company in good operating condition and to make such provision for depreciation, obsolescence and rehabilitation, that, upon the expiration of the period of public management and operation, the property shall be in good operating condition."¹

This provision and the policy of the public trustees in conformity with it have been subject to sharp criticism from the opponents of public management, particularly those who have favored public ownership. It is alleged that the state took hold of a run-down property and by means of heavy depreciation charges borne by the car riders have put this property in first class condition, not to the advantage of the public but to the advantage of the company stockholders. There is, however, little justice in this criticism. A considerable rehabilitation of the property was necessary in order to render adequate service, the substitution of bus service for abandoned trackage has constituted a heavy charge on depreciation and on reserves and, finally, the allowance for depreciation on the Elevated does not seem to have been in excess of similar allowances on other well managed street railway properties.

PUBLIC MANAGEMENT OF THE BOSTON ELEVATED

The first year of public trustee operation of the Boston Elevated, from July 1, 1918 to July 1, 1919 yielded a deficit of \$2,980,151.67 after an increase of fares from 5 cents to 7 cents on August 1, 1918 and to 8 cents on December 1, 1919. One million dollars was taken from the reserve fund and the balance assessed on the cities and towns served by the Elevated in proportion to their inhabitants as provided for by the Act. This assessment is

¹ *Op. cit.*, sec. 13.

PUBLIC OWNERSHIP AND MANAGEMENT 171

in the nature of a loan which the company has been in the process of repaying up to the present time. Then came a wage award of July 1919 which, being retroactive, increased the deficit by \$435,348. In consequence the trustees raised the fare to 10 cents on July 10.

The 10 cent fare was immediately productive of revenue, a careful scrutiny of operating costs led to a considerable reduction of the payroll and the calendar year 1920 ended with only a slight deficit of revenue below the cost of service.

**TOTAL RECEIPTS AND COST OF SERVICE, BOSTON ELEVATED 1919-1930
YEAR ENDING DECEMBER 31**

	Total receipts	Cost of service	Gain	Loss
1919	\$29,498,582	\$31,880,682		\$2,382,099
1920	34,031,636	34,378,803		347,167
1921	33,277,025	32,105,580	\$1,171,444	
1922	32,099,176	31,286,987	1,412,189	
1923	34,096,813	33,417,181	679,631	
1924	34,175,319	34,812,016		636,696
1925	34,547,379	34,045,185	502,193	
1926	35,481,313	35,964,062		482,749
1927	35,193,410	34,970,594	222,815	
1928	34,843,147	34,803,096	40,051	
1929	34,096,623	34,002,550	94,072	
1930	32,510,721	33,645,359		1,134,638

The repayment of the assessment of 1919 to the towns and cities totaled, at the end of 1930, \$2,630,818, leaving \$1,349,333 still due, which represents approximately the amount by which the Elevated has failed to meet its cost of service in twelve years of trustee operation.

The excess of receipts over cost of service in 1921 and 1922 encouraged the trustees, after some rather unsuccessful experimentation with a 5 cent fare for short rides in the downtown district, to introduce this fare for local rides in the suburbs. The response in the number of revenue passengers carried was immediate but the deficit in 1924 made it necessary to substitute a 6¼ cent token which caused a slight decrease in the number of passengers carried.¹

¹ The decrease was probably not as great as the passenger statistics indicate, however, as a change was made in 1925 in the manner of counting the passengers carried.

Wage increases in 1923, 1924 and 1925 increased operating expenses and were responsible for the deficits of 1924 and 1926. Since the latter year operating costs have shown a continual reduction, mainly because of economies in the use of labor, supplemented in 1929 and 1930 by a decrease in the cost of coal and materials. The decrease in the payroll has been possible largely because of the substitution of one man for two men cars. In 1919 the Elevated operated 39,373,452 revenue miles with two men surface cars and 20,451 revenue miles with one man cars. In 1930, 11,440,310 miles were covered by cars of the first type and 20,298,873 with cars of the second. The substitution of one man cars has been particularly rapid during the last two years with considerable saving but, in certain cases, with some loss in the speed and convenience of service. The number of bus miles has increased from 63,959 in 1922 to 7,813,467 in 1930.

The interest and dividend charges have shown no increase during the period of trustee management since no new securities have been issued. The financial reorganisation incident to the retirement of West End securities in 1922 and certain repayment and refunding operations have even reduced the fixed charges. A considerable increase in taxes occurred between 1919 and 1921 and a slight increase between 1921 and 1926; since that time there has been a slight decrease. The one capital item which has shown a considerable augmentation is the rental on rapid transit facilities leased from the city and state. These rentals increased from \$1,516,047 in 1919 to \$2,784,749 in 1930.

Public construction of rapid transit facilities has been largely responsible for the continuous increase of the total transportation investment from 138 million in 1919 to 175 million in 1930 and for the simultaneous increase in the permanent investment per revenue passenger. Any considerable increase in the investment has required the action of public authority since under the terms of Massachusetts law the company could not issue new capital at less than par and since the Elevated's common stock has never sold at par during the period of trustee control. The intention of the act to guarantee a return sufficiently high to permit of new financing has failed of its object in this respect.

The liberal charge on operating expenses for maintenance and depreciation, however, has made possible reconstruction and re-equipment sufficient to keep the property in a high state of oper-

PUBLIC OWNERSHIP AND MANAGEMENT 173

**CITY AND STATE INVESTMENT IN SUBWAYS, TUNNELS AND RAPID
TRANSIT LINES. DECEMBER 31, 1930**

	Construction Length miles	Investment	1930 rental paid
Owned by City of Boston			
Boylston Subway	1.503	\$ 6,513,724.53	\$ 292,713.47
Cambridge Connection .....	.470	1,652,624.16	80,550.12
Dorchester Tunnel	2.485	12,193,883.81	548,427.20
Dorchester Rapid Transit Ex- tension	6.076	10,663,631.10	481,138.01
East Boston Tunnel	1.518	7,202,881.95	323,707.08
East Boston Tunnel Extension	.411	2,343,942.75	105,446.72
Tremont Subway	1.698	4,403,533.58	198,093.82
Washington Tunnel	1.157	7,946,614.49	357,592.71
Total—City of Boston	15.318	\$52,930,836.37	\$2,387,669.13
Owned by Commonwealth			
Cambridge Subway	2.722	7,964,000.00	397,080.00
Grand Total	18.040	\$60,884,836.37	\$2,784,749.13

ating efficiency during a period of rapid adaptation of transportation facilities to new conditions. These charges have permitted, in addition, the accumulation of a reserve for accrued depreciation of something over \$13,000,000. This heavy depreciation allowance, as we have already mentioned, has been one of the objects of attack by critics of trustee control. Maintenance and depreciation have constituted around 25 per cent of gross revenue during the period of public management which is a considerably higher percentage than was charged under private management.¹ But it has already been pointed out that the depreciation charges under private operation were utterly inadequate. The present allowance for depreciation was determined only after a careful study of the probable life of the various parts of the property.² Finally, al-

¹ PER CENT OF MAINTENANCE AND DEPRECIATION TO GROSS REVENUE
(Annual Report of the Public Trustees, 1930, p. 30.)

Calendar years	Per cent	Calendar years	Per cent
1919	29.32	1925	24.26
1920	23.74	1926	25.30
1921	23.37	1927	24.55
1922	23.01	1928	24.67
1923	23.40	1929	24.29
1924	25.44	1930	25.56

² See 1923 House Doc. 1110, p. 48 (a report by the Department of Public Utilities) for a table of the estimated life of the various properties of the Boston Elevated on which the depreciation charges are based.

though the reserve for accrued depreciation seems large, it must be remembered that in the elevated and other types of construction, the company has property whose replacement is necessarily extremely expensive.

During the period of public management, the trustees have, from time to time, been subject to considerable pressure to extend facilities to outlying districts, to provide a more frequent service and to reduce fares. These demands were particularly important in 1921 when it became known that the Elevated was at last paying its way. The cities and towns pressed for the immediate repayment of their investment and the general public for better service and lower fares. The trustees commenced in the following year the repayment of the assessment and extended its 5 cent fare experiments. But on the whole they have stood firm against the extension of service insufficiently remunerative to cover costs. One of the greatest dangers of public operation, observed the Department of Public Utilities, "is the possibility of extensions of service into territories at a fare less than cost, first at one point and then at many others."¹ The public trustees have observed the same attitude.

Scarcely a year has passed since 1919 in which the public management of the Elevated has not been the subject of legislative inquiry.² In the course of this lengthy investigation certain weak-

¹ D. P. U. 1920, I: 162. Hyde Park Fares Case. The inhabitants of Hyde Park, a suburb of Boston, had petitioned for many years, first the Public Service Commission, then the Department of Public Utilities and the Public Trustees for the extension of service to Hyde Park. The matter was finally settled in 1923 when the city of Boston purchased from the Eastern Massachusetts its Hyde Park tracks and leased them to the Elevated (Mass. Acts of 1923, c. 405).

² See P. S. C. 1919: 243. Special Report on the Bay State Street Railway and the general street railway situation; Special Report of the Street Railway Commission of 1919; 1921 House Doc. 1495, Special Report of the D. P. U.; 1922 Sen. Doc. 287, Report of D. P. U. on the Costs of Different Methods of Transportation; 1923 House Doc. 1110, Report of D. P. U. on transportation facilities in the Metropolitan District; 1925 House Doc. 1180, Joint Committee on the finances and control of the Elevated; 1926 House Doc. 501, Joint Committee on the Elevated; 1927 Senate Doc. 7, on the purchase of certain Elevated structures; 1928 House Doc. 212, on Special Rates for School Children; 1928 House Doc. 400, Report of the Division of Metropolitan Planning on Improved Transportation Facilities; 1929 House Doc. 965, Special Commission on the Rapid Transit Needs of Boston.

nesses of the Act of 1918 have become evident. It has already been pointed out that the return allowed on the investment has proved inadequate to permit new financing. The Committee of 1926 which highly approved of public control, suggested that new financing could be made possible by extending the period of public guarantee for another thirty years.¹ The city of Boston could, of course, undertake new construction and lease the property to the Elevated as it had done on numerous occasions. But Boston is only one of numerous cities and towns served by the creation of the metropolitan transit district, which included the area and population served by the Elevated system. This difficulty was overcome in 1929 by the creation of the metropolitan transit district which includes the area and population served by the Elevated system.²

Another valid criticism of the terms of the public control act lies against the high return on preferred stock chargeable against the company's revenues. At the end of 1930 the Elevated was paying 8 per cent on \$6,400,000 of first preferred stock, 7 per cent on \$3,000,000 of preferred stock and 7 per cent on \$15,406,939 of second preferred stock. It has been maintained, with reason, that a considerable saving could be secured to the car rider by the substitution for these high yield securities of low yield state guaranteed bonds. The 6 per cent yield on the \$26,586,000 of common stock could be replaced, it has also been maintained, with advantage to all concerned by a lower return guaranteed by the state for a longer period.

These are objections raised by experience and subscribed to by nearly all impartial observers. Naturally political and financial interest has given birth to many other objections. The act has been described by office seekers as a "dastardly steal" from the straphangers of Boston and by private interests as robbery of the widows and orphans whose savings had been invested in Elevated securities. In addition the terms of the act have met with more serious criticism from those who objected to its fundamental principle, the payment of the full cost of service by the car riders. The Public Service Commission in 1919 subscribed to the principle that the car rider should not bear the full cost of service.³ But

¹ 1926 House Doc. 501, p. 32.

² Mass. Acts of 1929, c. 383.

³ P. S. C. 1919: 243. *Special Report on the Street Railway Situation in the Commonwealth.*

the 5 cent fare party received something of a blow when the Department of Public Utilities estimated in 1923 that the result of such a fare would be an annual deficit of at least \$10,000,000 and possibly \$12,000,000, to be borne by the taxpayer.¹ Nevertheless the committee of 1928 expressed the opinion of a considerable element of those interested in the question in its statement that, "It has been recognized in all recent studies of important metropolitan rapid transit developments that it was unfair to place the entire burden of their cost upon the car rider, and that there are in reality three parties in interest, each of whom should under proper conditions make a contribution toward the cost. These parties are the car rider, the property specifically benefited by the rapid transit extension, and the general public."²

This committee recommended rapid transit extensions of an estimated cost of from 35 to 40 millions and it was obvious that the cost of these extensions could not be covered by a 10 cent fare. A very good case can be, and has been, made out for a departure from the cost of service principle. But it underestimates somewhat the difficulties and dangers of this departure. One, and perhaps the principal, danger is illustrated in the recommendations of the committee of 1928. Rapid transit extensions are, in the abstract, a good thing within limits. But when the cost of these extensions is not to be borne by the car rider it becomes difficult to determine these limits. In view of the fact that Boston possesses already a closely integrated transportation system better adapted to its needs, in all probability, than that of any other metropolitan area in the country; in view of the fact that the demand for service is probably declining, although slowly, it appears that the rapid transit proposals of the committee already exceed these limits.

There are other objections to a departure from the cost of service principle. Although it is true that others than the car riders benefit from the existence of transportation facilities, it is exceedingly difficult to measure these benefits and to tax the recipients. Everyone knows that rail and bus service benefit certain landowners, but what landowners and how much is a different matter. Recent studies of this problem engender a certain skepticism regarding

¹ 1923 House Doc. 1110, p. 59.

² 1928 *Ibid.*, 400, p. 18.

the ease of its solution.¹ The indiscriminate taxation of the public to cover the cost of extensions introduces a policy about which any public authority would do well to think twice before acting.

A steady and fairly important current of opposition to public management has come from those who espouse public ownership. The Public Service Commission itself in the last years of its tenure of office leaned toward public ownership as the solution of the street railway problem and public ownership has been a minority recommendation of nearly every street railway committee to report during the period since the introduction of trustee control. Despite its defeat in two popular referenda public ownership of the Elevated is still an issue.

The Department of Public Utilities in 1928 found the reproduction cost less depreciation of the Elevated System to be around \$129,000,000 from which perhaps \$10,000,000 could be deducted on certain counts. Since the Act of 1918 secures the Commonwealth an option of purchase at around \$103,000,000 it is argued that the public should secure the advantage of this option. But since, under the Act of 1918 a return is guaranteed only on the 103 million it is difficult to see how purchase would, itself, be advantageous to the public. It is further maintained that the retirement of high yield securities, to be supplanted by state bonds, would considerably reduce the cost of service. This economy can be secured, however, in large part without undertaking the responsibility of public ownership.

The strongest case for state ownership rests upon the advisability of low fares with deficits to be met by taxation.² Transportation on these terms could not, in all probability, be provided except by state enterprise. The objection of taxpayers to the payment of dividends on the stock of a privately owned company would probably be too strong to be withstood.³ Assuming the manage-

¹ See Appendix A.

² This, as a matter of fact, was the minority recommendation of the Committee of 1919.

³ It is safe to say that had the deficit of 1919, assessed on the cities and towns, been a regular occurrence, trustee control could not have been maintained regardless of the efficiency of management. If, under the Act of 1931, which extends public control for another 28 years, a decrease in travel and a failure to raise fares leads to an annual deficit of any magnitude to be assessed on the cities and towns, it is the author's prediction that popular demand will force the exercise of the option of public purchase.

ment of a publicly owned system to be as efficient as the present management under public control, the principal danger would lie in ill advised extensions of service which could have no other effect than an increase of the deficit to be met by taxation.

There is more than a little doubt, however, as to whether the management of a state owned enterprise would be as efficient, for the present method has certain peculiar advantages. The fact that both public and private interests are involved and are sometimes in conflict leads to a rigid public scrutiny of all the acts and policies of the present management. The fact that the principle of the present system is the application of a fare which will cover cost forces economy of operation upon the management. Furthermore the maintenance of this principle is far easier under trustee control than it would be under state ownership. If the principle is wrong, of course these arguments fall to the ground. The present system of management might still be the most efficient but public ownership would probably be inevitable.

The public, however, has expressed its confidence in trustee control and the Act of May 19, 1931, extends its operation until 1959 with certain important changes.¹ These changes meet in part valid objections to the Act of 1918. The returns on the investment are considerably reduced. In return for the longer guarantee, dividends on the common stock are reduced from 6 per cent to 5 per cent. The trustees, furthermore, at discretion, can issue \$30,000,000 in 6 per cent bonds to be sold to the metropolitan transit district, the proceeds to be used to retire the preferred stock.² Whether the retirement of preferred stock reduces the fixed charges is, however, somewhat problematical for the act provides for a special compensation tax to be paid to the transit district sufficient, when added to the 6 per cent on the bonds, to pay for the cost of the money raised by the transit district plus 2 per cent. In other words if the district can borrow at 4 per cent, the tax is non-existent, if not, the tax may be considerable.³

The reduction of the common stock dividend to 5 per cent makes it improbable that the company can do its own additional financing for it is doubtful whether this is a return sufficient to carry

¹ Mass. Acts of 1931, c. 333.

² First preferred to be retired at \$110, the second preferred at \$102, the preferred at \$100.

³ Mass. Acts of 1931, c. 333, sec. 6.

the stock to par under the conditions of the act. This, however, is unimportant for the creation of the Metropolitan Transit District in 1929 has provided machinery for financing any extensions which may be made in the territory of the Elevated.

Some of the power and responsibility in the determination of the rate of fare is taken out of the hands of the trustees and lodged in the transit council. In case of a deficit the trustees shall notify the council and suggest fare increases judged sufficient to cover the deficit. The decision whether to raise fares or to impose the cost on the taxpayers is now to be made by the council. In the event of a deficit the trustees shall also notify the Department of Public Utilities which shall then conduct an investigation into the management. This automatic procedure eliminates the necessity of the frequent legislative investigation of the last few years. It provides also an elaborate system of managerial checks and balances.

The act continues the present leases of public owned transit facilities and preserves to the Commonwealth its option to purchase the property, but on terms which may be distinctly less advantageous to the stockholders.¹ Nevertheless the rise in the market price of Elevated stock immediately after the act went into effect indicates at least that the terms of the act are an improvement over the previous conditions of uncertainty.

The Governor of Massachusetts on signing the act is reported to have remarked, "This is not such a bad bill." The statement fairly represents the consensus of opinion. The stockholders of the Elevated, with the disastrous experience of private operation under the control of a public service commission and the present spectacle of the financial situation of a number of metropolitan transportation systems in mind, were content to accept an extension of public control even under more onerous terms. The champions of the public interest while not obtaining all they could have wished yet secured substantially more than the Act of 1918. The advocates of trustee control and the payment by the car rider

¹ The price stated in the Act is \$105 per share of common stock but this may be "decreased by one half of any sums hereafter assessed under the provisions (of the Act of 1918) upon cities and towns served by the company which have not been repaid to the commonwealth provided however that such decrease shall not reduce the amount payable on account of said common stock below the amount of eighty-five dollars per share." Mass. Acts of 1931, c. 333, sec. 17.

of the cost of service were pleased by the continuation of these principles. The advocates of public ownership were partially placated by the provision for further acquisition of transportation facilities by the state and by the possibility of complete purchase if trustee control breaks down as it may possibly do if faced with adverse operating conditions.

An evaluation of the justice of the present settlement to the various parties concerned depends upon evidence which has not yet come to light. The evidence is involved in the future demand for public transportation in metropolitan Boston and the conditions of its provision.

PUBLIC MANAGEMENT OF THE EASTERN MASSACHUSETTS

We have considered the operation of the Boston Elevated under the Public Management Act in some detail not only because of the importance of this road among Massachusetts street railways but because of the more than local significance of its peculiar relation to the state. The Eastern Massachusetts, to which we now turn briefly, is also an important transportation system, at one time boasting of a larger mileage under one management than any other street railway in the country. Its operation under public management, however, has not received the legislative or popular attention commanded by the Elevated nor has it been conducted with similar success. For this lack of success public management is in no wise responsible.

The Cost of Service Act of 1918 took this sprawling, badly articulated consolidation of country and small city properties out of the hands of the receiver and put it under the control of five public trustees who assumed office in May, 1919. The receiver had already succeeded in abandoning 270 miles of the most sparsely traveled and badly maintained track. The trustees continued this process, gaining local support for abandonment by dividing the property into a number of operating districts in each of which the fares charged were to be only so high as was necessary to cover the cost of service. The act had provided for separate fares determination in the lines south and north of Boston; the trustees established seventeen separate fares divisions. At the present time there are twelve.

Public management proceeded to deal immediately and drastically with two root evils which private management, restrained

by Commission regulation, had proved incapable of handling, the fare situation and jitney competition. A basic 10 cent fare was immediately introduced in all the operating districts with reduction from the basic rate when and where the revenues proved more than adequate to cover the cost of service. Jitney competition was brought under control in short order by placing before the towns and cities the alternatives of street railway service without jitney competition or no street railway service at all.

One of the most pressing needs of the property at the introduction of public management was capital for rehabilitation and re-equipment. Funds were secured for this purpose by a contribution of \$1,000,000 from the stockholders and the provision for the issue of \$5,000,000 in state guaranteed bonds. In the face of the deficit of the first year of operation the commonwealth was forced to pay the interest on the bonds issued, collecting the amount from the cities and towns served by the system. But the surplus of 1921 enabled the company not only to repay the municipalities but to retire \$300,000 of the bonds.

The financial reorganization required by the Act of 1918, together with the readjustments proposed by the trustees, established a funded indebtedness of slightly under \$29,000,000 of which slightly over \$19,000,000 consisted of refunding bonds due in 1948. During the period of public management the financial structure of the company has been improved by the retirement of all the funded indebtedness except the long term refunding bonds. The proprietorship liabilities established by the settlement are as follows:

First preferred stock	6%	.....	\$4,058,800
Preferred B	" 6%	.....	2,996,800
Adjustment	" 5%	.....	8,711,200
Common	"	.....	8,362,600

The cost of service contemplated by the act, which included dividends of 6 per cent on the common stock, required net revenues, after taxes, depreciation and interest, of \$1,360,652. This the company has failed to earn in every year of trustee operation except 1921 and 1922. Consequently the common stock has received no dividend, with the exception of three payments of 37½ cents a share made in 1929, the first year after the stockholders had been given representation on the Board of Trustees. Regular

182 *THE STREET RAILWAY IN MASSACHUSETTS*

dividends have been paid on the first preferred during the whole period of operation but were discontinued on the preferred B and adjustment stock in 1930.

The company has, as a matter of fact, failed to earn the cost of service by considerably more than the deficiency in the return on the investment for, despite heavy depreciation charges, property has had to be abandoned more rapidly than it could be amortised. The property operated, however, has been maintained by the trustees in good condition, obsolete rolling stock has been replaced by efficient one man cars and the company had in operation, at the end of 1930, 114 busses.

The present financial condition of the company is entirely the result of the inevitable decline in passenger traffic caused, in the main, by the increased use of motor cars but also, partially, by the depressed condition of much of the territory served by the system.

**CAR AND BUS MILEAGE AND GROSS REVENUES, EASTERN MASSACHUSETTS
1920-1930**

	Car miles	Bus miles	Gross revenues
1920	23,070,092		\$13,195,275.61
1921	19,769,958		11,318,264.80
1922	19,427,160		10,712,663.29
1923	19,288,626	395,240	10,712,706.
1924	18,391,300	869,269	9,745,501.
1925	18,191,451	1,079,716	9,638,180.
1926	17,883,950	1,287,167	9,788,035.
1927	18,064,642	1,435,817	9,625,434.
1928	17,687,403	1,722,978	9,248,119.
1929	16,687,233	1,999,899	8,579,454.50
1930	16,515,789	2,700,713	7,829,407.23

The division of the Eastern Massachusetts system into operating districts, in each of which the object of fare determination was to cover the cost of service for the particular district has led to a bewilderingly complicated fare structure for the system as a whole which has increased rather than diminished as the trustees have attempted to stem the decrease in revenues by concessions designed to stimulate particular kinds of car and bus riding. Habitual riders in the cities served by the company have pretty generally been favored by reductions from the basic fare in the form of punch cards selling at different prices in different districts, which

prices have shown a tendency to vary with the wage rates of transportation employees. The 12 per cent reduction in wages in 1921 was followed by a general reduction in fares. On the other hand the wage increases of 1923, 1925 and 1926 were among the most important causes of the increase in fares in those years. Considerable success has attended the recent experiment of one dollar tickets entitling the purchaser to ride at will for one day over the company's lines. In addition the company sells one dollar weekly pass cards permitting unlimited individual riding within certain fare limits and, in a number of cities served by its lines, has encouraged local riding by a 5 cent fare for passage over short distances.

At the present time the Lynn division is the only one of the twelve in which revenues are sufficient to cover the cost of service. This means that fare structures supposedly designed to cover the cost of service are actually designed to yield a maximum of net revenue, which maximum is inadequate. The elasticity of the demand for transportation is such, owing to the shortness of the average ride, the presence of alternative means of carriage, and other reasons, that an increase in the average fare would probably decrease gross revenues.

Public control was extended in 1928¹ for an additional five year period. The number of trustees was reduced from five to three, two to be appointed, as formerly, by the Governor, and one to be elected by the stockholders. Otherwise the act includes no changes of importance. Meanwhile, although the road may be said to be managed according to the cost of service principle, there is no prospect that cost of service, as defined in the act, can be covered. If traffic continues to fall off more line and equipment will have to be abandoned unamortised. The trustees have already antagonised public opinion in certain districts by continuing rail service capable of covering operating costs, instead of introducing busses, and this antagonism is increased by the policy, on which public authority is now fairly well agreed, of excluding competition in the territory already served by the Eastern Massachusetts.

Recent agitation has had as its object state guarantee of a fixed return on the investment but it is hard to see how this will solve any problem except that of the individual security holder. For the time being the territory served by the Eastern Massa-

¹ Mass. Acts of 1928, c. 298.

chusetts is receiving transportation service at less than its full cost. If traffic decreases no further there is no reason why this situation should not continue indefinitely. If traffic does decline below the level necessary to cover costs of operation the towns and cities concerned will find themselves faced with the alternative of losing their transportation facilities or of paying their cost of operation either by fares or taxation or both. There seems to be no reason for believing that any other transportation agency could perform the service more cheaply than the Eastern Massachusetts. There seems equally no reason why the state should in perpetuity pay a return on an investment which has in the long run turned out to be excessive and imprudent. The chief difference between a state guaranteed return for the Boston Elevated and for the Eastern Massachusetts is that on the former road the cost of service probably can and on the latter probably cannot be collected from the car rider.

CHAPTER 9

CONCLUSION

PRESENT POSITION OF URBAN TRANSPORTATION

The preceding chapters have been primarily concerned with matters of fact and record. Although the problem has been the analysis of the salient characteristics of the rise and decline of street railways in Massachusetts, it can, I think, be justly claimed that these are also salient characteristics of the rise and decline of the industry the country over. The principal aspects of the history of the industry may be summarised briefly.

The electrically operated street railway introduced a new epoch in urban transportation. It made possible the continuance and acceleration of the growth of metropolitan areas, one of the most striking facts in the history of the 19th century. It not only connected city and country but, in a sense, created the suburb.

The network of street railway lines, however, spread over the countryside before the economic principles of operation were clearly understood. Fifteen years after the introduction of electric traction street railways were heavily overbuilt. Too great a reliance on the experience of the horse-car period coupled with an enormously rapid change in technique resulted in inadequate and over-optimistic estimation of the cost of maintaining and replacing street railway property.

The realisation of this miscalculation came slowly but even after it had sunk into the consciousness of operators and investors the industry continued in favor. Street railways, by a mere continuation of the increase in traffic which had marked their history from the beginning, must eventually, it was felt, be enabled to meet their full cost of operation. A forecast of the rise in costs and the growth of motor traffic lay outside ordinary human prescience.

When the cumulative results of high maintenance and depreciation charges, rising costs and motor competition had overcome the reluctance of street railway companies to make those disclosures

of their true operating and financial position necessitated by application for fare increases, public authorities appeared oblivious to the seriousness of the situation. It required a catastrophic period of street railway receiverships and abandonments of line during which the public saw its transportation system in the process of dissolution and disappearance before fare increases were grudgingly allowed and the regulation of irresponsible motor competition reluctantly undertaken. In part this general deafness of the public and its representatives to the street railway situation was the result of the machinations in municipal politics and the stock manipulations, often fraudulent, which had marked the early history of the industry in many sections of the country. But in Massachusetts which had been singularly free from incidents of this kind the attitude of the public was hardly to be distinguished from its attitude elsewhere.

Once fare increases had been granted their result was disappointingly small. The presence of alternative means of transport made the demand for street railway service elastic except in metropolitan areas where the average ride was long and the conditions of motor operation difficult. What had been obvious to the initiated for a long time now became obvious to all; that, except in the large city, and there provisionally, the street railway was doomed.

Street railway operation has continued in many localities long after it has ceased to pay its full cost of operation and the end of its tenure under such circumstances is not yet. The reason for this is connected with one of the dominant facts of the industry on which previous chapters have focussed attention: the high proportion of fixed to total costs. Street railways will continue to operate as long as operating costs can be covered and something paid to the bondholders. The stockholders in many operating railway enterprises have long ceased to have any concern.

Taking the history of the industry as a whole it should be obvious that the general public, and this is by no means exclusively composed of car riders, has received for long periods from the street railway a service whose full cost has not been paid. This means, of course, that at the termination of the life of those parts of the property whose cost does not justify replacement, street railway service must be discontinued. A substitute common carrier stands ready to take its place, the motor bus. But is this

a complete or only a partial substitute? Can it operate more cheaply, and, if so, under what conditions and with what density of traffic? If the use of the private motor car continues to increase must not any common carrier increase its charge for service in order to exist? What charge is the public ultimately willing to pay for transportation? If the private motor car is used for the major part of its urban transportation by all except the poorer classes can the cost of common carriage be paid by the rider?

With these questions we leave the realm of fact and enter the realm of conjecture. Our study of street railways in Massachusetts is properly finished; to enter the speculative territory of the future prospects of the street railway is to begin a new study and one whose data do not necessarily include much of what has gone before. Within this territory we can do no more than hazard a few guesses.

The rapid change in the nature of bus design and bus operation, the absence of commonly accepted standards in the technique of operation and cost accounting, and the lack of knowledge of the average life of, and, therefore, the proper depreciation charge for, various types of vehicles in use, make it exceedingly difficult to estimate the probable limits of the encroachment of bus service upon the field of street railway transportation. Within the last few years the twenty-passenger bus has given way to the thirty-passenger, the thirty-passenger to the forty, and now motor vehicles seating over fifty passengers are in operation.

The investment required per seat-mile is, of course, very much greater for rail than for bus service. But it appears to be an established fact that the operating costs per seat-mile are somewhat less for the former than for the latter.¹ The question, which type of service will, in the long run, survive, may be answered,

¹ The statistical investigation necessary to demonstrate this assertion cannot be undertaken at this point. Its validity, moreover, depends, to a certain extent, upon conditions of construction and operation and the density of traffic. A study, however, by Warner Tufts, of the National Association of Motor Bus Operators, of 95 companies operating 7,986 busses, led to the conclusion that operating costs approximated 1 cent per seat-mile.

² Companies operating buses averaging 25-passenger capacity spent almost exactly 25 cents per bus-mile, whether the equipment was used in city or intercity service. Smaller equipment cost somewhat more than 1 cent per

188 THE STREET RAILWAY IN MASSACHUSETTS

generally, then, in terms of density of traffic.¹ A density of traffic sufficient to reduce the investment per passenger mile to a low figure will secure the perpetuation of street railway service. To

seat-mile, while larger equipment cost less per seat-mile." Bus Transportation, Feb. 1931. *What it Costs the Average Company to Operate*.

The operating costs for city companies in 1929, as published by the National Association, were as follows: see *Bus Facts for 1931*.

Average seats per bus	Operating expenses * per bus-mile, cents
20	21.24
22.5	23.62
25	25.61
27.5	27.27
30	28.56
32.5	29.61
35	30.46
37.5	31.25
40	31.91
42.5	32.52
45	33.10
47.5	33.62
50	34.14
52.5	34.65
55	35.06

* This includes everything except the return on the investment. These costs are somewhat more per seat-mile than the operating costs per seat-mile of all but the very high cost trolley companies.

¹ This obvious fact is brought out clearly in an article in the *General Electric Review*, Dec., 1921: *Respective Fields of the Rail Car, Trolley Bus, and Gasoline Bus in City Transportation*. The data, which are, of course, by now out of date, were taken from the records of a number of city street railways and from five representative bus companies. The upper figures represent costs on the assumption that construction is at 1921 prices; the lower figures assume construction costs 50 per cent less.

Total Costs per Car or Bus Mile, cents.

32 passenger rail car	30 passenger trolley bus	30 passenger gasoline bus
	Medium traffic route	
36.7	25.8	32.8
28.5	24.3	32.4
	Moderately heavy traffic route	
36.0	26.5	34.0
28.6	24.8	33.5
	Heavy traffic route	
31.8	25.5	33.1
26.3	23.7	32.7
	Very heavy traffic route	
28.2	26.6	34.2
25.2	25.4	33.7

give a quantitative estimate to this density, however, would be an exceedingly hazardous undertaking. The variation in investment per unit of street railway plant and equipment and in operating expenses per car-mile as between companies is matched only by the variation in the cost per bus-mile reported by companies operating busses.

Estimates have been made from time to time, under certain assumed conditions, of the relative cost of rail and bus transportation which, if accurate, would enable us to define within narrow limits the probable future spheres of operation of these respective common carriers.¹ But the figures of actual costs exhibit a variation with the *a priori* estimates and with each other sufficient to cast uncertainty over the whole problem.² One thing has become obvious, however, and that is that the full cost of bus operation is considerably more than many, who have been encouraged to start bus companies during the past decade, anticipated.³ Without either a considerable density of traffic or a high fare the bus cannot survive. In other words, the territory adapted to successful bus operation is not so different from the territory adapted to successful street railway operation as had been supposed.

According to A. E. R. A. figures on bus costs in 1930, of 120 reporting city street railways, 58 showed a loss for that year on their bus operations.⁴ The inclusion in expenses of a charge for

¹ See e.g., a report of the Mass. D. P. U. *Comparative Costs of Different Methods of Transportation, 1922* Sen. Doc. 287.

² The American Electric Railway Association has reported the 1930 cost per bus-mile of busses operated by 120 city street railway properties. Eliminating those companies operating busses seating less than 20 passengers, the remaining companies show an astonishing variation in operating costs per bus-mile and per seat-mile. Although there is a concentration between 15 and 20 cents per bus-mile there is a considerable representation of companies reporting costs per bus-mile which exceed or fall short of this range. Part of the variation is caused by the failure of some companies to allow for depreciation and there are a number of other discrepancies in accounting procedure as between companies. A. E. R. A. Bulletin, 358.

³ In 1923, '24, '25, '26, bus manufacturers carried on an intensive selling campaign with considerable success, on the basis of a represented cost of bus operation which actual experience has found it difficult to equal.

⁴ 18 of the 28 reporting interurban street railways and 18 of the 46 reporting mixed (city and interurban) properties showed a loss on their bus operation. A. E. R. A. Bulletin, 358.

depreciation would have considerably increased this number. Buses were used, of course, on the less densely traveled routes where street railway operation would have shown an even greater loss. The figures, moreover, do not necessarily mean what they appear to mean. A bus line may be profitably undertaken as a feeder to street railway lines even though the fares actually collected on the bus line do not pay the full costs of operation. The figures do bear out, however, a common observation in the industry, that, if and when a street railway makes money, it is usually not on its bus operation.

The destiny of both the street car and the motor bus as common carriers is closely connected with two unpredictable factors, the future change in the number of privately owned motor cars and the future movement of the general price level. The theory has been current in street railway circles for the last two or three years that the registration of privately owned motor cars has about reached its maximum. If this turns out to be true and if, as certain authorities suppose, we stand at the threshold of a slow, secular decline in prices, the future of urban transportation may be more rosy than its immediate past. For the street railway, and the same is true of bus transportation, is an industry which benefits from falling prices.

If, on the other hand, the number of privately owned motor cars continues to increase and the whole of the recent decline in prices turns out to be a purely cyclical phenomenon, common carriers will not continue to operate in the smaller cities without an increase in fares. It is usually taken for granted that 10 cents is the maximum charge which it is possible for a street railway to make. In the areas where such a charge is necessary the length of the average ride is usually so short that any further increase in the fare would probably lead to a decrease in gross revenues. Under such circumstances the smaller cities may be faced with a serious curtailment or the complete disappearance of their street railway systems unless a part of the cost is assessed upon others than the car riders. And it is by no means certain that, if the street railway disappears, the car rider can or will pay the full cost of its substitute, the motor bus.

APPENDICES

APPENDIX A

STREET RAILWAYS, LAND VALUES, AND THE DISTRIBUTION OF POPULATION

It had been the purpose of the author to include in this study a chapter on the effect of street railway transportation on industrial and commercial location, on the distribution of population and on land values. There is no doubt that the effect in these directions has been enormously important nor that the whole complexion of urban life has been changed by it. The introduction of electric traction immediately doubled the radius of feasible daily travel from urban centers and laid the basis for the tremendous growth in population and area which American cities have witnessed during the last forty years. There is, furthermore, a great deal of truth in the slogan that "business and population follow the car lines." The proximity of rapid transit and street car lines has an undeniable effect upon land values, a great many of the early street car lines were subsidiary to land development schemes, and real estate operators have, by devious as well as legitimate means, frequently encouraged street railway extensions to property in which they were interested.¹

The measurement of the relation between transportation facilities and land values in particular is a matter of more than purely academic interest. The assessment of part of the cost of street railway transport upon landowners who benefit from the proximity of their holdings to the railway lines was suggested early in the history of the industry and, in the face of the crisis of the last fifteen years, has more than once been proposed as the solution of the street railway situation. Why, if business men and landowners benefit from the construction and operation of street railways, should the car rider alone pay the cost, particularly in those localities where the rate of fare is high and still insufficient to cover the full cost of service?

Testimony on the importance of the relation between street railway facilities and the distribution of population as well as land values in

¹ The West End road of Boston, for example, with which all the other street railways in Boston consolidated, was built by Henry Whitney to further his real estate projects in Brighton and Brookline.

Massachusetts is not lacking. So far as the distribution of population over a wider area is concerned, reported the Street Railway Commission of 1898, "with all the results, direct and indirect therein implied, a most superficial examination will suffice to show that Massachusetts is far in advance of any portion of Europe. This has . . . in large degree been brought about in an extraordinarily short time . . . through the rapid and energetic expansion of the street railway system."¹

"It is a well known fact," according to the Street Railway Commission of 1918, "that real estate served by adequate street railway facilities is much more readily saleable and commands a higher price, than real estate not so served."² In a recent study on the traffic control problem of Boston it is asserted that, "The development of outlying residential neighborhoods, and the subsequent growth of business activity in their midst, has followed very closely the extension of transportation and traffic facilities which have rendered new areas more accessible to the gainful occupational districts of the city. The principle is illustrated by the manner in which business tends to develop near the principal stations and transfer points of the Boston Elevated lines."³

Not only the existence of transportation facilities but the rate of fare charged thereon influences the location of population, business and the level of land values. The 5 cent flat fare for long rides is alleged by most of the Massachusetts street railway commissions to have been largely responsible for relieving the congestion of population and for the development of suburban residential areas. "One of the great reasons for the development of suburban areas in Boston was because the realty men made a great slogan of the fact that their territory was within the five cent fare."⁴ The adoption of the ten cent fare in Boston, according to the Public Service Commission, caused a great demand for tenements within walking distance of the central districts.⁵

A mayor of Lynn reported that in 1916-17 with a 5 cent fare there were 217 empty tenements in the factory district of Lynn and 19 empty tenements in the outlying districts. In 1919 as a result of the introduction of the zone fare there were 109 empty tenements in the outlying districts and only 27 in the factory districts.⁶ "Many girls were board-

¹ *Report*, p. 17.

² Mass. Sen. Doc. 265, p. 17.

³ Miller McClintock, *Street Traffic Control Problem*, 1919, p. 129.

⁴ Fed. Elec. R. W. Com. II: 1480. Testimony of John J. Walsh.

⁵ *Ibid.*, II: 2075. Testimony of J. B. Eastman.

⁶ *Ibid.*, II: 1627. Testimony of R. S. Bauer.

ing in Lynn in boarding houses in the factory districts. They can not live at home any longer, at Peabody and places like that right around Lynn, because of a 15 or 18 cent fare or larger, so they came into the boarding house district of Lynn; and the boarding houses are full of girls who have left their homes in the suburbs because of that enormous barrier of car-fare."¹

In the Boston and Worcester Rate Case it appeared that certain real estate developments near Wellesley had been undertaken on the basis of a low, 7½ cent, flat fare between Wellesley and Chestnut Hill. The increase in the fare to 16 cents threatened a serious decline in real estate values and a considerable shifting of population.² The change from a 5 cent to a 10 cent fare in Providence, according to the chairman of the Rhode Island Public Service Commission, "has operated to stimulate tremendously the business activities of the center of Pawtucket and to the same extent to take away the business from the center of Providence."³

It would be easy to multiply examples and to adduce further evidence of reputable observers. Indeed the influence of street railways and street railway fares on land values and business and industrial location is a matter of everyday experience. Nevertheless, to measure this influence or even to establish its character is extremely difficult. It has been a truism in the street railway industry and among public service officials that the 5 cent flat fare for long distances was largely responsible for the distribution of the population over wide areas in American cities. Yet the careful study by Walter Jackson of the comparative effects of the flat fare and the zone fare in Europe and the United States resulted in the conclusion that the nature of the fare had little to do with the distribution of the population.⁴ At any rate there are many other variables which also affect the distribution of the population such as the time consumed by transportation, character of the population and comparative wages, prices and standards of living.⁵

A study of the rate of growth of Massachusetts towns served by street railways as compared with the rate of growth of towns not so served appears to indicate that street railway transportation had a considerable

¹ Fed. Elec. R. W. Com. II: 1627. Testimony of R. S. Bauer.

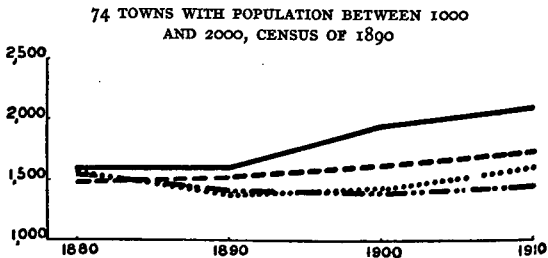
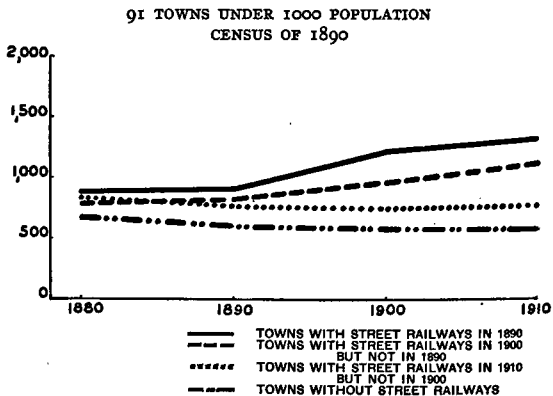
² P. S. C. 1917: 59.

³ Fed. Elec. R. W. Com. II: 1183. Testimony of W. C. Bliss.

⁴ Jackson made this study for the Electric Railway Journal. See his evidence before Fed. Elec. R. W. Com. II: 1602.

⁵ Cf. Jackson and McGrath, *Op. cit.*, p. 128.

effect upon the distribution of population throughout the state. In the following diagrams Massachusetts towns of under 4,000 population in 1900 were divided into four classes. For each of these classes the growth of towns having street railways in 1890 was compared with the growth

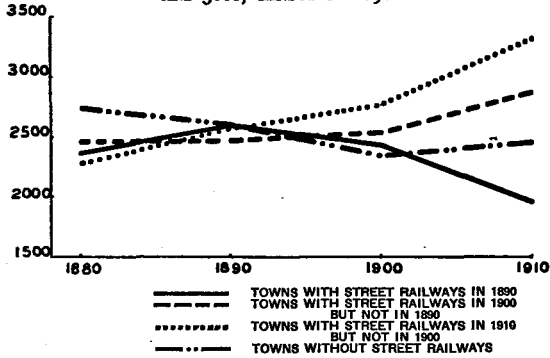


of towns in which street railway service was introduced between 1890 and 1900, between 1900 and 1910, and with the growth of towns which had no street railway service at any period.

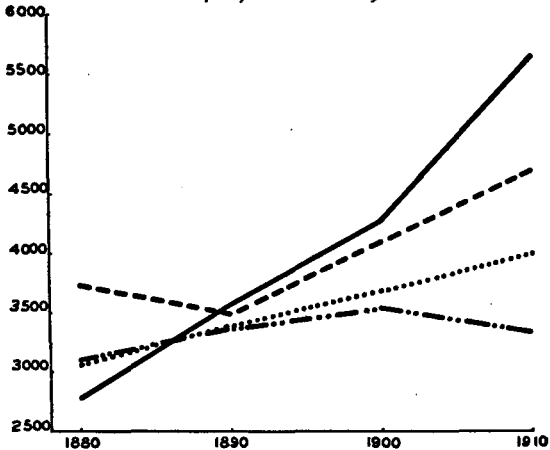
APPENDIX A

197

43 TOWNS WITH POPULATION BETWEEN 2000
AND 3000, CENSUS OF 1890



20 TOWNS WITH POPULATION BETWEEN 3000
AND 4000, CENSUS OF 1890



STREET RAILWAYS AND THE POPULATION CHANGES OF
MASSACHUSETTS TOWNS, 1880-1910

It is, of course, obvious that the whole of the change in population between 1880 and 1910 was not the result of the presence or absence of street railways. The decline in population of towns under 1,000 population not served by street railways would not, perhaps, have been arrested by the presence of railways for these towns were situated, for the most part, on the Cape or in the Berkshires at considerable distance from centers of population. The towns served by street railways in 1890 were, in general, close to centers of population and the street railways probably accelerated a growth which was, in any case, inevitable. The only exception is to be found in the towns between 2,000 and 3,000 population.¹ The towns in which street railways were introduced between 1890 and 1900 were, generally, further removed from the cities but in what was, at the time, considered to be good street railway territory. The street railways perhaps assisted a growth which would have taken place without them. The towns in which street railways were introduced after 1900 were, in the main, country towns whose growth was probably independent of street railway connection with the cities. On the whole the conclusions to be drawn from such statistical evidence are tentative and somewhat dubious.

The problem of the relation between street railways and land values is likewise somewhat unamenable to statistical treatment. Take for example the values of land at or near the principal stations and transfer points of the Boston Elevated lines. It is true of course, as one of our authorities has stated, that these values are high. But how does the causation run? Are these values high because of the proximity of stations and intersections or are the stations and intersections so located because of the prior existence of centers of business and population or the possibility of establishing such centers? Would the location of stations and intersections by pure chance lead to the development of similar

¹ There were only three towns in this class, Groveland, Merrimack and Wrentham, all of which are country places at some distance from centers of population. The considerable decline in the average population of this group between 1900 and 1910 is to be accounted for largely by the creation, in 1905, of the town of Plainville out of part of what had formerly constituted Wrentham.

centers? As a matter of fact transportation facilities are only one of a number of variables determining land values.¹

This is not to say, of course, that a carefully devised statistical technique is not capable in certain situations of disentangling the influence of transportation facilities from other influences in the determination of land values. Nor is it to deny, what is obvious to everybody, that street railway transportation has had a profound effect upon land values, business location and the distribution of population. But the problem of measuring the influence is intricate and constitutes of itself the proper object of a considerable and separate study. The glib conclusions of a number of committees of inquiry that transit facilities create land values and the frequent proposals, for example in Boston, to pay the cost of such facilities by special assessment appear hasty and of doubtful value in the light of the evidence.

¹ In a recent and careful study on the relation between transportation facilities and land values in New York City (Edwin H. Spengler, *Columbia Studies in History, Economics and Public Law*, Number 333, 1930) the author comes to the negative conclusion that, "In view of the foregoing considerations, it is scarcely possible for the experience of New York to lend support to the statement which says: 'That local benefit arises from urban transportation systems is so indisputable as not to warrant further argument or illustration.'"

APPENDIX B

INDICES OF STREET RAILWAY COSTS

The American Electric Railway Association's index of street railway operating costs, calculated by Albert S. Richey and published in the Association's journal *Aera*, begins in 1913, which year is taken as the base. The index assigns a weight of 625 to wages and 225 to material prices. The wage data are maximum wage rates of conductors and motormen (two man cars) of 144 companies, weighted in proportion to the number of platform men employed by each company. The materials index weights the price of fuel at 40 and materials, including metals and metal products, lumber and building materials, at 60.¹

Wage data for Massachusetts street railways have not been published except for scattered years though the Board of Railroad Commissioners published the annual earnings of street railway employees in this state. The wages index which is published in Chapter 5 in comparison with the *Aera* wages index was compiled by taking the average annual earnings of street railway employees for all the street railways in the United States and the "probable hourly rates" of unskilled labor, assigning equal weight to each series.²

The materials index, which is charted on the next page in comparison with the *Aera* materials index, was compiled from the prices of the following commodities assigned the designated weights.

¹ Further details on the constitution of this index have not been published and communication with Mr. Richey failed to elicit anything beyond the fact that certain of the materials series were not available before 1913. For a discussion of the operating costs index see A. E. R. A. *Proceedings, 1924-25. Report on Valuation.*

² Both these series are taken from Paul Douglas, *Real Wages in the United States, 1890-1926*, pp. 182, 325. The average annual earnings of street railway employees is arrived at by dividing the total wages paid street railway employees in census years (1890, 1902, 1907, 1912, 1917, 1922) by the numbers employed in those years, and then interpolating between census years by means of various state statistics, notably those of Massachusetts, New York, Pennsylvania, Ohio and Illinois.

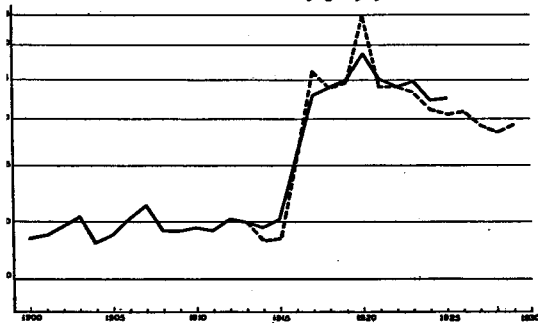
APPENDIX B

201

Series	Weights
Coal, anthracite	20
Coal, bituminous	20
Copper wire	17
Wholesale prices	10
Steel rails	9
Lumber	9
Steel sheets	3
Hammers	2
Shovels	2
Glass	2
Linseed oil	2
White lead	1
Zinc oxide	1
Putty	1
Cement	1
Total	100

MATERIALS PRICE INDEX 1900-1925

AERA MATERIALS PRICE INDEX 1913-1929



The indices of wages and materials, calculated with 1913 as a base year, were combined in the proportions $\frac{260 + 100}{360}$ to make the index of

street railway operating costs charted in Chapter 5. All three indices are rough but the close agreement of all of them with the comparable *fers* indices indicates that they possess approximately the same reliability and that they may be taken for the period from 1900 to 1913 as roughly measuring the changes in operating costs.

APPENDIX C

MASSACHUSETTS STREET RAILWAY SECURITIES ELI- GIBLE FOR INVESTMENT BY MASSACHUSETTS SAVINGS BANKS

NOTE: The year is that during which the securities of the companies listed were legal investments. The period of dividend record on which the list of legal investments is based ends with the year previous to the one here given.

Special note by Public Service Commissioners in their 1915 report: 1: xxxv. The Commission complains at being compelled to certify that dividends (of 5%) have not impaired assets or capital stock. All it can do is judge from net divisible income and other returns; but investors are likely to think that certification by the Commission means approval after thorough investigation.

Special note by Public Service Commission in their 1916 report: "The statutes cited above (ch. 273, Acts of 1915), as construed by this Commission and its predecessor, do not require the Commission to determine whether the provisions for maintenance and depreciation made by street railway companies as shown by their returns have or have not been adequate."

<p style="text-align: center;">1906</p> <p>Athol & Orange Dartmouth & Westport East Middlesex Fitchburg & Leominster Holyoke Hoosac Valley Pittsfield Electric Springfield Union West End</p>	<p style="text-align: center;">Union West End</p>
<p style="text-align: center;">1907</p> <p>Athol & Orange Boston Elevated Dartmouth & Westport East Middlesex Fitchburg & Leominster Holyoke Hoosac Valley Pittsfield Electric Springfield</p>	<p style="text-align: center;">1908</p> <p>Athol & Orange Boston Elevated Citizens' Electric Dartmouth & Westport East Middlesex Fitchburg & Leominster Holyoke Pittsfield Electric Springfield Union West End</p>
<p style="text-align: center;">1909</p> <p>Athol & Orange Boston Elevated Dartmouth & Westport East Middlesex Fitchburg & Leominster</p>	<p style="text-align: center;">1909</p> <p>Athol & Orange Boston Elevated Citizens' Electric Dartmouth & Westport East Middlesex Fitchburg & Leominster</p>

Holyoke	Holyoke
Pittsfield Electric	Nahant & Lynn
Springfield	Springfield
Union	Union
West End	West End
1910	"Under the provisions of ¶ 4 of ch. 323 of the Acts of 1911, certain Boston & Northern bonds are eligible."
Boston Elevated	
Boston & Revere Electric	
Citizens' Electric	
Dartmouth & Westport	
East Middlesex	1914
Fitchburg & Leominster	Bay State
Holyoke	Boston & Revere Electric
Pittsfield Electric	East Middlesex
Springfield	Fitchburg & Leominster
Union	Holyoke
West End	Nahant & Lynn
1911	Springfield
Boston Elevated	West End
Boston & Revere Electric	Worcester Consolidated
Citizens' Electric	
Dartmouth & Westport	1915
East Middlesex	Bay State
Fitchburg & Leominster	Boston & Revere Electric
Holyoke	East Middlesex
Pittsfield Electric	Fitchburg & Leominster
Springfield	Holyoke
Union	Milford & Uxbridge
West End	Nahant & Lynn
Worcester Consolidated	Springfield
1912	Union
Boston Elevated	West End
Boston & Northern	Worcester Consolidated
Boston & Revere Electric	
Citizens' Electric	1916
East Middlesex	Boston & Revere Electric
Fitchburg & Leominster	East Middlesex
Holyoke	Fitchburg & Leominster
Springfield	Holyoke
Union	Springfield
West End	Union
1913	West End
Boston & Revere Electric	Worcester Consolidated
East Middlesex	"Under the provisions of ch. 273 of the Acts of 1915, Boston Ele- vated bonds are eligible."
Fitchburg & Leominster	

	1917	Fitchburg & Leominster Union
Boston & Revere Electric		West End
East Middlesex		1922
East Taunton		Boston & Revere Electric
Fitchburg & Leominster		East Middlesex
Holyoke		Fitchburg & Leominster
Springfield		Union
Union		West End
West End		1923
Worcester Consolidated		Boston & Revere Electric
" . . . the bonds of the Boston		Fitchburg & Leominster
Elevated . . . and of the Milford		Union
& Uxbridge . . . are legal invest-		1924
ments . . . by virtue of the pro-		Boston & Revere Electric
visions of ch. 273 of the Acts of		Union
1915."		1925
	1918	Boston Elevated
Boston & Revere Electric		Boston & Revere Electric
East Middlesex		Holyoke
East Taunton		Union
Fitchburg & Leominster		West End
Holyoke		1926
Milford & Uxbridge		Boston Elevated
Springfield		Boston & Revere Electric
Union		Holyoke
West End		Union
Worcester Consolidated		West End
	1919	1927
Boston & Revere Electric		Boston Elevated
East Middlesex		Boston & Revere Electric
East Taunton		Holyoke
Fitchburg & Leominster		Union
Union		West End
West End		1928
Worcester Consolidated		Boston Elevated
	1920	Union
Boston & Revere Electric		West End
East Middlesex		1929
East Taunton		Boston Elevated
Union		West End
West End		1930
	1921	Boston Elevated
Boston & Revere Electric		West End
East Middlesex		

APPENDIX D

MASSACHUSETTS STREET RAILWAY FAILURES BY DECADES

1890-99:

Abandonments:

Albany Street Freight
 *Bridgewater & East Bridgewater
 *Brockton & Bridgewater
 *Brockton & East Bridgewater
 (No. 1)
 *Grafton, Upton & Milford
 *Holbrook & Weymouth
 †Nantucket Electric
 *People's Electric
 Siasconset
 *Whitinsville

Receiverships:

Attleborough, North Attleborough & Wrentham
 Blackstone Valley
 Interstate (R. I.)
 Newburyport & Amesbury Horse R.R.
 Norfolk Southern

1900-09:

Abandonments:

Bristol County
 *Cape Cod
 *Essex County
 *Haverhill & Boxford
 *Haverhill, Danvers & Ipswich
 *Horse Neck Beach
 *Maplewood & Danvers
 Natick & Needham
 *Orange & Erving
 *Plymouth, Carver & Wareham
 *Plymouth County
 *Southbridge & Charlton Depot

Receiverships:

Bristol County
 Concord & Boston
 Hampshire & Worcester
 Lowell & Boston
 Marlborough
 Middleborough, Wareham & Buzzards Bay
 Natick & Needham
 Norfolk Western
 South Middlesex
 Stoughton & Randolph
 Worcester & Southbridge

1910-19:

Abandonments:

Blue Hill
 Bristol & Norfolk

Receiverships:

Bay State
 Blue Hill

* Never in operation.

† Unaccounted for; made only one return.

Brockton & Plymouth	Brockton & Plymouth
Norfolk & Bristol	Dedham & Franklin
Oak Bluffs	Medfield & Medway
Plymouth & Sandwich	Norton & Taunton
Swansea & Seekonk	Plymouth & Sandwich
Ware & Brookfield	Swansea & Seekonk
*Worcester & Northern	Taunton & Pawtucket
*Worcester & Providence	Warren, Brookfield & Spencer
Worcester & Warren	

1920-29:

Abandonments:

Concord, Maynard & Hudson
 Connecticut Valley
 Conway Electric
 Lowell & Fitchburg
 Martha's Vineyard
 Medway & Dedham
 Milford, Attleborough & Woonsocket
 Milford, Framingham, Hopedale & Uxbridge
 New Bedford & Onset
 Northern Massachusetts
 Norton, Taunton & Attleborough
 Norwood, Canton & Sharon
 Plymouth & Brockton
 Providence & Fall River
 Shelburne Falls & Colrain
 Webster & Dudley
 Worcester & Webster

* Never in operation.

Receiverships:

Boston & Worcester
 Concord, Maynard & Hudson
 Connecticut Valley
 Interstate Consolidated (Mass.)
 Massachusetts Northeastern
 Milford & Uxbridge
 Northern Massachusetts

SUMMARY

Decade	No. of Abandonments	No. of Receiverships	Total *
1890-99	10	5	15
1900-09	12	11	21
1910-19	11	10	17
1920-29	17	7	21
Totals	50	33	74

* The figures in the last column are in three of the four decades different from the sums of the figures in the two preceding columns. This is to avoid double counting of 9 companies which went into receivership and were subsequently abandoned.

APPENDIX E

STREET RAILWAY HOLDING COMPANIES IN MASSACHUSETTS

n Electric Associates

(Middlesex & Boston)

Organized May 28, 1910.

Always abandoned in 1917; continued to exist as gas and electric holding company.

n Suburban Electric Companies

(Middlesex & Boston)

Organized Nov. 25, 1901.

Organized as *Suburban Electric Securities Company* in 1921.

n & Worcester Electric Companies

(Middlesex & Worcester; Framingham, Southborough & Marlborough)

Organized Dec. 29, 1902.

Massachusetts Consolidated Railways

(Middlesex, Worcester, Maynard & Hudson; Connecticut Valley; Northern Mass.)

Organized Nov. 16, 1911.

Not reported in 1923.

Massachusetts Electric Companies

(Middlesex, Worcester, Plymouth State; Newport & Fall River)

Organized June 29, 1899.

Not reported in 1919.

England Investment & Security Company

(Middlesex, Worcester, Attleborough Branch; Consolidated (Conn.); Interstate Consolidated (Mass.); Marlborough & Westborough; Milford, Attleborough & Woonsocket; Springfield; *Springfield Railway Companies*; Springfield & Eastern; Uxbridge & Blackstone; Western Massachusetts; Worcester & Blackstone Valley; *Worcester Railways & Investment Company*; Worcester & Shrewsbury St. Ry.; Worcester & Webster; Worcester & Westborough)

Organized June 25, 1906; continued May 25, 1927.

Not reported in existence.

Hampshire Electric Railways

(Middlesex, Worcester, Amesbury & Hampton; Haverhill & Plaistow; Haverhill & Southern New Hampshire; Lawrence & Methuen; Lowell & Pelham; Massachusetts Northeastern)

Organized Aug. 24, 1905.

Not reported in existence.

Southeastern Electric Companies

(Taunton & Pawtucket)

Organised Jan. 2, 1905.

Dissolved Nov. 1917.

Springfield Railway Companies

(Springfield)

Organised Mar. 15, 1905.

Still in existence.

Suburban Electric Securities Company

(Middlesex & Boston; Boston Suburban Electric Companies)

Organised in 1921 to replace *Boston Suburban Electric Companies*.

Still in existence.

Worcester Railways & Investment Company

(Marlborough & Westborough; Springfield; Worcester & Blackstone Valley; Worcester Consolidated; Worcester & Shrewsbury Railroad)

Organised July 9, 1901.

Dissolved Dec. 31, 1917.

Merrimac Valley Electric Company

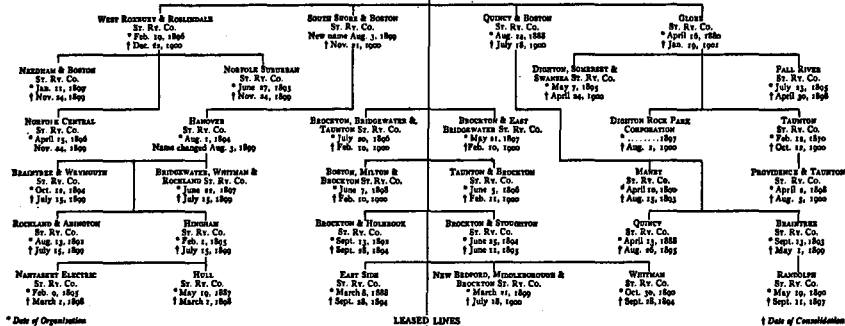
(Citizens Electric Street Railway; Salisbury Land and Improvement Company; Salisbury Beach Corporation; formerly owned Haverhill and Amesbury Street Railway)

Organised Feb. 1907.

HISTORY OF THE ORGANISATION OF THE SOUTHERN DIVISION OF THE BAY STATE STREET RAILWAY COMPANY

OLD COLONY STREET RAILWAY COMPANY
Consolidated with the BOSTON AND NORTHERN STREET RAILWAY COMPANY
July 1, 1901

BROCKTON STREET RAILWAY COMPANY
* Dec. 28, 1880
Name changed Feb. 12, 1901



* Date of Organization

† Date of Consolidation

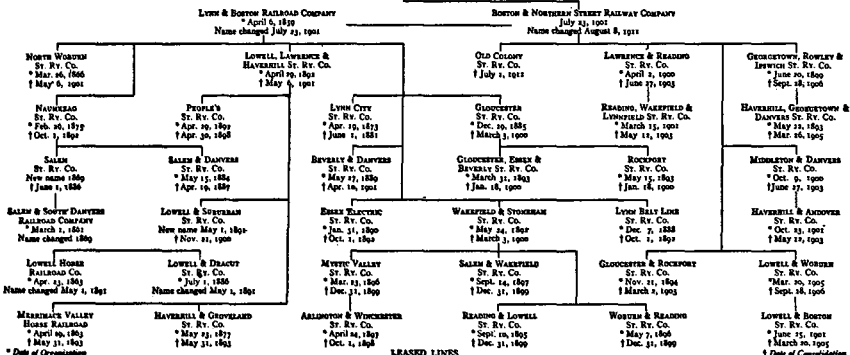
LEASED LINES

NEWPORT & FALL RIVER STREET RAILWAY COMPANY
Change of name after consolidation of Middlesex & Portsmouth and Fall River & Stone Bridge St. Ry. Cos., February 28, 1898.
Leased to the Old Colony St. Ry. Co., July 1, 1901, for a term of 99 years.
Lease expires July 1, 2000.



HISTORY OF THE ORGANISATION OF THE BAY STATE STREET RAILWAY COMPANY

BAY STATE STREET RAILWAY COMPANY
Aug. 8, 1911



* Date of Organization

† Date of Liquidation

BOSTON & CHILMARK RAILROAD CO. Organized April 29, 1852. Constructed with the Salem Turnpike & Chelsea Bridge Corporation for the use of Turnpike from Broadway, Chelsea, to junction of tracks of the Middlesex Railroad Company for a term of 50 years from the 25th day of April, A.D. 1852. Contract transferred to the Maiden & Abreast Railroad Co., September 15th, 1852. On March 31st, 1862, the Maiden & Abreast Railroad Co. transferred all its rights to the Middlesex Railroad Co., and on April 16th, 1862, the Middlesex Railroad Co. transferred said rights to the Lynn & Boston Railroad Co. On November 12, 1880, the lease was extended for a period of 99 years from October 1st, 1880, and expires October 1st, 1979.

WINDMILL RAILROAD CO. Organized May 20, 1837. Leased to the Lynn & Boston Railroad Co., March 29, 1863, for 50 years from October 1st, 1861. Lease annulled by new lease dated December 18th, 1879, to effect January 1st, 1880, for a term of 999 years; expires January 1st, 2079.

NARRANS STREET RAILWAY. Organized August 14, 1823. Leased to the Lowell & Suburban Street Railway Co., July 1st, 1900, for a term of 99 years. Lease transferred by consolidation, Nov. 21, 1900, to the Lowell, Lawrence & Haverhill St. Ry. Co.; again transferred by consolidation, May 6, 1901, to the Lynn & Boston Railroad Co. Lease expires July 1st, 1999.

BEVERLY STREET RAILWAY CO. Organized May 16, 1822. Name changed to the Lynn & Boston Street Railway Co., July 1st, 1900, for a term of 99 years. Lease transferred by consolidation, Nov. 21, 1900, to the Lynn & Boston Railroad Co., July 1st, 1893, for a term of 99 years. Lease expires July 1, 1994.

BOSTON & CHILMARK RAILROAD CO. Organized February 8, 1860. Name changed to the East Middlesex Street Railway Co., Chapter 237, Acts of 1882. Leased to the Lynn & Boston Railroad Co., May 1st, 1893, for a period of 99 years. Lease expires May 1, 1992.

APPENDIX G

CLASSIFICATION OF MASSACHUSETTS STREET RAILWAYS¹

Class B

1890-99

1. East Side 1890-2
2. Globe 1890-9
3. Holyoke 1890-9
4. North End 1893-5
5. Springfield 1890-9
6. Union 1890-9
7. Worcester Consolidated
1890-9

1900-09

1. Holyoke 1900-9
2. Springfield 1900-9
3. Union 1900-9
4. Worcester Consolidated
1900-9

1910-19

1. Holyoke 1910-9
2. Springfield 1910-9
3. Union 1910-9
4. Worcester Consolidated
1910-9

1920-29

1. Holyoke 1920-9
2. Springfield 1920-9
3. Union 1920-9
4. Worcester Consolidated
1920-9

Class C

1890-99

1. Boston & Revere Electric
1890-2
2. Brockton 1890-9

* No record of passengers after 1918.

† No record of passengers during the decade.

¹ See Chapter 4. Class A included only the Boston Elevated and the West End operated as one property.

3. East Middlesex 1890-2

4. Lowell, Lawrence & Haverhill 1893-9

5. Lowell & Suburban 1892-9

6. Lynn & Boston 1890-9

7. Worcester, Leicester & Spencer 1892-4

8. Worcester & Suburban 1896-9

1900-09

1. Brockton (Old Colony)

1900-9

2. Lawrence & Methuen 1903-9

3. Lynn & Boston (Boston & Northern) 1900-9

4. Nahant & Lynn 1906-9

5. Worcester & Holden 1904-9

6. Worcester & Southbridge
1903-9

1910-19

*1. Boston & Northern (Bay State and receiver, Eastern Massachusetts) 1910-9

2. Boston & Worcester 1910-9

3. Lawrence & Methuen 1910-2
1914-9

4. Massachusetts Northeastern
1914-9

5. Nahant & Lynn 1910-9

1920-29

1. Boston & Worcester 1920-6

†2. Eastern Massachusetts
1920-9

3. Massachusetts Northeastern
1920-9

4. Nahant & Lynn 1920-9

Class D

- 1890-99
1. Athol & Orange 1895-9
 2. Attleborough, North Attleborough & Wrentham 1890-2
 3. Beverly & Danvers 1897-9
 4. Braintree 1895-8
 5. Braintree & Weymouth 1896-8
 6. Clinton (Leominster & Clinton) 1894-9
 7. Commonwealth Avenue 1897-9
 8. Conway Electric 1897-9
 9. Cottage City (& Edgartown Traction) 1892-9
 10. Dartmouth & Westport 1895-9
 11. Dighton, Somerset & Swansea 1896-9
 12. East Wareham, Onset Bay & Point Independence 1890-9
 13. Fitchburg (& Leominster) 1890-9
 14. Framingham Union 1890-9
 15. Gardner (Electric) 1895-9
 16. Gloucester 1890-9
 17. Gloucester, Essex & Beverly 1896-9
 18. Greenfield & Turner's Falls 1896-9
 19. Haverhill & Amesbury 1893-9
 20. Haverhill, Georgetown & Danvers 1897-9
 21. Haverhill & Groveland, 1890-2
 22. Hoosac Valley 1890-9
 23. Hull 1891-7
 24. Interstate 1896-9
 25. Marlborough 1890-9
 26. Martha's Vineyard 1897-9
 27. Merrimack Valley Horse Railroad 1890-2
 28. Milford, Holliston & Framingham 1897-9
 29. Mystic Valley 1897-9
 30. Natick & Cochituate 1890-9
 31. Natick Electric (South Middlesex) 1893-9
 32. Newburyport & Amesbury Horse Railroad 1890-8
 33. Newton 1890-9
 34. Newton & Boston 1893-9
 35. Newtonville & Watertown 1894-7
 36. Norfolk Central 1897-9
 37. Norfolk Suburban 1895-9
 38. Northampton 1890-9
 39. North Woburn 1890-9
 40. Pittsfield (Electric) 1890-9
 41. Plymouth & Kingston 1890-9
 42. Quincy & Boston 1890-9
 43. Reading & Lowell 1897-9
 44. Rockland & Abington 1894-8
 45. Rockport 1897-9
 46. Southbridge & Sturbridge 1897-9
 47. Taunton 1890-9
 48. Wakefield & Stoneham 1893-9
 49. Warren, Brookfield & Spencer 1897-9
 50. Wellesley & Boston 1896-9
 51. West Roxbury & Rosindale 1897-9
 52. Woburn & Reading 1897-9
 53. Woonsocket (R. I.) 1896-9
 54. Woronoco 1892-9
- 1900-09
1. Amesbury & Hampton 1907-9
 2. Amherst & Sunderland 1900-6
 3. Athol & Orange 1900-9
 4. Berkshire 1903-9
 5. Blue Hill 1900-9
 6. Boston & Worcester 1904-9
 7. Bristol & Norfolk 1904-9
 8. Brockton & Plymouth 1901-9
 9. Citizens' Electric 1900-9
 10. Commonwealth Avenue 1900-3
 11. Concord, Maynard & Hudson 1902-9

12. Conway Electric 1900-9
 13. Cottage City (& Edgartown Traction; Oak Bluffs) 1900-9
 14. Dartmouth & Westport 1900-9
 15. Dedham & Franklin 1905-9
 16. East Taunton 1900-9
 17. Fitchburg & Leominster 1900-9
 18. Framingham Union 1900-3
 19. Gardner, Westminster & Fitchburg, 1900-9
 20. Georgetown, Rowley & Ipswich 1901-6
 21. Greenfield & Turner's Falls 1900-4
 22. Hampshire & Worcester 1902-4
 23. Haverhill, Georgetown & Danvers 1900-4
 24. Haverhill & Plaistow, 1906-9
 25. Haverhill & Southern New Hampshire 1903-9
 26. Hoosac Valley 1900-5
 27. Interstate Consolidated (R. I., Mass.) 1900-9
 28. Lexington & Boston 1901-9
 29. Linwood 1901-9
 30. Lowell, Acton & Maynard 1905-9
 31. Lowell & Fitchburg 1907-9
 32. Lowell & Pelham 1903-9
 33. Marlborough 1900-2
 34. Marlborough & Westborough 1902-9
 35. Medfield & Medway 1901-9
 36. Milford, (North) Attleborough & Woonsocket 1901-9
 37. Milford & Uxbridge 1903-9
 38. Natick & Cochituate 1900-8
 39. New Bedford & Onset 1902-9
 40. Newton 1900-8
 41. Newton & Boston 1900-9
 42. Norfolk & Bristol 1903-9
 43. Norfolk Western 1900-4
 44. Northampton 1900-9
 45. Northampton & Amherst (Connecticut Valley) 1901-9
 46. Norton & Taunton 1900-9
 47. Norwood, Canton & Sharon 1902-9
 48. Palmer & Monson (Springfield & Eastern) 1900-5
 49. Pittsfield Electric 1900-9
 50. Plymouth & Sandwich 1900-9
 51. Providence & Fall River 1902-9
 52. Shelburne Falls & Colrain 1900-9
 53. South Middlesex 1900-6
 54. Southbridge & Sturbridge 1900-4
 55. Taunton & Pawtucket 1906-9
 56. Templeton 1902-9
 57. Uxbridge & Blackstone 1903-9
 58. Ware & Brookfield 1907-9
 59. Warren, Brookfield & Spencer 1900-9
 60. Webster & Dudley 1900-2
 61. Wellesley & Boston 1900-3
 62. Westborough & Hopkinton 1903-8
 63. Western Massachusetts 1906-9
 64. Woonsocket (R. I.) 1900-6
 65. Worcester & Blackstone Valley 1900-9
 66. Woronoco 1900-6
- 1910-19
1. Amesbury & Hampton 1910-12
 2. Athol & Orange (Northern Massachusetts) 1910-19
 3. Berkshire 1910-19
 4. Blue Hill and receiver 1910-19
 5. Bristol & Norfolk 1910-18a
 6. Brockton & Plymouth and receiver 1910-19
 7. Citizens' Electric 1910-12

- *3. Concord, Maynard & Hudson 1910-19
 *9. Connecticut Valley 1910-19
 10. Conway Electric 1910-15b
 11. Dedham & Franklin and receiver 1910-13
 12. East Taunton 1910-19
 13. Fitchburg & Leominster 1910-19
 14. Gardner, Westminster & Fitchburg 1910-12
 15. Haverhill & Amesbury 1910-12
 16. Haverhill & Plaistow 1910-12
 †17. Haverhill & Southern New Hampshire (Massachusetts Northeastern) 1910-12
 18. Interstate Consolidated 1910-19
 19. Lexington & Boston 1910-12
 20. Linwood 1910-19
 21. Lowell & Fitchburg 1910-19
 22. Lowell & Pelham 1910-12
 23. Medfield & Medway and receiver 1910-13
 24. Middlesex & Boston 1910-19
 25. Milford, Attleborough & Woonsocket 1910-19
 26. Milford & Uxbridge 1910-19
 27. New Bedford & Onset 1910-19
 28. Norfolk & Bristol 1910-19
 29. Northampton 1910-19
 30. Norton & Taunton and receiver 1910-17
 31. Norwood, Canton & Sharon 1910-18a
 32. Oak Bluffs 1911-17
 33. Plymouth & Sandwich 1910-18a
 34. Point Shirley 1912-19
 35. Providence & Fall River 1910-17
 36. Shelburne Falls & Colrain 1910-19
 37. Taunton & Pawtucket 1910-15
 38. Templeton 1910-12
 39. Ware & Brookfield 1910-18a
 40. Warren, Brookfield & Spencer and receiver (and Worcester & Warren) 1910-18a
 1920-29
 1. A. B. C. 1920-7
 ‡2. Athol & Orange Transportation Area 1925-9
 3. Berkshire 1920-9
 ‡4. Concord, Maynard & Hudson 1920-2
 ‡5. Connecticut Valley 1920-3
 6. East Taunton 1920-9
 7. Fitchburg & Leominster 1920-9
 8. Gardner & Templeton 1925-9
 ‡9. Grafton & Upton Railroad 1920-9
 ‡10. Greenfield & Montague Transportation Area 1925-9
 11. Interstate Consolidated (Interstate) 1920-9
 12. Linwood 1920-9
 13. Lowell & Fitchburg 1920-8
 14. Middlesex & Boston 1920-9
 15. Milford, Attleborough & Woonsocket 1920-3
 16. Milford & Uxbridge 1920-7
 17. New Bedford & Onset 1920-8
 18. Northampton 1920-9

* No service for passengers after 1910.

† Started to Class C in 1912—1913 omitted.

‡ "1918" refers to the calendar year 1917, found in Returns 1918 Part II; "1918" refers to the calendar year 1918, found in Returns 1918 Part III. "1917" is the calendar year 1916, and "1919" the calendar year 1919. Otherwise, fiscal year ending June 30.

§ No reports of number of passengers carried.

¶ Largely a freight road. Passenger traffic limited by the Milford & Uxbridge after 1910.

APPENDIX G

215

- | | |
|------------------------------------------------|-----------------------------------------|
| 19. Northern Massachusetts
1920-3 | 21. Plymouth & Brockton 1923-7 |
| 20. Norton, Taunton & Attle-
borough 1920-7 | 22. Point Shirley 1920-9 |
| | 23. Shelburne Falls & Colrain
1920-6 |

‡ No reports of number of passengers carried.

APPENDIX H

PERCENTAGES OF DEPRECIATION AND MAINTENANCE TO INVESTMENT AND GROSS REVENUES FOR CER- TAIN MASSACHUSETTS STREET RAILWAYS 1915-1929

I

PERCENTAGE OF DEPRECIATION TO INVESTMENT

Year	Berkshire	Boston El.	Bay State E'n Mass.	Holyoke	Spring- field	Union	Wor. Con.
1915	0.092%	0.077%	0.256%	2.24%	0.445%	2.73%	0.404%
1916	0.086	0.391	0.252	0.216	0.465	2.91	0.452
1917	2.41	0.357	0.257	0.229	0.491	2.64	0.464
1918	0.554	1.21	0.415	0.699	0.598	1.70	0.507
1919	0.560	2.03	1.65	3.68	0.624	2.93	0.532
1920	0.0787	2.16	1.81	4.11	0.634	2.58	0.551
1921	0.108	2.11	2.36	1.75	0.766	2.36	0.852
1922	0.108	2.06	1.79	4.98	0.756	3.89	0.846
1923	0.110	1.95	2.18	4.94	0.748	3.17	0.852
1924	0.125	2.42	2.01	2.37	0.859	3.12	0.859
1925	0.126	2.38	2.37	0.514	0.866	2.29	0.852
1926	1.63	2.69	2.46	0.761	0.896	2.31	1.01
1927	0.612	2.51	2.26	0.562	0.962	2.86	1.15
1928	0.516	2.36	2.21	0.614	1.23	2.75	1.48
1929	0.587	2.81	2.15	0.481	1.30	3.08	1.43

II

PERCENTAGE OF MAINTENANCE TO GROSS REVENUE

Year	Berkshire	Boston El.	Bay State* E'n Mass.	Holyoke	Spring- field	Union	Wor. Con.
1915	28.6%	14.8%	19.8%	16.2%	16.9%	20.1%	22.4%
1916	24.2	16.3	21.0	17.1	18.7	16.4	19.4
1917	20.7	17.2	19.2	22.2	19.4	18.1	20.3
1918	31.9	26.3	22.2	25.0	22.2	14.1	23.7
1919	40.2	27.5	26.8*	26.6	21.3	16.9	22.9
1920	27.7	21.6	33.3	33.4	23.5	18.0	28.6
1921	22.9	22.8	30.9	27.5	21.7	16.8	24.6
1922	23.5	20.6	30.7	27.2	22.1	16.0	26.0
1923	28.6	22.2	32.1	26.5	25.2	19.4	25.6
1924	27.5	23.5	29.3	19.8	21.2	20.7	22.2
1925	29.2	22.3	29.3	15.7	22.2	17.7	22.2
1926	32.1	24.5	29.4	17.2	23.3	17.0	26.5
1927	36.2	22.9	29.2	19.3	22.6	18.0	23.8
1928	26.2	22.8	24.2	18.5	19.9	21.7	21.8
1929	27.9	22.4	24.1	18.4	22.1	21.1	24.2

* Operations taken over by Eastern Mass. May 31, 1919.

APPENDIX I

STREET RAILWAY TAXATION IN MASSACHUSETTS

I

CORPORATE FRANCHISE TAX

Year	Par value capital stock	Market value capital stock	Corporate excess	Rate per \$1000	Corporate franchise tax assessed
1903	68,404,480		58,600,000	16.76	984,229
1904	68,542,038		55,000,000	16.60	912,730
1905	70,326,985		56,800,000	17.25	980,954
1906	71,216,925		58,800,000	16.87	992,309
1907	73,280,155		54,000,000	17.03	921,168
1908	74,737,505		54,000,000	17.20	930,065
1909	80,728,880		57,000,000	17.35	989,289
1910	84,345,065	98,562,943	64,101,491	17.60	1,128,186
1911	86,639,175	105,298,052	68,982,468	17.93	1,236,855
1912	89,118,975	106,984,544	66,552,423	17.97	1,195,947
1913	97,284,375	102,643,814	60,225,809	17.92	1,079,246
1914	98,194,775	96,745,905	53,223,309	18.09	962,809
1915	99,031,275	90,170,816	46,141,574	18.55	855,926
1916	102,493,675	82,062,054	38,257,751	19.14	732,253
1917	103,691,975	74,756,009	29,354,058	19.47	571,533
1918	106,641,075	50,787,601	13,551,695	19.07	258,430
1919	102,651,977	51,924,003	13,032,935	19.41	252,969
1920	102,710,677	53,050,587	9,505,746	21.34	199,042
1921	102,610,677	48,324,873	9,372,906	23.34	218,763
1922	105,675,726	61,272,444	17,627,940	25.20	444,224
1923	105,371,092	65,172,002	19,321,806	26.60	512,631
1924	103,934,277	61,294,347	12,525,356	27.07	339,052
1925	103,981,846	59,687,996	11,311,443	27.42	311,147
1926	103,847,752	61,222,592	13,377,698	27.77	371,507
1927	102,280,032	61,186,050	12,929,458	28.86	373,021
1928	101,675,314	60,744,761	12,782,567	29.46	376,557
1929	100,745,297	57,397,334	9,767,527	29.65	289,591
1930	100,628,770	55,124,146	9,179,179	29.12	267,292

II

COMPOSITION OF TOTAL TAX ON MASSACHUSETTS STREET RAILWAYS

Year	Property tax	Corporation tax	Earnings tax	Total taxes	% total to gross inc.	% total to net inc.
1890	a	b	b	\$284,979	3.4	13.3
1895	a	b	b	488,138	3.7	11.7
1900	a	b	\$254,799	1,347,119	6.3	16.4
1905	a	\$980,954	354,532	1,893,053	6.6	18.2
1911	\$668,946 ^a	1,236,855	545,777	2,464,686	6.7	17.4
1915	965,953 ^a	855,926	629,553	2,467,773	5.9	16.4
1920	1,160,101	199,042	35,749	1,905,133	2.8	12.9
1925	1,433,612	311,147	764,498	2,475,544	4.2	16.5
1929	1,374,024	289,591	476,029	2,254,563	4.1	15.4

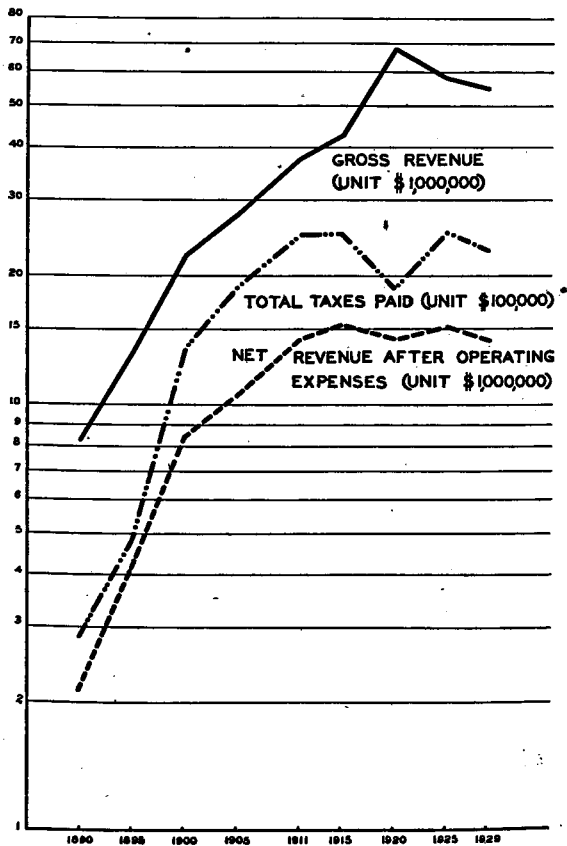
^a Not separately reported.

^b Not in existence.

^c The Boston Elevated reported a single "estimated" figure for property and corporation taxes together. The figure here given was obtained by subtracting from the total corporation taxes those paid by other roads, thus giving the amount of the corporation tax paid by the Boston Elevated; subtracting this from the Boston Elevated's combined "estimate" of property and corporation taxes, thus giving approximately the amount of property tax paid by the Boston Elevated; and adding this to the property tax paid by the rest of the roads. A few small roads likewise failed to specify the kind of taxes, and the totals in such cases were divided up among the various taxes proportionately to those of all the companies.

The total does not include outlay on maintenance and repair of the public highway, which before 1898 was large and which, despite the commutation tax, designed to relieve the street railways from these expenditures, still continued to some extent after 1898. These figures are lumped in the maintenance charges of the various companies and are not separately itemised. The Boston Elevated paid no commutation tax but the total includes a compensation tax paid for the same purpose.

The total includes certain small local taxes and the federal income tax which, except in the case of the Boston Elevated, was small. After 1928 the excise, or earnings, tax was removed except from the Elevated. The principal part of the earnings tax reported for 1929 represents the federal income tax.

MASSACHUSETTS STREET RAILWAYS—REVENUE
AND TAXES

INDEX

- Adams, Charles Francis, 10, 134;
Commission, 32.
- American Electric Railway Association, 103, 120, 168; wages (chart) 106; index of operating costs, 200.
- Athol and Orange Transportation Area, 165.
- Bankrupt stocks, 143.
- Barnes, Irston R., 133, 136, 150, 151, 156.
- Bauer, J., 151.
- Bay State Rate Case, 152, 155, 157.
- Bay State Street Railway Co., 16, 31, 43, 100, 125, 128, 131, 159, 165, 168, 209, 210.
- Bay State Consolidation, 41, 51.
- Beeler, John A., 164.
- Beginning of street railway industry, 6.
- Berkshire Street Railway Co., 106.
- Blue Hill Street Railway, 149.
- Bonds of street railways (table of prices and yields), 49.
- Boston and Northern Lines, 31, 44, 48, (table and chart) 56, 100, 102, 120.
- Boston and Worcester Co., 45, 121.
- Boston and Worcester Rate Case, 195.
- Boston Elevated Act, 170.
- Boston Elevated Co., 16, 29, 31, 48, 96, 100, 102, 105, 115, 117, 119, 126, 127, 146, 159, 163, 164, 165, 168, 169, 178, 179, 198; public management, 170; total receipts (table), 171; cost of service (table), 171.
- Boston subway, 163.
- Bradlee, H. G., 51.
- Brandeis, Justice, 151.
- Brockton-Old Colony Co., 31, 41, 100, 102.
- Bullock, Prof. C. J., 42, 141, 145.
- Cable system, 6.
- Cambridge subway, 163.
- Cambridge Street Railway, 118.
- Capital investment, 18, 19, (table) 20; over-investment, 26.
- Capitalisation, (table) 26.
- Capital structure, (table) 27; ratio of net earnings to fixed charges (table) 28.
- City systems, 41.
- Classification of Massachusetts Street Railways, Appendix G, 211.
- Concord, Maynard and Hudson Co., 121.
- Consolidated Railways Co., 62.
- Consolidation, 7, 13, 14, 41, 44, 51, 140, 148; share exchange, 42; share values, 44; disadvantages, 46; earnings, 53; effect on dividend rate, 61; see also Economies of consolidation.
- Country lines, 13.
- Cost of service principle, 168, 176, 183, 186.
- Costs, rising, 7, 12, 14, 98; historical, 73; indices, (chart) 98, materials, 15, operating, 15, 200, wages, 15; investment, 71, 73, 77, 83, 87, (charts) 88, 89; operating, 71, 74, (table) 81, 82, 89, (charts) 90, 91, (table) 96, 97, 99, (tables) 100, 187; overhead, 74; summary, 109; promoters' expenses, 154; effect of technical changes, 93; motor bus costs, 189.
- Credit policy, 22.
- Depreciation, 23, 30, 31, 32, 33, 74, 90, 100, 101, 155, 170, 172, 173, (table) 216.
- Demand, elasticity, 122, 123, 126; curves, 123.
- Density of traffic, 74, 77 (chart), 78, 96; relation to costs, 85, 86.
- Department of Public Utilities, 160.
- Dividends, 12, 15, (table) 31, 33, 36, 181.
- Eastern Massachusetts Act, 165.
- Eastern Massachusetts Co., 31, 84, 100, 105, 169, 180; reserves (table), 182.
- Eastman, Joseph, 151.
- Economies of consolidation, 45, 46, 47; financing, 47; equipment, 49; management, 51; operation, 51; purchasing, 52; earnings, 60.
- Economies, internal, 95.
- Employees, number, (chart) 107; unions, 105.
- Expansion, xvi, 4, 7, 10, 12, 174.

- Failures, Appendix D, 205.
- Fare changes, 15, 16, 34, 106, 114, 118, 120, 122, 126, 157, 168, 171, 194; five cent fare, 5, 127; fare limits, 5; flat fare, 118; regulation, 138, 148, 181; effect on land values and population, 194; effect on traffic (tables) 122, 127.
- Fitchburg and Leominster Co., 31, 100.
- General Electric Securities Co., 22, 23.
- Globe Co., 31, 100.
- Gonzenbach, E., 51.
- Government control, xvi.
- Greenfield and Montague Transportation Area, 165.
- Greenfield and Turner's Falls Co., 166.
- Holding Companies, 14, 34; balance sheet, 35; capitalisation, 36; dividends, 36; advantages, 37; disadvantages, 38; economics, 38; list, Appendix E, 207.
- Holyoke Street Railway Co., 12, 28, 31, 96, 100, 105.
- Horse railway, 3, 4.
- Industry, conditions in, 15.
- Influenza epidemic, 123.
- Interurban speed, xvi, 10, 11; mileage, 10, 11.
- Investment, 71, 73, 76, 77, 83; land and buildings, power plant, rolling stock, track construction, 87-89; prudent, 150; reinvested earnings, 153; securities eligible, Appendix C, 202.
- Jackson, D. C., and D. J. McGrath, 72, 79, 80, 121, 195.
- Jackson, Walter, 195.
- Jitney competition, 16, 123, 127, 160, 181; municipal regulation, 137.
- Key System Transit Co., 124.
- Labor saving devices, 108.
- Land values, affected by street railways, 103, 198.
- Lynn and Boston Co., 31, 100.
- Maintenance and depreciation, 23, 30, 74, 90, 91, 100, 101, 172, 173, Appendix H (tables) 216.
- Massachusetts Board of Railroad Commissioners, 4, 12, 14, 21, 24, 25, 45, 52, 101, 120, 138, 200.
- Massachusetts Consolidated Railways, 36.
- Massachusetts Electric Companies, 34, 36, 43, 44.
- Massachusetts Highway Commission, 16.
- Massachusetts Northeastern Roads, (table and chart) 58.
- Massachusetts Public Service Commission, 15, 21, 23, 30, 34, 39, 43, 101, 102, 106, 122, 125, 128, 138, 148, 155, 157, 177, 194.
- Materials price index, 15, 201.
- Mellen policy, 61, 63.
- Metropolitan Transit District, 179.
- Middlesex and Boston Co., (table and chart) 59.
- Middlesex Rate Case, 102, 119, 152.
- Mileage, 6, (table) 7, 8, 10, 11, 12, 21, (table) 42; decline, 16; State highway, 17; bus miles, 172.
- Monopolistic character, 65, 162.
- Motor competition, 7, 16, 123, 128, 161, 172, 187; vehicles registered, 17.
- Municipal regulation, 133; on construction, 136; operation, 136; jitneys, 137; rate adjustment, 138; service, 139; securities, 28, 141, 144.
- New England Investment and Securities Co., 37, 66.
- New Hampshire Electric Railways, 36.
- New York, New Haven and Hartford Railway, 8, 10, 34, 37, 61.
- Northern Massachusetts Co., (table and chart) 57, 166.
- Obsolescence, 103.
- Old Colony Lines, 44, 48, (table and chart) 55.
- Omnibus, 3, 10.
- One man cars, 108, 172.
- Operating costs, 71, 74, (tables) 81, 82, 89, (chart) 90, (table) 96, 97, 99, 187; maintenance, 89, (chart) 91, (table) 100; power (table) 100; wages (table) 100; index, 15, 200; ratio, 12.
- Overbuilding, xvi, 12.
- Passengers, number, see revenue passengers.
- Pavement maintenance, 110.
- Pleasure parks, 12.
- Population, 9; changes, 198.
- Power costs, (table) 100, 108; generation, 50, 109.

- Promoting, 21; profits, 24, 43; expenses, 145, 154.
- Public ownership and management, 163, 165, 166, 170, 175, 180. See also Trustee control.
- Railway traffic, (table) 9; mileage, 11; ownership of trolley lines, 62. See also New York, New Haven and Hartford Railway.
- Rapid Transit facilities, 84, 163, 172, (table) 173.
- Rate base, 152.
- Reorganisation, 18.
- Repairs and replacements, 101.
- Revenue passengers, (table) 8, 73, 77, (table) 115, 117, 127.
- Revenues, gross passenger, 114; total receipts, (table) 171.
- Richey, Albert S., 200.
- Rides per inhabitant, 9.
- Security issue, xvi; control, 28, 30, 141; affecting liabilities, 144; affecting expansion, 147; affecting operation, 147; eligible for investment by Massachusetts Savings Banks, Appendix C, 202.
- Service, speed, comfort, 5, 97, 98, 124; freight, 10; regulation, 139; cost (table) 171.
- South Shore and Boston Co., 44.
- Springfield Street Railways Co., 28, 31, 62, 96, 100, 105, 128, 153.
- State intervention, 19.
- Stock prices, 68; issue, 142, 143, 146; bankrupt, 143.
- Stone and Webster, 102.
- Storage battery car, 6.
- Street control, 134.
- Street Railway Commission, 16, 111, 134, 194.
- Taxation, 110, 172, 177, (tables) Appendix I, 217; commutation tax, 111, 134; corporate franchise tax, 112; property tax, 112.
- Thompson-Houston Electric Co., 5, 22.
- Traffic density, 4, (table) 13; variation, 114, (tables) 115, 116, 117, 122, 123, 126, 127; relation to costs, 188.
- Transfers, 110, 120.
- Trustee control, 159, 165, 178.
- Union Street Railway of New Bedford, 29, 31, 41, 61, 96, 100, 105, 128.
- Urbanisation, 3, 193, 196, 197.
- Wages, 12, (table) 100, 105, 106, (chart) 107; increase, 163, 172; index 15, 200.
- Warren, Brookfield and Spencer Co., 122.
- West End Railway Co., 31, 100, 118.
- Westinghouse, 23.
- Worcester Consolidated Co., 31, (table and chart) 54, 96, 100.
- Worcester Railways and Investment Co., 37.
- Zone system, 121.