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HISTORY

OF THE

West End Street Railway

IN WHICH IS INCLUDED

SKETCHES OF THE EARLY STREET RAILWAYS OF BOSTON — CONSOLIDATION OF THE VARIOUS LINES—FOREIGN STREET RAILWAYS— THE BERLIN VIADUCT—ANECDOTES, ETC.,

TOGETHER WITH

SPEECHES

BY

President HENRY M. WHITNEY,

AND OTHERS.

ALSO, EXPERT TESTIMONY AS TO THE SAFETY OF ELECTRIC CURRENTS.

ILLUSTRATED.

BOSTON

EDITED AND PUBLISHED BY

LOUIS P. HAGER.

Introductory.

The design and scope of this work will be found as clearly indicated and as amply set forth on the title page as is requisite to the most complete understanding of the plan which it involves and the character of the matter embodied in its pages.

As there stated, it is a collection, original and selected, of the choicest, most striking and interesting historical facts which it is possible to glean on the subject of street railways, in the preparation of which my aim has been to present them divested of all verbiage and in a form calculated to interest not only the student of figures, but the average reader who desires to add to his store of information regarding great internal enterprises.

In the prosecution of my purpose every important work has been carefully consulted, with a view to examining whatever might promise aid to my efforts, and nothing bearing on the work has been left unexplored in its preparation.

Besides these invaluable means, the best private sources within the circle of men of letters have been resorted to, and the suggestions and assistance thus personally extended have added materially to the pleasure of my task as well as to the value of its results.

We are especially indebted to the following gentlemen who have

made it possible to have this work not only interesting to the general reader, but accurate and reliable in the information supplied :

Mr. Henry M. Whitney, President of the West End Street Railway.

Prentiss Cummings, Esq., Attorney.

Hon. John H. Studley, Supt. Sixth Division West End Street Railway.

Louis Pfingst, Master Mechanic West End Street Railway.

F. S. Pearson, Chief Engineer Electrical department West End Street Railway.

H. F. Woods, Purchasing Agent, West End Street Railway.

John H. Studley, Jr., Chief Clerk Purchasing department, West End Street Railway.

Having wrought to the best of my ability in the field from which this history has been garnered, it is sent forth with the consciousness that, whatever defects or deficiencies may be discovered, it has at least been my aim to spare no pains in rendering it as readable, rich in facts, and as perfect of its kind as seems to me possible.

THE EDITOR.

Boston, Mass., January 1892.

HISTORY

OF THE

West End Street Railway.

HISTORICAL FACTS.

THE FIRST STEAM RAILROAD — INCEPTION OF THE WEST END SYSTEM — A GRAND BOULEVARD — DETAILED PLAN, COST, ETC.

IT is not our purpose in this work to go into the lengthy details of the introduction of steam railroads, but as it is somewhat in line with the subject in hand, and as it will serve the purposes of comparison later on, we may be pardoned for making a slight digression, as we hope thereby to relieve the tedium which the mere recital of bare facts and figures would necessarily entail.

To the unthinking or superficial observer of things as they exist to-day, it would sound strange to be told that it is but a little over sixty-five years since a steam railroad was first suggested to Thomas Gray, who was then travelling in the northern part of England, and that to him the world owes all that it at present enjoys in the magnificent equipment of the thousands of lines which traverse the two hemispheres. Yet such is the fact; but the introduction of steam for purposes of transportation was not the work of a month or a year, and the encouragement Mr. Gray met with in attempting it would have discouraged any one less enthusiastic than he proved to be. He stood looking at a small train of coal cars impelled by steam along a tramroad which connected one of the colleries of that district with a wharf at which the coal was shipped. Approaching the engineer of the train, he asked :

" Why are not these tramroads laid down all over England, so as

to supersede our common roads, and steam engines employed to convey goods and passengers along them so as to supersede horse power?"

"Just propose you that," said the engineer, looking at the questioner with the corner of his eye, "to the nation, sir, and see what you will get by it! Why, sir, you would be worried to death for your pains!"

The intelligent traveller did not heed the engineer's warning, however, and it is fortunate for the world that he did not. The idea he had conceived continued to haunt his brain, and would not be driven out. Tramroads, locomotive steam engines, horse power superseded! Mr. Gray would talk of nothing else to his friends, and at length broached the scheme openly; first to the public by means of letters and circulars, and later by the publication of a book. Although to all this trouble, the engineer's words seemed likely to prove true, as hardly any one would listen to him or be bothered with his fancies.

Still he persevered, holding the public by the button, as it were, and dinning into its ears the same wearisome words: Tramroads, locomotive steam engines, horse power superseded! From public political men, including the cabinet ministers of his day, he received but little encouragement. A few influential commercial men, however, began at length to be interested in his plan. Persons of eminence took it up and eulogized and advocated it almost as enthusiastically as its original projector.

It having thus been proved, according to Dogberry's immortal phrase, "that the scheme was a good scheme, it soon went near to be thought so." Capital came to its aid, and in 1826 Parliament passed an act authorizing the construction of the first British railway for general traffic.

Here in the United States steam railroads were soon after introduced, but the history of such enterprises is so well known that it is needless to take up space with events concerning them. The subject is an interesting one for individual investigation, and the student will find that, though progress was, and always has been, more rapid in this country than anywhere else on the face of the globe, it was not made without the most determined opposition from some quarters. Even our canals shared the fate of all other enterprises in this respect, and their projectors were targets for the

shafts of ridicule and even political persecution. Since the time of Galilei, the creator of experimental science, this has always been the case, and probably always will be. No great discovery or enterprise has ever sought public recognition that there didn't come from some corner the stereotyped "I object," although modern society tempers all reference to such obstructionists with the more pleasing term of "conservatism." Call it what you will, there are those to-day who sit in the flickering light of a tallow dip nursing the prejudices which made the Inquisition a possibility, but they recognize the fact that "the world do move," though the acknowledgment comes through clenched teeth and with moody indifference.

Having given the reader an inkling of the opposition which beset the introduction of steam railroads in this and other countries, he will be enabled to read between the lines as he follows the brief history of the street railway system of Boston, from its earliest date to the present time, and note the difficulties which surrounded and hampered its progress, but which eventually surmounted all obstacles and culminated in one of the most complete and comprehensive systems known to the world.

INCEPTION OF THE SYSTEM.

In 1886 Mr. Henry M. Whitney, who had become convinced of the magnificent possibilities of that section of Boston bordering on the town of Brookline, purchased large tracts of land along the line of Beacon street in the latter place, and shortly after formed a syndicate for its development. Having done this, he employed F. L. & J. C. Olmsted, of Boston, to carry out the plans he had long cherished of connecting the two places named by a grand boulevard 200 feet in width.

The plans were admirably carried out under the direction of the Messrs. Olmsted, and the result is one of the most picturesque thoroughfares this country can boast of. The length of the boulevard is something over seven miles. Through its centre run the two tracks of the electric railway, on either side of which shade trees have been set, and though planted but a short time are already beginning to reveal the beauties of the picture which will be presented in its fullness a few years hence. It is something altogether unique to step into one of these cars and ride out to Chestnut Hill

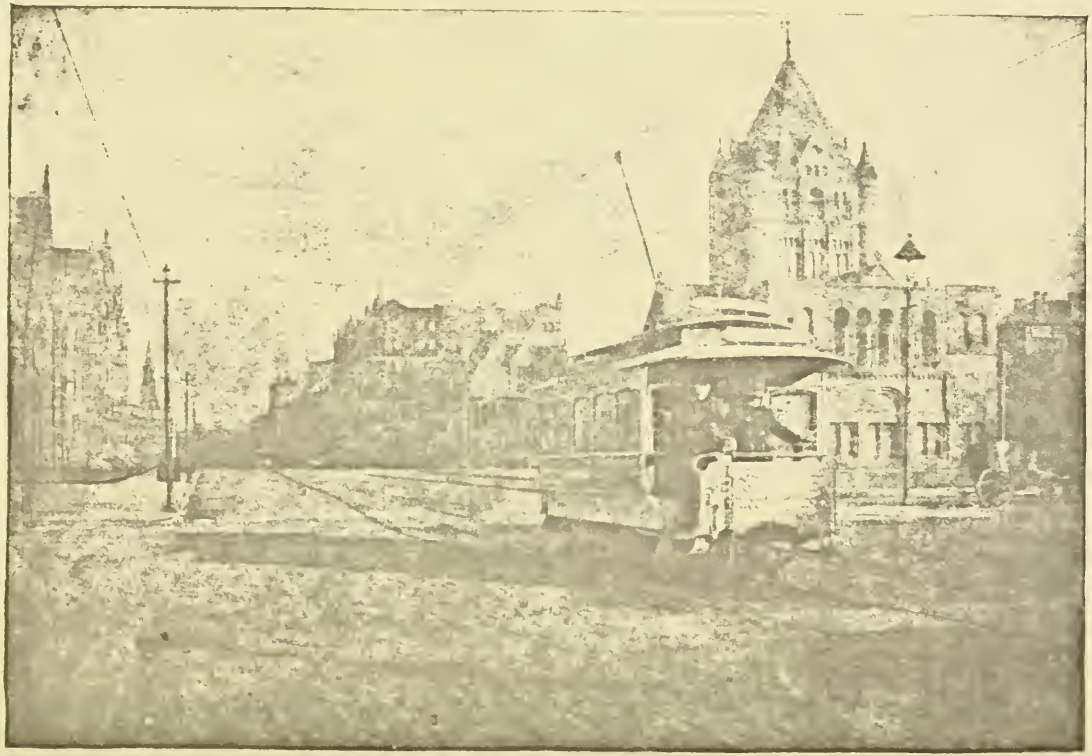
reservoir; or, what is better still, if one would properly appreciate the grand work in progress in the Back Bay district, start from the Public Garden and pass through Commonwealth avenue to the boulevard. This will give a better idea of the beauties which are gradually unfolding under the direction of the city of Boston, and the link supplied by the West End Street Railway connecting it with the beautiful and wealthy town of Brookline. Residences of almost every conceivable style of architecture and of rare beauty of design form the background of terraced lawns shaded by noble trees, the broad macadamized driveways bordering the tracks of the railway being thronged every pleasant day with the equipages of the wealthy and those less fortunate in worldly possessions, but all sharing alike in the pleasure it affords.

DETAILED PLAN OF BOULEVARD, COST, ETC.

The detailed plan of the grand boulevard is as follows: Average width, 160 feet; sidewalks on both sides, 10 feet wide; planting space for trees, 5 feet; driveway, 30 feet; trees, 5 feet; railways, 20 feet; trees, 5 feet; bridleway, 20 feet; driveway, 50; trees, 5 feet. Length of boulevard, seven miles; total cost, about $227,000. About 1,300,000 square feet of land was required to widen the boulevard to its present width. Of this amount the West End Land Company gave 630,000 feet, or about one half the quantity needed for the improvement, and Mr. Henry M. Whitney pledged $100,000 individually for the project. The increase in taxable property has been so great along the line of this fine thoroughfare as to prove a source of revenue little expected by its most sanguine friends.

The syndicate formed for the purpose of developing this section was known as the West End Land Company, and shortly after its organization it became evident that the means of transportation, which then consisted of a line of coaches and the Boston & Albany Railroad, were entirely inadequate to convey the thousands who would naturally be attracted in that direction, and a street railway corporation was formed for the purpose of constructing a line from Boston to Brookline, the articles of association locating the road as follows:

Commencing at the intersection of Marlborough street and West Chester park, in Boston, through West Chester park to Beacon



VIEW OF COPLEY SQUARE, SHOWING BROOKLINE AND BRIGHTON ELECTRIC CAR OF THE WEST END, EQUIPPED WITH THOMSON-HOUSTON SYSTEM.

street, thence through the latter street in Boston and Brookline to its intersection with Chestnut Hill avenue, its terminus. Also, to commence at the intersection of Beacon street and Washington street in Brookline, and to extend through the latter street to Harvard square, Brookline; and to extend from the intersection of Beacon and Washington streets through the last named street to its intersection with Cambridge street, Ward 25, Boston. Also, to commence at the intersection of Beacon and Harvard streets, through the latter to Harvard square; and to extend from the intersection of Beacon and Harvard streets, Brookline, through Harvard street to Allston station on the Boston & Albany Railroad, the length of the road being about eight miles.

The completion of this road, or system of roads, gave Boston a means of transportation to Brookline and the suburbs of the city in and around Chestnut Hill reservoir, and furnished Brookline with better accommodations than that town had previously enjoyed for communicating with the city. It had been in operation but a few years, however, when the subject of street blockades in Boston began to assume a serious aspect, and this at once engaged the attention of the master minds who were then working to develop the suburbs and led to the consolidation which followed in 1887.

It would be useless to attempt to enumerate the various phases which opposition to these two gigantic enterprises assumed. They are well outlined in the several speeches of Mr. Whitney before the Legislature and the Central Club of Somerville, while the benefits which have accrued under them are pointedly told by Prentiss Cumings, Esq., in his address before the legislative committees on Cities and Taxation, and to which we would refer the reader. The statistics these addresses contain are taken from the most reliable sources, and are such as to strengthen the confidence of the public in the good intentions of the West End Street Railway Company toward the public, while exercising ordinary prudence in protecting the interests of its stockholders.

STREET RAILWAYS.

THE FIRST "HORSE" RAILROAD — TRIBULATIONS OF THE PIONEERS OF STREET RAILWAYS — NOVEL METHOD OF WRECKING A CORPORATION — THE LORD'S DAY AND THE DEACON — CHARTERS AND LOCATIONS OF THE VARIOUS ROADS.

THE first "horse" railroad, and what no doubt gave the cue to the pioneers of street railway transportation in the vicinity of Boston, was a line from Harvard College in Cambridge to the Fitchburg Railroad at Union Square, Somerville. It was a unique affair, its equipment consisting of a steam passenger coach which had seen better days, and which had been relegated to this service long after it had passed the period of its usefulness behind the iron horse. The length of the road was about a mile and a half, to give what the Yankee calls a rough guess, and its trips were scheduled to connect with the passenger trains on the Fitchburg. It was not a chartered institution, but the enterprise of one man, and history fails to inform us whether he owned the rolling stock and the one pair of horses used as motive power in conveying passengers to and fro. Be that as it may, it was a "monopoly," although not particularly "gigantic" in its proportions, and unquestionably served its day and generation well. The first street railway corporation to receive a charter from the Massachusetts Legislature was

THE DORCHESTER AND ROXBURY.

This was in 1852, and the corporators named were William D. Swan, Charles C. Holbrook and William Hendry. By a special act passed May 30, 1857, they were empowered "to construct, maintain and use a railway or railways, with convenient single or double tracks, from a point on Meeting House Hill, in the town of Dor-

chester, upon and over Hancock and Stoughton streets, so called, in said town of Dorchester, to the line separating said town from the city of Roxbury; and also from a point near the Town House in said Dorchester, upon and over Washington street, so called in said town, to the line separating said town from the city of Roxbury, and at said line to connect with the Metropolitan Railroad Company," etc. The duration of this corporation was extended by the Legislature, but on October 1, 1864, its property and franchise passed into the hands of the Metropolitan Railroad Company.

METROPOLITAN RAILROAD.

J. P. Ober, Moses Field Fowler and Henry N. Hooper and their associates were the corporators of the Metropolitan Railroad, and a charter was granted them May 21, 1853. The first location granted the company was from the old Boylston Market, corner of Washington and Boylston streets, Boston, to Eliot square, Roxbury. Twenty other locations were subsequently granted by the cities of Boston and Roxbury, so that at the time of consolidation in 1887, the Metropolitan had become the most important of the roads doing business in Boston.

CAMBRIDGE RAILROAD.

The corporators of this road were Gardiner G. Hubbard, Charles C. Little and Isaac Livermore, the company being incorporated the same year as the Metropolitan (1853). The first location in Boston was granted December 4, 1854, and was from the intersection of the West Boston bridge with Cambridge street, with a double track extending to Chambers street, thence with a single track through Cambridge street to Green street, and the latter street to Bowdoin square. Five subsequent locations were granted, so that in 1887 the company's route extended to Boylston street; also through Chardon, Leverett and Lowell streets, returning to Cambridge via Brighton street, over Craigie's bridge. For the privilege of using Craigie's bridge the company paid into the treasury of Boston $30 per year on each car run over that structure. At the time of the incorporation of the Cambridge Railroad, what is now known as the West Boston bridge, at the foot of Cambridge street, was owned by a company called the Hancock Free Bridge Corporation, and all cars were subjected to the payment of toll when passing between the two cities.

UNION RAILWAY.

Two years later (1855) the Union Railway Company was incorporated, with John C. Stiles, Moses M. Rice and T. Russell Jencks as corporators. This company leased the tracks of the Cambridge Railroad Company and had its route over the first location granted the latter through Leverett street, returning to Cambridge via Craigie's bridge.

MIDDLESEX RAILROAD.

The charter of the Middlesex Railroad was granted April 29, 1854, Asa Fisk, Richard Downing and David Kimball and their associates being the corporators. The fight to obtain a location in the city of Boston was a long and bitter one, but on March 6, 1857, the first car was run from Charlestown Neck to the corner of Charlestown and Stillman streets in the city proper. The road was necessarily a crude affair, the rails being of cast iron, and only eight feet in length. After the road's extension to Dock square through Cornhill, which was finally effected after paying the city of Boston $10,000 for the cost of changes on Sudbury street and the widening of Union, "bob-tail" cars made the circuit from Bunker Hill to Dock Square, where, instead of changing the horses to the other end of the car for the return trip, the car was swung around, the body of it being hung upon a centre pivot, which permitted the car to turn in either direction. The sensation of being thus whirled around was peculiarly edifying to passengers, many of whom, especially ladies, no doubt made the trip for the sole purpose of experiencing it. Volumes of interesting incidents and anecdotes might be written concerning the Middlesex Street Railroad's early history, its struggles for extension and the level-headedness displayed by its managers in overcoming the obstacles which beset it upon every hand; but a single one must suffice here, as showing the prejudice which existed against the running of its cars on the Lord's day. A good deacon had visited Boston one Sunday, presumably making the journey from his Charlestown home on foot. As he was about to return, he caught sight of a Middlesex car, and the day being very inclement, he pocketed his moral scruples and entered it. Comfortably seated in the car, and its only other occupant, was a prominent

citizen of Charlestown, to whom the pious deacon, with well-feigned indignation, said: "What's this car doing over here on the Lord's day?" Being informed by the citizen that it was the intention of the company to run its cars regularly on Sundays as on other days, but little more was said until the car had proceeded some distance, when the deacon, who had no doubt been mentally debating the moral aspect of such a course, suddenly exclaimed: "Well, I must confess, it's mighty comfortable!"

Public sentiment, which was at first most bitter against the introduction of this road to supersede the old line of omnibuses, gradually succumbed to the inevitable, and on April 30, 1858, the company was permitted to cross Charlestown bridge without the payment of toll thereafter, and a year later that restriction was removed from the Malden bridge.

The subsequent history of the Middlesex Street Railway up to the time of its consolidation with the Highland road was one of unexampled prosperity. Its lines were extended, its equipment greatly improved, and its managers had the satisfaction of seeing its stock advance from $30 per share to $158.

BROADWAY RAILROAD.

The charter of this road was granted on the same date as that of the Middlesex company, April 29, 1854, with Charles J. F. Allen, Seth Adams and John P. Monks named as corporators. The location of its route was from South Boston Point (now City Point) to a point near the intersection of Broadway and Turnpike street (now Dorchester street), for the purpose of forming a junction with the Dorchester Avenue Railroad. The business was continued from the time it commenced operations, which was four years after the granting of the charter, until May 25, 1868, when an act was passed by the Legislature changing its name to that of the

SOUTH BOSTON RAILROAD.

The locations subsequently granted by the city are substantially the same as those in use by the South Boston cars at the present time(1891).

BOSTON AND CHELSEA RAILROAD.

Charter also granted April 29, 1854, the corporators named in the act being Isaac Stebbins, John Low, Bradbury C. Bartlett, John Rice and Thomas Russell. The route of this road has not been changed since the act of incorporation.

DORCHESTER RAILWAY.

The Dorchester Railway Company succeeded the Dorchester Avenue Railway Company in January, 1858, by decree of the supreme judicial court, the company failing to meet the provisions of its charter, which was granted in 1854. Its corporators were Cheever Newhall, Edward King and John J. May, the first location granted being "from a point near the Lower Mills, so called, in the town of Dorchester, upon and over the way or street heretofore known by the name of the Dorchester turnpike, or Turnpike street, to the line of the city of Boston, and thence upon and over such streets in South Boston as the Board of Aldermen of the city of Boston may determine, upon and over the North Free bridge (Federal street bridge), and upon and over Sea and Broad streets in the direction of State street." All subsequent locations were granted the Dorchester Railway as successors of the Dorchester Avenue Railway Company. It is related of the latter organization that it was equipped at one period of its brief existence with double-deck cars, and that after passing through a series of discouraging annoyances by its competitors, met its death by an accident to four of its passengers, who purposely tumbled from the top of the car on which they were riding and then sued the company for damages. Judgment was rendered against the corporation, and this with other unfortunate circumstances caused its collapse. As stated elsewhere, the property and franchise of the Dorchester Railway Company passed into the hands of the Metropolitan Railroad Company, October 1, 1863.

DORCHESTER EXTENSION RAILWAY.

Henry L. Pierce, Asaph Churchill and Edward H. R. Ruggles were the corporators of this company, which received its charter February 18, 1859. Its line was located from a point near the

Lower Mills in Dorchester, and connected with the (then) terminus of the Dorchester Railway at Centre street in that town. This road was purchased by the Metropolitan Railroad Company in October, 1863, and the several locations thereafter were granted the latter corporation.

SUFFOLK RAILROAD.

This road was chartered April 30, 1857. Its corporators were George H. Plummer, Ebenezer Atkins, Edward F. Porter, David L. Webster, Asa Fisk and John G. Webster and their associates. The property and franchise of this corporation were purchased by the Metropolitan Railroad Company July 27, 1864, and locations thereafter were granted to the latter.

WINNISIMMET HORSE RAILROAD.

The Winnisimmet Horse Railroad Company received its charter May 26, 1857, and its route was from that portion of Chelsea called Prattville, over the Winnisimmet Ferry and the tracks of the Middlesex Railroad to "Scollay's Building, so called, in Court street, Boston."

LYNN AND BOSTON HORSE RAILROAD.

Incorporated April 6, 1859. Its charter called for a location from the town of North Chelsea through Saugus to the city of Lynn; to enter upon and use the tracks of the Boston and Chelsea, Chelsea Beach, and Middlesex companies, all tracks in Chelsea and East Boston, the ferry-ways and boats of the Winnisimmet Ferry Company and "the tracks of any horse railway company in the city of Boston; for the purpose of transporting its own passengers to and from Scollay's Building, so called, in Court street, Boston."

WINTHROP RAILROAD.

This road was chartered March 22, 1861. In 1865 a location was granted it in East Boston, but the location not having been constructed by the company it became void. Its franchise and property were sold to the town of Winthrop a year or two later and shortly thereafter the road was abandoned.

CHELSEA AND EAST BOSTON RAILWAY.

Incorporated May 5, 1863. Its charter, rights and franchise were assigned to the Metropolitan Railroad Company December 5, 1865.

BROOKLINE AND BACK BAY RAILWAY.

September 15, 1868, the Brookline and Back Bay Street Railway Company conveyed all its franchises and rights to the Metropolitan Railroad Company.

THE HIGHLAND STREET RAILWAY.

This road was chartered April 12, 1872, and began active operations the 22d of the following October. Its termini were Grove Hall in the Roxbury district and Temple place in the city proper. It was the best equipped of the several street car lines, its cars being handsome specimens of architecture, and their bodies were ornamented with the conventional plaid of the Scotch Highlanders, in the centre of which on either side was a panel representing some historical scene or a portrait of some one of the Massachusetts governors for which the cars were named. It was the first to uniform its employees, adopting for this purpose a gray cloth similar to that of the letter carriers' uniforms. It was a well-managed corporation, exacting the strictest courtesy from its employees toward the patrons of the road, in return for which it paid liberal salaries and otherwise encouraged those who held subordinate positions. Its stockholders were mostly wealthy residents of the Back Bay district, among whom were many ladies. August 21, 1886, the Highland Street Railway consolidated with the Middlesex, the two roads being known as the "Consolidated."

CHARLES RIVER RAILROAD.

This road received its charter in 1881, but after two or three years of struggling for existence, on October 30, 1886, it consolidated with the Cambridge Railroad and sank its identity as a corporation. It was never a paying institution, and to-day is reckoned among the lines of the West End system which do not meet running expenses.

CONSOLIDATION.

ALL THE BOSTON STREET RAILWAYS UNDER ONE MANAGEMENT — IMPROVED SERVICE SECURED — SYSTEM OF DESIGNATING ROUTES BY COLOR — PREDICTION OF CALVIN A. RICHARDS, ESQ. — AN EARNEST DESIRE TO SERVE THE PUBLIC — PRESS COMMENTS, ETC., ETC.

AS might be supposed, with all these lines of street railway converging in Boston and traversing its narrow and crowded thoroughfares, instead of accommodating its great and growing population, there was a continual clashing of interests which promised to culminate in inextricable chaos. Loud and just denunciations were heard upon every hand of the transportation facilities which these various systems afforded, and the means for remedying existing conditions soon became a subject for the gravest consideration.

Strikes of long duration upon several of the suburban lines threatened the prosperity of the outlying districts, and added largely to the inconvenience experienced in the city proper. What was to be done? Mature deliberation by those who had the best interests of all concerned at heart could devise but one plan which seemed at all practicable, and that was consolidation. In the face of a public sentiment which had been educated to abhor monopolies and trusts, this was effected, and the great West End system of to-day had its inception. Despite the most strenuous opposition, and the predictions and prophecies made of the evils which were sure to result from this centralization of power, under the wise and conservative management which has characterized the new order of things, a system of transportation has been developed which no other city in the universe can match, and which promises results that can hardly be computed in dollars and cents.

This was the work of a few farsighted men, who grasped the situation at a glance, and solved the problem of transportation with

a skill which has never been equalled in a case where such great interests were involved, and where public opinion, and in many instances the press, were antagonistic to its purposes.

After the passage of what was known as the "West End Bill" by the Legislature, in 1887, Mr. Calvin A. Richards, then at the head of the Metropolitan Street Railway Company, showed his appreciation of the consolidation scheme by being the first to exchange his shares of Metropolitan for the preferred stock of the West End Company, on the basis proposed by the latter to the various street railways, which was as follows : One and one fourth shares of West End preferred for each share of Metropolitan, equivalent to increasing Metropolitan shares from 40,000 to 50,000 ; 119.39 shares of West End preferred for each share of Cambridge, equivalent to an increase of from 19,500 (par 100) to 29,000 (par 50) ; South Boston, 15,000 to 18,750 ; Consolidated (Middlesex and Highland) from 17,000 (par 100) to 30,250 (par 50).

A few days after this action by Mr. Richards, a gentleman who was acting as trustee for a stockholder of the Metropolitan, wrote him for advice in regard to the matter. As Mr. Richards' reply covers the subject of consolidation so succinctly and completely, and subsequent events have so thoroughly confirmed his views in the matter, we cannot do better than make a few extracts from it. After quoting the resolution of the Board of Directors of the Metropolitan Street Railway Company, advising the acceptance of the terms of exchange of its stock for the cumulative preferred eight per cent. stock of the West End, Mr. Richards says :

"Permit me to say that in an experience of many years I have never known our Board to give more careful, deliberate and thoughtful consideration to a matter than we did to this, for although we were fully aware that the control of affairs was soon to pass from our hands, we felt that so far as we were able to do so, the larger number of shares still in the hands of the minority should be protected by us, even though we were only requested to recommend their exchange for the stock of another corporation. As the subject presented itself to us in the light of existing facts, the exchange seemed to be the very best thing possible for us to do, and for the following reasons :

"Our books show plainly that over 20,000 of the 40,000 shares of this company had been bought and paid for, and were now owned

and held by the gentlemen comprising the West End Railroad Company. They had bought these shares at a high price for the purpose of gaining control of voting power in our corporation. To any one at all familiar with the laws governing corporations of this kind the fact is made plain at once * * * * that they can do almost anything they please, and do it legally, with the franchise and property of the company.

"Almost to our surprise they made us the proposition above referred to, which does not act in any coercive way whatever. They do not now attempt to make use of the controlling power which has cost them so much. They simply invite the minority stockholder to deposit his shares for exchange and receive therefor the preferred shares of the West End Railroad Company, upon which they guarantee forever a dividend of eight per cent., and to bring that dividend up to the standard of ten per cent., which we have only paid for eighteen months. They give as a premium an increased number of shares amounting to twenty-five per cent., so that in money value we get an assured cumulative dividend of ten per cent.; i. e., cumulative means that if for any reason a dividend is ever passed for any length of time, it remains as a lawful claim, and must be paid. The situation, then, is precisely this: We get a guaranteed, unfailing interest of ten per cent. on the par value ($50) of the preferred stock, which we are invited to take in exchange for our shares in the Metropolitan Company. No coercion by control, but the free-will offering of those who hold the positive, unassailable power to do almost anything else with us they please.

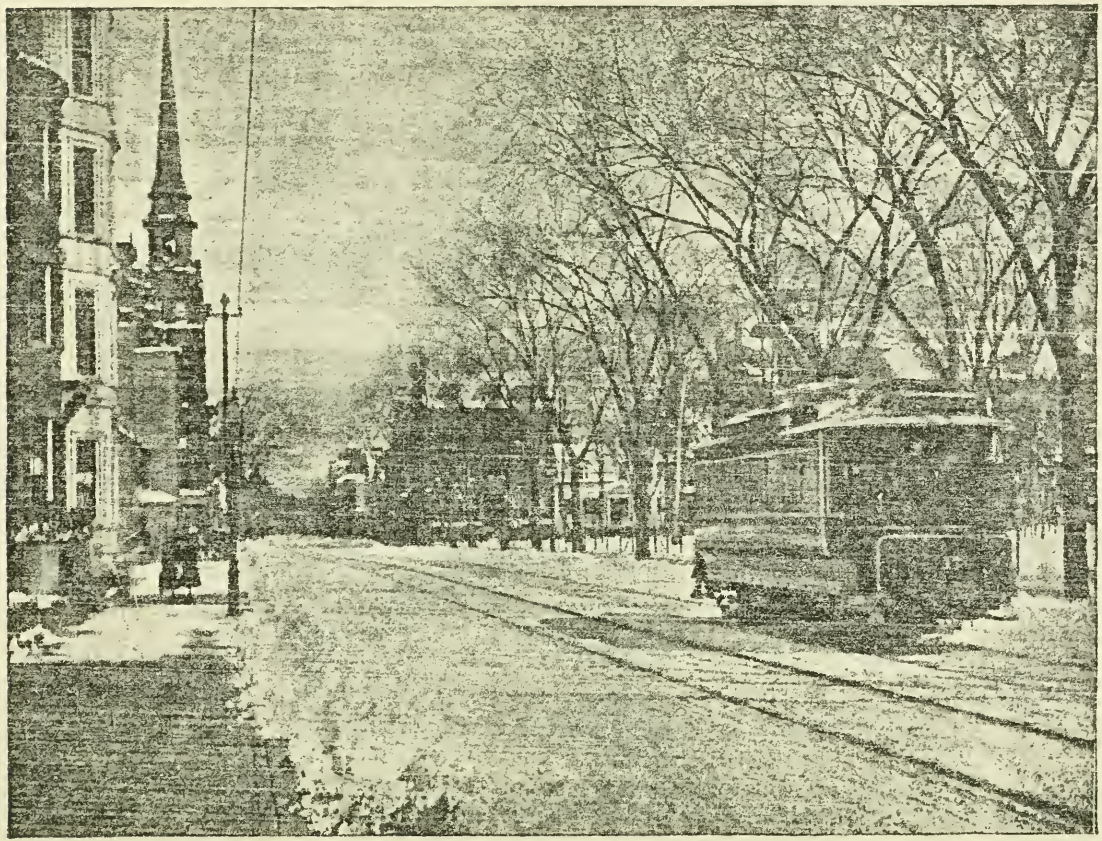
"We have been asked by many the very natural questions * * * What is the capital of the West End Road, and what guarantee can they give that these dividends will be paid?

"As I understand it, the capital at present (1887) is simply nominal—some $80,000—a nucleus around which will go the entire capital of all the roads they propose to call into it. The stockholders of that company deposit all the shares they own in the Metropolitan, South Boston and Cambridge roads for exchange, precisely as they ask us to do with ours. They inform me that they intend to proceed at once to build, under the rights that Brookline and Boston have given them, an amount of track, and equip it, which will cause an expenditure of half a million of dollars. With this addition, they will then have a capital of over seven millions of dollars.

"Now, as to the earning capacity of this property, so that they can pay these promised dividends. Their plan is to bring into one grand corporation the Metropolitan, Consolidated, Cambridge and South Boston roads, place them all under one management, and run them as one road. The most casual observer, or the most careful and experienced examiner, must see or find all possible doubt removed, even under almost any management, that the question of earning the promised dividend is so far settled that they can safely guarantee it. Now, let us look at this magnificent property. It begins, we will say, at the water edge of Charlestown, extending inland to Everett, Malden and Somerville, passing on through all of Cambridge, Brighton, Watertown, into Newton, Brookline, West Roxbury, all of the Highlands, Dorchester and South Boston, the entire Boston proper, through East Boston, Chelsea, and round back to the water one grand circle, embracing some fifteen or twenty towns and cities, its lines offering first-class accommodation to our entire suburban population, and, within Boston, commanding every depot, ferry and place of amusement of every kind. But it is not this alone, in my judgment, that makes the great and permanent value; it is the all-important fact that they will own the franchises of these roads and hold them under their charter.

"The business awaiting them now, immense as it is, is nothing compared with the future. It has now become an undisputed fact that the street railway is the greatest factor in promoting the growth of the residential population wherever its lines extend. The increase in the number of passengers carried by the Metropolitan alone in the last ten years has been from 22,000,000 in 1876 to over 40,000,000 in 1886, and during that year the roads now to be consolidated carried over 86,000,000 of passengers. The increase for the last three years on the Metropolitan has been very nearly 3,000,000 each year, and so far this year (1887) has exceeded those proportions. Conceive for one moment the vast number with this increase alone that this new company will have to accommodate."

Although Mr. Richards might naturally be supposed as unwilling to yield his important official position as President of the Metropolitan road, there is nothing in his written or oral opinions on the subject which do not express unqualified acquiescence in consolidation as the only means of solving the problem of better service, and keen perception of the benefits which must accrue from placing the



VIEW OF BLACKSTONE SQUARE, SHOWING ELECTRIC CAR OF THE WEST END EQUIPPED WITH THE THOMSON-HOUSTON SYSTEM.

competing lines of railway under one sole management. His vision of the future under such a condition was not only prophetic, but manifested in an eminent degree the soundness of his judgment and an unselfish purpose to adopt any measure looking to the welfare of the city and the growth of its magnificent suburbs.

Regarding the character of the men who projected and carried to a successful issue this great scheme, there seems to have been no misgiving on the part of Mr. Richards, as near the close of his letter of advice to the trustees, he says :

"Into whose hands will all this pass? What kind of men are they? It will pass into the hands, not of a set of speculators, whose headquarters are in a different city, and who have long tried to obtain this control, but into the possession of Boston men ; will be owned by Boston capital and managed by Boston experience. At the head of it will be a gentleman who has done more to build up our city, both in its real estate and its commercial interests, than any other man of his age ; a man who believes, evidently, in the importance of Boston's citizens to own, run and build the street railways of their own city, rather than to send their money to St. Paul, Minneapolis and Kansas City to do the same thing there."

Five years have elapsed since the above was written, and the question, Has all that Mr. Richards predicted in regard to consolidation been realized? can be answered most emphatically in the affirmative.

The reforms inaugurated under the new management have not only forever set at rest the tongues of its calumniators, but has won the confidence, esteem and cordial good-will and co-operation of those whose opposition sprung from honest convictions. The public at large have been convinced that mercenary motives were not at the bottom of the great project, and only such profits were sought in its prosecution as were legitimate and honorable ; which, indeed, would fail to satisfy the ordinary demands of a more grasping corporation than the West End Company has proved itself to be.

No corporation ever met with such bitter opposition at every point, but the man at the helm was steadfast and immovable, and while treating the opinions of the humblest with the utmost deference and respect, he never lost sight of those interests which he had at heart, and which have proved so valuable to the city and its outlying districts. This may seem like fulsome praise of an official, but before

making such a charge it will be well to investigate and see whether it has been unworthily bestowed.

In order to make the routes of the various cars understood, a system of painting was adopted, which was calculated to aid those who patronized the various lines, so that, even at a distance, they might be easily and readily recognized and all mistakes avoided. This system will undoubtedly be maintained after all the lines are operating by electricity. The colors adopted are as follows:

The cars on the Mount Pleasant line and all those running to Meeting House Hill, or Dorchester avenue and to Field's Corner, are ultramarine blue, ornamented with gilt.

Cars of the Warren street lines, Egleston square, to Norfolk House, to East Boston ferry on Washington street, Hampden street, Roxbury and Charlestown, rapid transit Warren street via Harrison avenue to Post Office square, and Atlantic avenue on Washington street, are green, with gilt letters.

Huntington avenue line, Dartmouth street, West Chester park to Boston & Maine, Fitchburg, Eastern and Lowell railroad stations, and Back Bay cars are a peacock blue.

Cars to and from Jamaica Plain, East Boston and Chelsea ferry on Tremont street, Lenox street, Columbus avenue and Atlantic avenue on Tremont street, are yellow.

On all the Charlestown lines the cars are painted a buff, with gilt letters.

All cars from and to Cambridge are carmine.

All K street, City Point, Bay View and other South Boston cars are vermilion.

Signs are displayed on all cars showing their direction, so that passengers can readily determine whether they are going to or coming from the point they desire to reach.

The reforms inaugurated need not be enumerated in detail here, as they are well known to those who were patrons of the old lines; but to show that there has ever been manifested a sincere and earnest desire to accommodate the public to the fullest extent, it is only necessary to critically scrutinize the course of the West End Company in the matter of the most trivial complaints from its patrons. Although many of them bordered on the ridiculous, they never failed of consideration, and often, no doubt, at the expense of time which might have been more profitably employed by the road's officials.

But Mr. Henry M. Whitney, the gentleman who conceived the magnificent possibilities of consolidation, has always seemed to have in mind Addison's immortal words:

> "'Tis not in mortals to *command* success;
> But we'll do more, Sempronius, we'll *deserve* it."

At a meeting of the new corporation held a short time after the agreement to consolidate had been signed by the various roads, Mr. Whitney outlined the policy of the West End Company in a brief address, and as every act since that time (September, 1887) has furnished the strongest proof of his own sincerity and that of his coadjutors, we will quote a portion of it. He said:

"This consolidation has been brought about, as the directors of these several corporations are aware, in response, first, to public sentiment, and, secondly, in response to a judicious consideration of their own welfare. The time had come when, for the good of these corporations themselves, it was absolutely essential they should come together. Public sentiment was reaching that point upon the question of the blockades upon these roads, when, unless the roads had voluntarily taken the subject up and brought about a different condition of things, the state or the city would have interfered and compelled them to do something. The condition of the street railway problem to-day is very different from what it was when these several companies were organized. Boston was then a city of 75,000 or 80,000 inhabitants; to-day it is a city of upward of 450,000 inhabitants. Had the authorities of that early day, had the citizens of Boston when these roads were started, had the least conception of the future problem of street transportation, they would have met it in a manner which would have relieved the citizens and have relieved the streets of the present day of these blockades from which the community is now suffering. The trouble is, the streets are too narrow; that is the whole difficulty. So recently as the Boston fire, in 1872, and 1873, it would have been possible, treating this question in a broad way, to have laid out streets through a part of this territory which would have accommodated the travel, but that opportunity, to a large extent, has been lost.

"The mission of this transportation company in the future is to see to it, so far as possible, that public sentiment be educated to the point

of providing avenues hereafter which shall be sufficiently wide to accommodate the travel without embarrassing the community; and I hope that every stockholder, when the question of extension of avenues arises, will see to it, both for the interests of the road and of the people, that more consideration is paid to the question of how the people are to get to and from their homes and their business.

"I believe that this company is destined to play a very important part in the lives of this whole community. I am myself deeply sensible of the responsibility which this organization holds in this community. I hope and believe that we shall so be able to administer our affairs that, not only shall the stockholders be proud of the organization and have a security second to none, but that every employee shall be proud to belong to the organization, and that the entire community will point to it with pride. We believe that we can do something for the comfort and happiness of this people that we could not do as individual corporations, and I am deeply sensible of the responsibility which rests upon us to do it. I hope that this company will meet the future questions connected with the transportation problem in the broadest way.

"I am perfectly well aware, and the whole thinking community must be aware, that it is impossible to avoid these blockades without inconveniencing somebody. The cry of the community is, 'Take some of the cars off the streets.' Well, that is the problem. We shall endeavor to do that in a manner which shall interfere with every section as little as possible; but some of the people from all sections will undoubtedly be compelled to walk short distances, or at least some of them. If a man wants to go from Tremont street line to Washington street, it is probable that in some instances he will be obliged to walk. But the foundation upon which society rests is that for the good of the whole every one must yield a little. I can simply say for myself and my associates that we have an honest desire to do the best we can for the stockholders and for the community; and I believe that with the support of the stockholders, and an enlightened public sentiment which will permit us to do what is necessary, we can work out this great problem.

"New means of transportation will be introduced as soon as it can be settled what is best. Gentlemen are all well aware that the use of the cable system, which might at first seem best, * * * *

is complicated by the question of the narrow streets, and therefore, in that respect, the question of transportation here is a more difficult one to settle than it is in other cities. I believe that some way will be found which will be acceptable to all reasonable men, and those are all we can hope to satisfy."

Commenting upon the above address, the *Boston Transcript* editorially said :

There will be grumblers and complaints in newspapers, and intimations that there is more loss than gain in the movement (consolidation). The President foresees this and has discounted it. The principal fact is, that to abolish the blockade will prove such a public benefaction that it will outweigh all other considerations. Nothing more plainly shows the statesmanship of this strong address than its double announcement that the corporation proposes to deal with its working force with liberality and justice and to make the interests of the community the paramount consideration. This franchise is by far the most important ever granted by the state and city, and it is fortunate that it is in good hands.

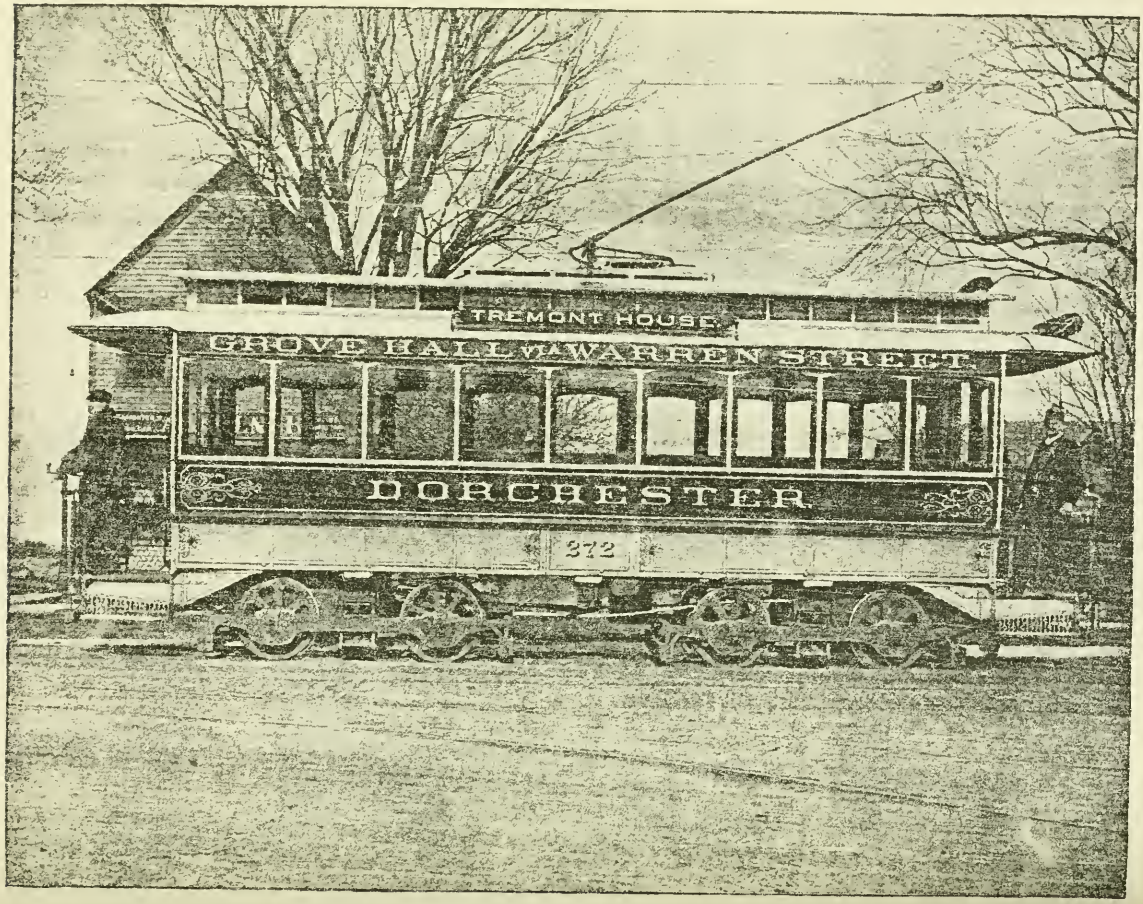
The *Boston Journal* was also favorably impressed with the solution of transportation, as outlined in Mr. Whitney's speech, and said :

Mr. Henry M. Whitney made some very interesting remarks at the West End meeting of stockholders, which exhibited the broad and comprehensive principles upon which he proposes that the new corporation shall be conducted. Mr. Whitney, in the right spirit, takes the public into his confidence, and assures the community that the problem of horse railroad transportation in our most crowded business avenues will receive immediate and earnest attention.

With one or two exceptions the press of Boston was favorable to consolidation, those opposing it doing so from not altogether disinterested motives, or else because they lacked the perceptive faculties necessary to comprehend that in no other way could a system be established which should meet the demands of the increasing population and open up the suburbs to a large number who were every year being crowded into undesirable tenements by the demands of business for more room. Nor was Boston the only place concerned. So great had become the importance of the scheme that it was the topic in all great financial centres, the New York

press especially making it the subject of lengthy editorials, one of which, the *Financial Examiner* of November 19, 1889, took occasion to say:

Probably the history of no other modern financial undertaking presents a record of such rapid development and of such an uninterrupted succession of triumphs over all opposing elements as that of the now celebrated West End enterprise of Boston. It was brilliant and longsighted in its very inception, and at once became the talk of the street and an important element in the local market, but it soon assumed a magnitude and scope that far exceeded the original plans of its projectors and made it the marvel of the day. And a notable circumstance of the scheme was that it was about the first instance in recent years of the employment of Boston capital on an extensive scale at home in the same ample and extensive manner in which it has been made to build up vast interests abroad, as in the creation of great railway systems ramified all over the Western country and down in the heart of Mexico.



VIEW OF WEST END EIGHT-WHEEL ELECTRIC CAR, EQUIPPED WITH THOMSON-HOUSTON MOTORS.

IN THE LEGISLATURE.

IMPOSING ADDITIONAL BURDENS ON STREET RAILWAYS—ADDRESSES BY HENRY M. WHITNEY, PRESIDENT OF THE WEST END RAILWAY, AND PRENTISS CUMMINGS, ESQ., ATTORNEY, MARCH, 1891.

NOTWITHSTANDING the improved condition of street railway traffic in the city, and the almost fabulous appreciation of real estate in the outlying districts reached by the lines of the West End Railway, the intervention of the Legislature was sought for the purpose of imposing burdens which would have the effect not only to greatly retard the magnificent improvements already under way, but to leave the corporation without any guarantee for its financial safety in the future, should they be completed.

The Citizens' Association of Boston, abetted, no doubt, by the old opposition from State street, were the instigators of the legislative movement, the former appearing through counsel before the Committees on Cities and Taxation, at the hearings on the bill then before the General Court, allowing the cities and towns of the Commonwealth to impose taxes for the use of streets by private corporations.

While this bill was ostensibly a general statute, its provisions would not have had any serious effect outside of Boston. The West End Railway Company had just reached a point in its business where such a bill, had it become law, would have been peculiarly disastrous to its interests as well as the interests of the public it served so well, and it was indeed fortunate for all concerned that it had such able advocates as its President and Prentiss Cummings, Esq., to place the matter in its true light before the Committees of the Legislature.

As Mr. Whitney's presentation of facts covers nearly the whole subject of street railway service, both in this country and Europe, the statistics given and the comparisons made cannot fail to interest the general reader and impress him with the superiority of Boston's system over that of any other in the known world. This is a sweeping statement to make, but it cannot be controverted. Our street railways challenge the admiration of all, both in equipment and the manner in which they serve the public, and it should be the dispassionate judgment of all who wish to maintain the material prosperity now so substantially and rapidly developing, that every reasonable safeguard be thrown around those who are risking their capital and devoting their best energies to the great work.

Besides the subject of street railways, there will be found much valuable matter in Mr. Whitney's address bearing upon the social problem, a feature which has never engaged the attention of those who are supposed to have the moral aspect of all great enterprises nearest their hearts. They evidently did not care to analyze the missionary work of a great corporation, because they supposed that any good from such a source was simply impossible. "Grasping monopoly" was the rallying cry of the opposition, and when they were met before the committees of the Legislature with solid facts and figures, they found that, not only had they no charges to make, but nothing upon which to base them.

When Dr. Johnson was asked his reason for the dislike he entertained for Dr. Pell, he gave the following answer:

> "I do not like thee, Dr. Pell,
> The reason why, I cannot tell;
> But this I know, and know full well —
> I do not like thee, Dr. Pell."

And this was about the only explanation tendered by those who were attempting to obstruct the progress of a corporation which, while presumably not enlisted in the great work of solving the problem of transportation upon purely moral grounds, was nevertheless quietly accomplishing more in that direction than the most zealous advocates of social reform could ever hope to accomplish unaided by it. In addressing the Committees Mr. Whitney said:

I had expected that these gentlemen who have been so free with their charges against the street railway systems of the State

of Massachusetts would have presented some actual statistics and facts with reference to what the service is in Boston compared with that in the cities to which they have referred. I could not conceive it possible that men should come up here and ask actually to revolutionize the system of street transportation in the State of Massachusetts, without giving a single reason for it excepting the fact that, as they had the power and wanted the money, this seemed to them the best and easiest way of getting at it. Now, sir, I hold that the compensation for the use of the streets to the people of any city or town is not to be judged absolutely by the sum of money that they pay, either into the city treasury or that of the State. The city of Boston, what is it? What is the city or town but the people that are in it? And if this system of transportation deals with the lives and with the customs and habits of the people themselves, why is not the subject of the service that these people receive through this transportation service the real question at issue in this case?

Now, Mr. Chairman and gentlemen, the street railways of the State have not received their privileges, as they are called, without compensation. They have, in the first place, taken care of that part of the street covered by their tracks. In so far that the street has been paved, they have been asked to do their share of the paving, which amounts to $7,000 or $8,000 a mile of single track. Now, reference has been had to some cities in the United States that require certain compensation paid directly to the city. The only city referred to, that I know of, is the city of Baltimore. And every gentleman who has been here and referred to the city of Baltimore has admitted that the service in the city of Baltimore bears no comparison whatsoever to that in the city of Boston. In the city of Baltimore the main service is comprised of one-horse bobtail cars, and is of a character that would not be tolerated in the city of Boston for a single day. And if you will take into consideration the service, and base it upon the experience of the city of Baltimore, if you were ever there, I am perfectly willing to leave the whole question to your judgment on the comparative merits of the two systems.

LAW OF GREAT BRITAIN.

Reference has been had also to the systems in other countries,

and I have taken pains to collect accurate information as to what those systems are. I hope, therefore, you will be patient with me while I undertake to show you exactly what is done in foreign cities, and then compare it with what is being done here. Now take the law of Great Britain. There is absolutely no law of taxation of any kind there for street railroads which differs at all from the law of taxation for any other property. They pay no tax upon franchise, charter, privileges, or rights of any kind. They pay only upon real estate owned or leased for its or their use, just as a private individual would pay; and as the appointments of London tramways are very meagre, the taxes are very small upon stables, offices and a few stations. The rates of fare are limited by law to two cents per mile, which would enable the companies to charge on lines of three miles six cents, and on lines of five miles ten cents. I hold in my hand here an act to authorize the construction of street tramways in certain parts of the metropolis north of the river Thames, an act of parliament of the year 1869. This is the language used: "The company may demand and take for every passenger traveling upon any or either of the tramways, or any part or parts thereof respectively, including tolls for the use of the tramways, carriages for motor power, and other expenses incidental to such business, any tolls or charges not exceeding one penny (or two cents) per mile. But the company may charge for any less distance than three miles any sum not exceeding three pence."

Now the average rate for transporting passengers over the street railway in Boston averages but a little more than one cent. There are at present in London eight tram companies, and the fare is not uniform. The dividends paid by the London companies are as follows: On the North Metropolitan, 9 3-4 per cent.; another one, 9 3-8 per cent.; another 6 per cent. The total capital of all tramways in England, Scotland and Ireland is £13,700,000. The pay for conductors and drivers is from $1.08 to $1.44 per day, and the time is from fifteen to sixteen hours, beginning at 7.45 in the morning and ending at from 11 to 11.30 at night. The cost of the drivers and conductors is a large part of the cost of running any street railway company, and in Great Britain the cost of conductors and drivers is absolutely less than one half of what is paid in Boston to-day. The pay of our conductors and drivers for ten hours' work is $2 for the horse-cars and $2.25 for the electric cars for ten hours'

service. And there is no obligation upon the company in Great Britain to take any more care of the track than is taken care of in the city of Boston. There is no additional obligation resting upon any street railway company in Great Britain which is in any respect more onerous, nor as onerous in respect to taxes, as that borne by every street railway in the State of Massachusetts to-day.

LINES IN PARIS.

Now we come to Paris. In Paris the lines of omnibuses and the lines of horse-cars, or tramways, as they are called there, are controlled by one company. It is true they pay quite a large tax to the state, but their fare is six cents for a short distance — six cents on the inside and three cents on the outside. But their charter runs for fifty years. Now, look at Paris. There is a city of 2,250,000 inhabitants, packed as full with human beings as it can be packed from one end of it to the other, measuring not over 3 1-2 miles from the centre to the circumference; and, notwithstanding that, the fare in the city of Paris is six cents compared with five cents in the city of Boston. And the pay of conductors and drivers, the main expense of the service, is hardly more than one-half of what it is here. Well, now, the poor people of Paris do not use the cars or omnibuses. This is evident from the fact that in the whole city of Paris the horse-cars and the omnibuses carried, in the year 1890, but 180,000,000 passengers, and the West End Street Railway Company last year carried on its little system comparatively and with a small population, 114,000,000 passengers. There are more passengers brought into and carried out of the city of Boston to-day by the horse-cars and by the steam railroads then are moved daily on the different systems of transportation in the city of Paris. What are the wages in Paris? Five francs, and seven francs the highest — $1.14. Five francs and seven francs is the compensation, and the hours are as they are in Great Britain, from fifteen to seventeen hours a day. The average length of tramway lines in Paris is 3 11-12 miles. They start from a common centre and go to the outer circle, and that six cents carries these people about 3 11-12 miles on the average. They do that for six cents. Well, now, right here let me call your attention to the fact that the average length of lines of the West End Street Railway Company is 3 3-4 miles. I have here the reports, if the Committee desire to examine them, of the full text of the charters of Paris and of England.

IN GERMANY.

Now we come to Germany, and the system throughout Germany, throughout the continent almost, excepting Paris, is substantially the same. It is what is called the zone system. And here, for illustration, is a map of Frankfort [submitting map to committtee]. The system is this: From one point to another there is a certain rate of fare, 10 pfennigs, which is 2 1-2 cents; that takes you a certain distance. If you go a certain distance beyond that, you pay another fare. If you go a certain distance beyond that you pay a third fare, and so on. The fare ranges from 2 1-2 cents to ten cents, and here I show you a sample of the tickets. Well, now, the distance between that point N and A is less than a mile; and the distance, the limit of this distance which a railroad company is obliged to carry for a fare of 2 1-2 cents, is limited to 1 1-2 miles. The average distance is something less than a mile. So that, as a matter of fact, when you say you can travel in Germany, at a single fare, for less than you can in Massachusetts, what do you mean? Why, you mean you can go 1 1-2 miles, and that is all you mean. You can go from N to A and that is .91 of an English mile, for 2 1-2 cents. You can go from this point to this point, .45 of a mile, just about half a mile, for 2 1-2 cents. But if you go three or four or five miles, instead of 2 1-2 cents, it is 10 cents. Here is a sample of the tickets. and Mr. Rosnosky here, who is familiar with the customs and rates there, knows the truth of what I say in regard to it. Here is a list of stations from one point to another, within which limit you can ride for a certain fare. This is the Frankfort concession: 2 1-2 cents for a distance of 1,400 metres to 2,000 metres; that is .84 of a mile to 1 1-5 miles — that is the extent to which anybody can ride in Frankfort for a single fare not exceeding 1 1-5 miles. Fifteen pfennigs (3.75 cents) for a distance from 1.2 to 1.8 English miles; 20 pfennigs for a distance from 1.8 to 2.7; 30 pfennigs for a distance of 3.6 miles or more.

So you see that in the city of Frankfort, although nominally the fare is cheaper, yet, as a matter of fact, so far as the distance is concerned it is wellnigh double the actual fare paid by the people of the city of Boston. And what is the result of that? Does the Frankfort company earn any less dividends than are earned here? Not at all. The Frankfort line last year earned $89,856 on a total capital of $661,000, or about 14 per cent. profit, and divided 10 3-4 per cent.

A REPORT FROM HAMBURG.

Now, I have here a report from the city of Hamburg, which is a city of 570,000 people, and, including its suburbs, 700,000 people. I hold in my hand here a letter from the United States consul at Hamburg, touching this qnestion, which I will read :—

U. S. CONSULATE, HAMBURG, February 10, 1891.

The accompanying report has been prepared upon the tramway system of Hamburg, with my assistance, and has been taken from the official reports and from information given by the directors of the companies. I am very familiar with the companies here, and with my knowledge of their imperfections, and the reason for their being so,—the inability of the companies to do better under the heavy taxes paid to the state,—I can see nothing here for Americans to copy, either in the car systems or the relations of the state to the companies. Very truly yours. CHARLES F. JOHNSON,

U. S. Consul.

And here is the report :—

"The Hamburg Tramway Company, 70 kilometres in length, reduced to a single track, each kilometre being about three-fifths of a mile, which would be about 50 miles of track." Then follows a certain lot of details about the amount of the capital stock and the horses and cars required, etc., which I will read, if any member of the Committee cares particularly to hear it. It says : "The company pays from 5 to 6 per cent. per annum on capital. The company pays 1 pfennig for its concession for every passenger carried by it. One hundred pfennigs equal 24 cents. Its concession runs for 25 years, and at the end of that period the track becomes the property of the state, unless concession is renewed. The company paves between the tracks, and a foot on the outside of the rails, and keeps this part in repair." It has been stated that upon some of the German roads at tee end of the concession all the property of the company reverted to the state, yet from my examination, which has been very thorough, there is no evidence that any road, anywhere in Europe, gives anything more to the state than simply its track at the end of the period of its concession. I have taken special pains to inquire upon that feature of it. They do at the end of thirty years, by agreement, give to the state the track. "The expenses of the fare, etc., will be seen from reports furnished by the directors. The expenses yearly, for personal injuries, are very small, the highest not having reached 10,000 marks, or $25,000, in any one year."

HIGHEST AND LOWEST FARES.

Now, the year that the roads were consolidated, while they were absolutely horse railroads, the damages to persons and property throughout the system exceeded $100,000, and that was before the West End Company had anything to do with running the roads. I will say that the expense of that department has slightly increased, but not more than the increase in travel. "There are no other means of conveyance in this city, except licensed carriages. The fares are regulated by the charter. The lowest fare is 10 pfennigs, the highest 25 pfennigs, or 6 1-4 cents. The lines are divided into zones or stations, and the fares are fixed upon the basis of 5 pfennigs for 1,250 metres, 1,600 metres being one mile. The pay for a conductor begins at 72 marks for a month; highest 90 marks per month, which is $22.50 per month. The pay of drivers is 85 marks per month, lowest; 110 marks, highest. Labor, thirteen hours per day, twenty minutes for dinner." The above is a summary of the tramway system in Hamburg, which for the year 1889, the last reported, carried 29,305,036 persons. Now, that is a most astonishing fact, and it is a fact that confronts every one considering this question — how small a proportion of the population ride. And the reason, in my judgment, is simply this, that the cost of riding in Germany, throughout all Germany, in proportion to the income of the people, is very much greater than it is with us. Now, I assume that the conductor and driver of a horse-car in Frankfort or Paris represents at least the average pay that laborers receive. I apprehend that this pay that conductors and drivers receive throughout all Europe, as well as all America, is somewhat above the average, and, assuming that this is sixty cents a day, that may be said to be a fair measure at least of the income of the laboring people of that section. Sixty cents a day I assume to be a liberal measure of the income of the laboring person in Hamburg. Well, now, if he were to travel on a car back and forth to and from his work, he would have to pay five cents, and that would be one twelfth of his whole income. In Boston, assuming that the same condition of things applies here, that the pay of a conductor and driver, $2 and $2.25, represents the fair measure of the income of the people who ride, the cost of transporting them to and from their homes is one twentieth to one twenty-second of their income.

BERLIN'S SYSTEM.

I come now to the oft-quoted city of Berlin — Berlin, whose system is pointed to as though it was something that we should imitate. And what are the facts in the city of Berlin? There is one great Berlin tramway company, which substantially controls all the lines in Berlin, as the West End controls all the lines in and about Boston to-day. It was chartered and received its first concession in 1872. In 1882 the old concession was annulled and a new one substituted, which runs for thirty years, to 1912. The terms of the concession are as follows: Obligation to pave between the tracks, and one metre on either side. To pay a tax of 1 per cent. to the city of Berlin on the first 1,000,000 of gross income; when it earns 2,000,000 gross, 1 1-2 per cent., adding 1-2 per cent. for each additional 1,000,000 earned, until the whole tax shall reach 8 per cent., and that is the limit. It pays an income tax, under a law applicable to all persons and companies, on the net income. The whole tax amounts now to about 7 1-2 per cent. on the gross income. In return, the city grants to it the exclusive use of tracks, and no person or team can walk or drive upon them, except from necessity, under heavy penalty, which gives them a clear track and easy movement.

The track becomes the property of the city at the end of concession, and, until then, the fares cannot be reduced. The whole track is divided into 36 lines, and I have here a map from the city of Berlin showing the lines.

Each line is divided into sections, with an iron post in the sidewalk marking the station, and the cars do not stop between these stations for any purpose. The fares vary according to the distance, from 10 pfennigs, or 2 1-2 cents, to 40 pfennigs or 10 cents, and the longest line is 11 kilometres, which is about seven miles; but the average of all the fares is 11.55 pfennigs, or not quite 3 cents.

Now I desire to call your attention to the fact that almost all of the travel is between these short lines. It is mainly short travel. The fact is that in no city in Europe, neither in Liverpool nor London, nor in any city in Germany. can you pass from one section of the line to another section of the line, even if you desire to go no more than fifty feet from one station into the other section, without paying two fares. That is the system. If a station is at this point,

and you get into a car 100 feet away from it and pass 100 feet beyond that point, you pay two fares.

PAY AND WORK.

The pay of conductors and drivers is substantially the same as it is in Frankfort. It is 75 marks per month, and the highest is 100 marks per month, varying from $18 to $25 a month. Every man works twelve hours per day, with about twenty minutes for dinner. The expense for personal injuries is very small, owing to the law of right of way, and the company insures against all accidents for a year for 30,000 marks. Absolutely for $7,500 this great Berlin tramway system is run as far as the expense for personal injuries is concerned. The total number of people carried by the Berlin system in 1889 was 114,400,000.

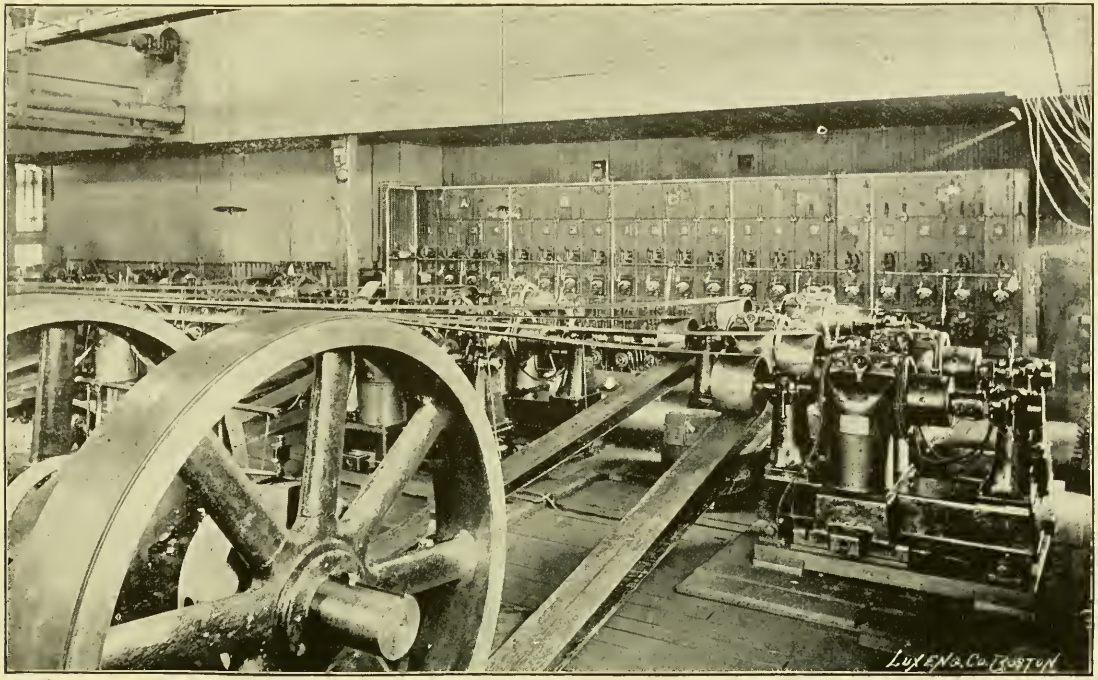
Mr. Kittredge. Seven thousand five hundred dollars would not pay your counsel fees for preparing your suits?

Mr. Whitney. No, sir; not a quarter part of them. Here is a city of 1,700,000 inhabitants, and they carry exactly 400,000 less people on their system than the street railway system of Boston.

The company provides each year a sinking fund sufficient to pay off the whole capital at the end of thirty years, and then pays 12 1-2 per cent. on its stock (last year) with the expectation of increasing each year, so that it will soon reach 15 per cent or more. The city is a level plane, and the distances are so short. The average fare per mile for passengers is greater in Berlin than it is in Boston, notwithstanding our great excess of expenses. So it is in Hamburg. I hold in my hand here the report of the great tramway system of Berlin for the year 1889, and there are some facts in that to which I wish to call your attention, as compared with the system of the city of Boston. Here it is for the whole ten years since the concession. For the last five years, beginning with 1885 and going down to 1889 inclusive, the average profits upon their line were 45 per cent.

WHAT BERLIN OBTAINED.

Now, I will take it for the year 1890, and I would like to read to you. This is for the year 1889. The capital stock was as follows: $4,275,000. First mortgage bonds, $2,174,875; second mortgage



VIEW OF TEMPORARY DYNAMO ROOM NO. 1. CENTRAL POWER STATION OF THE WEST END.

bonds, $1,215,875; mortgages, $230,125. The total receipts were $3,349,642.25, and the net profits were $1,451,888. The percentage, for some reason or other, was considerably less than in previous years. The year previous the earnings were $3,013,612.75, and the net receipts, $1,385,586. Now, what did they do with it? Of course, you gentlemen know that this money did not come out of the corporation. It came out of the people. What did they do with it? Why, they put aside for sinking fund on first and second mortgage bonds $305,779.25. They paid to the city of Berlin, and this comprised all the taxes that were paid to the city of Berlin by the great Berlin system, $301,149.75. And the West End Street Railway Company paid to the city for its franchise and other taxes last year, $222,377.80; and this year, with its increase of stock, it will absolutely pay more to the city than this road in the city of Berlin, earning its 45 per cent., while the system in Boston earns less than 7 per cent. They laid aside for their reserve funds, in addition, $220,181.75, and they paid out in dividends $534,375, being 12 1-2 per cent. And I have it here for the whole ten years. In 1880 it was 9 per cent., that is, $270,000, and its sinking fund and taxes $99,995.25.

In 1881, paying sinking fund, $224,689, and taxes, $115,992.75, they paid 9 1-2 per cent., and so on. In 1882, 8 1-2; in 1883, 9.75; in 1884, 10 1-2; in 1885, 11; in 1886, 11.25; in 1887, 12; in 1888, 12.25; in 1889, 12.5. Now, what do these street railroads of Berlin do for the people there? Why they carry them on the average 1.9 miles — that is the average distance that people ride there; and the average fare received is about three cents. The cost to the city of Berlin, or to the Tramway Company of Berlin for all its expenses, is 14 cents per mile. That is the cost of doing business in the city of Berlin — 14 cents per mile, against the average cost of doing it in the State of Massachusetts of nearly 26 cents: and could anybody expect that any railroad could be run in the State of Massachusetts and do so much for its people at a lower rate of fare, though the expense is nearly double.

BOSTON FARES LOWER.

Owing to the actual distance that people are carried in Berlin, the average fare per mile in Berlin exceeds the average fare paid by the

people of the city of Boston. The average fare paid per mile by the people of the city of Berlin is 1.54 cents. The average fare per mile paid by the people of the city of Boston under this system of the West End Street Railway Company is 1.3 cents. Now, what would have been the effect on the finances of the West End Street Railway Company if it had collected what is collected per mile in the city of Berlin? Why, it would have amounted to an additional sum of $993,677.73 per year. Give us the same rate per mile, notwithstanding the greatly increased expenses, give us the same rate per mile that is charged to-day in the city of Berlin, and the West End Railway Company would have made nearly $1,000,000 extra last year, and who would have paid it? Why, it would have come from the people, of course, who ride. What would have been the effect upon the finances of the West End Railway Company if we could have operated our road at the expense of the Berlin roads? If the West End road could have been run at the same expense per mile as the Berlin road, there would have been a saving in expenses to the West End road of $1,943,189.60, a total difference of $2,936,867.33.

Now, gentlemen, if you think that the Berlin system is desirable for the people of Boston, we, representing the capital that is invested in our system, can take no exception to that. Give us, if you so desire, the Berlin system, and we will pay almost any taxes to the city or the State that you desire.

Now, what is the effect of this system upon the social life of Berlin? Why, it is exactly what you would expect it to be. It confines the population of the city of Berlin, as of every other city where the system is in vogue, to a certain prescribed limit. You cannot go out of that limit, because you cannot afford to. The people cannot live in the suburbs, because they cannot pay the cost of getting to and from. And as a result of that, there are no suburbs in that city.

NO SUBURBS LIKE OURS.

Any man here who has been in Berlin or Paris or London knows perfectly well that there are no such things as suburbs. In those cities, the lines of brick tenement-houses go to a certain point, filled with a teeming population, and then you are in the fields.

The system which has been in use throughout the State of Massachusetts, extending its lines as population demanded, is entirely unknown in any city of Europe. And, so far as social advantages go, I place the system of the State of Massachusetts against any in the wide world. I knew that must be the fact when I saw what the system of transportation was in these cities. I knew that it must affect the social relations of every one of those people, and I desired to find some statistics to show me absolutely that it was so, and I went to the Encyclopædia Britannica, and I have taken this quotation from that encyclopædia. I regret that it has not been brought down to a later date. It comes down to 1872, at which time there were 826,341 inhabitants in that city. The 826,341 inhabitants of the city were found, at the census of 1871, to be living in 14,478 dwelling houses. I hold in my hand the auditor's report of the city of Boston, and I find that in this year there were upward of 50,000 dwelling-houses in the city of Boston, with less than half the population. The numbers show that the luxury of a single house for a single family is rare, and this holds good, also, of the wealthier classes of the people.

These numbers fall far short of the present (1875) number of houses and of households, as will be seen from the fact that the value of the household property of the city in 1874 exceeded that of 1871 by $90,000,000 of which the greatest part falls to newly built houses or houses enlarged. In 1871, the average number of persons comprised in a household was found to be 4.6, the number of households dwelling in a house 12.3, and the number of persons dwelling in a house 57.1. That is the social life in Berlin. The average number of people throughout the city of Berlin at that time was 826,341, and there were living 57 persons, on the average, under every roof. In 1540 the average number of inmates in a house was 6, in 1740 it was 17, in 1867 it had risen to 32, and in 1871 to 57. Now I know no reason why the same law has not held good from that time to this.

I see in their transportation system no means which the poor have for escaping from this crowded condition which would lead me to suspect that anything else had happened — but that the system has constantly progressed.

DWELLINGS UNDER GROUND.

"Between the years 1867 and 1871 the one-story houses of the city decreased 8 per cent., the two and three story houses 4 1–2 per cent., while the number of four-story houses increased 11 per cent., and the five-story and higher houses increased 50 per cent. With the increase of high houses, the underground cellar dwellings, which form so striking a feature in the house architecture of the city, increase in a like proportion, and these and the attics are the dwellings of the poor. In 1867 there were 14,292 such cellar dwellings. In 1871 they had increased to 19,208. Taking the average of 1864—four inmates to a cellar dwelling—we get 76,832 persons living under ground. In 1871 there were 4,565 dwellings which contained no room which could be heated.

"This class of dwellings has doubled between the two census years of 1867 and 1871. Taking three inmates (the ascertained average of 1867 to such a dwelling), we have 13,695 persons who pass the winter in unheated dwellings, in a climate where cold not infrequently sinks below the zero of Fahrenheit. Of the remaining dwellings of the city, 95,423 had only one room each which could be heated. This number, at four persons to a dwelling, gives us an insight into the domestic life of 381,692 of the inhabitants of the city; this, with 13,695 persons mentioned above, is nearly half the population. Such dwellings engender no feeling of home, and the habits of the people are in a certain sense nomadic.

"In 1872, 74,568 changes of dwelling took place, involving an expense, at a very moderate calculation, of $794,500. In the poorer townships there were 200 removals to every 100 dwellings. The rate of mortality is high. In 1872, a favorable year, it was 28 to every 1,000 of the population. Taking the deaths as a whole, 58 per cent. were children under ten years of age." Now, I wish to call attention to the condition of things in Berlin—a condition of things which I think might have been avoided if the same system had been pursued there as has been pursued in every city in the State of Massachusetts. Why, what do we do here? When population crowds the centres of the cities, people go out to the outer limits, and that is the trouble with the horse-car system to-day. A man goes away out to Dorchester, Roxbury, Cambridge, Somerville, or somewhere where he can find a cheap home, and by paying $30 a year for going

back and forth to his home, and that is all he pays if we carry him every working day in the year, this ten cents a day, or $30 a year, pays an interest at 6 per cent. on his $500, and he goes out to the suburbs with his family, to live under healthful conditions.

NO TENEMENT SYSTEM HERE.

There is no tenement system in the city of Boston. It is impossible so long as this transportation system is left untouched for it to flourish here. And that is the question that you are called upon to deal with. It is not simply a question as to whether the street railway company should pay a small sum, or any sum, into the city treasury, but it deals with the greatest social problem that the age has to consider, and you can do nothing that will promote the benefit of this community and posterity, of those that are to come after us, so much as to provide this cheap transportation to the suburbs. Now, how is it with the city of Boston ? Why, we carried 114,000,000 people last year, and we earned the enormous sum of 6.2 per cent. That is all we earned upon the capital invested. And how is it divided? There are many people who feel that when they pay five cents to the transportation company the company retains as profit nearly the whole of it; and there is also a theory, that my friend Mr. Harding indulged in, that in some way or other the company have some special place where they can put away their money so that the public shall not know anything about it. Well, that is perfect nonsense. No big corporation ever undertook any business of that kind. And, in the second place, we have not the money to put in such a place. We need absolutely every cent that we have to furnish the transportation that we do furnish. And, crowded as the cars are, it is utterly impossible for the company to do any more for what it receives. Now we take five cents, if you please—a little less than five cents—for every passenger. And what do we do with it?

WHERE THE FIVE CENTS GO.

Why, in the first place, we pay out about 2 1-2 cents immediately to the conductors and drivers and stablemen to perform their services. None of that comes to us. We pay for material and for our trackwork 1 1-4 cents, which makes absolutely 3 3-4 cents of the whole, 4 9-10 cents that we receive, which we immediately pay

out to the men to bring you back and forth to your homes, and to pay for grain and provender and the stabling of the horses. We pay out for interest and rental for other roads 1-4 cent of that, and taxes .19 of a cent, or almost .20, and there is left of all this 5 cents for the large dividends of the West End road, .64 of a cent. That is all. We carried 114,000,000 people last year, and all that we paid out to the parties furnishing the capital, or could afford to pay, was .64 of 1 cent per passenger. Now I know that there is a feeling abroad in the community that the company is able to do very much more if it only had the disposition. I know the crowded condition of the cars, and I regret it myself more than anybody else. But it is not in my power, nor that of anybody else, to remedy it in the existing condition of things. And if you are wise and fair and just and will examine this question in its business relations, you will see that you cannot get anything more out of the corporation than it receives, and if you undertake to tax a corporation more than it can pay, and to revolutionize its system and discourage the capital that is necessary to provide even these present facilities, you injure a large number, a much larger number of people than the people that are interested in this corporation. And the trouble of it is this: I do not undertake to say that if you will draw a line at Roxbury postoffice and stop it at the Boston postoffice, and another line from the Boston postoffice to Charlestown square, that we could not pay you anything. Of course we could then pay you something.

THE REAL PROBLEM.

But that is not the problem. The problem is to extend these lines into the suburbs, where these poor people go. And if it rested with us to withdraw the lines, and you will dare face this question of saying to the corporation, "Withdraw your lines that do not pay this percentage and the taxes," we will accept it. Now, here is a list of lines that I will not weary you with, which run in all directions and which we are running (absolutely at a loss) and (we) have been running them for years in that way. The mayor of Malden came before you and claimed that the city of Malden should be allowed to impose a tax for the great privilege of running through the city of Malden. Well, as a matter of fact, that line runs to-day through the city of Malden at an absolute loss to the West End Corporation, and

has for the last thirty years, and we would ask nothing better than to be allowed to give it up. If the compensation which the West End Railway Company furnishes to the city of Malden is not regarded as sufficient, we will cheerfully acquiesce in the permission of the city of Malden to remove our tracks.

And what have the city of Malden and the city of Somerville asked? Why, they have come and asked your Committee that the city of Boston and the city of Somerville and every other city should be allowed to charge any railway company any sum which the board of aldermen of that city may see fit to charge for the privilege of operating the road. Well, what would be the effect upon the city of Malden if the things that I have stated to you in reference to the business of Malden are true? Supposing we made a contract with the city of Somerville which should be binding upon the city of Somerville for a term of years, that we be allowed to run our cars to the Malden line. What should we do? Why, we should simply say to the people of Malden: "We will run our cars to the Somerville line, and from that point you may walk." What should we do with the city of Somerville if we had a like contract with the city of Boston? Why, we should say to the city of Somerville precisely the same thing. It is not an advantage to run the cars through the city of Somerville. The profit is exceedingly small.

NOT WHOLLY FOR PROFIT.

We should very much prefer to run our cars to the Boston line and let the Somerville people, find their own way to their homes from that point, if it were merely a question of profit. And if the West End Street Railway Company had regard only to its finances, that is what it would say. So that these cities and towns, in coming to the Legislature and asking that any city or town may be permitted to charge whatsoever it may please for the transportation facilities through that city or town, know nothing at all about what they are asking. There is a feeling, also, that the railroad company does not run cars enough.

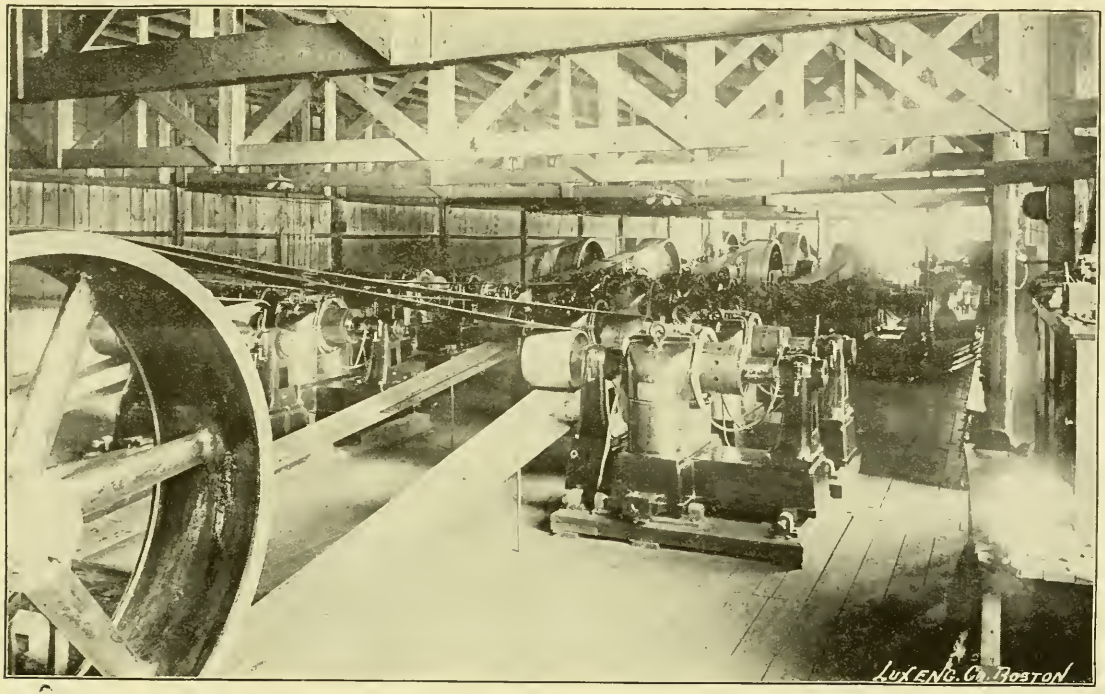
Well, now, we admit that at morning and night the cars are very much crowded. And what is the reason of that? Why, the reason is that there is such a great crowd of people going to the suburbs. That, in one respect, is one of the most important facts connected

with this whole question, that there are these people who ride to these suburbs and who desire to go these long distances. Nothing of the kind is known in Europe. Nothing of the kind exists there, for the cars travel only these short distances in this crowded population, and they run no more cars at one hour of the day than at another. The West End Railway Company runs cars enough to give everybody a seat if the travel was run throughout the day as in Berlin. The average number of passengers per car was 24 1-2 through the year, and the average seating capacity of these same cars that were run was 28. The question which, I take it, this Committee is here to consider, is this: How, in justice to everybody, shall the transportation of this city be improved? I take it that this Committee considers it of vastly more consequence to consider the effect of any change in the transportation service upon these people than the simple matter of paying $10,000, $20,000, $30,000, $40,000, or $50,000, into the city treasury.

THE MAYOR'S PLAN.

Under the bill proposed by Mr. Matthews and the city of Boston, we are asked to divide with the city all above eight per cent. Well, the West End Street Railway Company paid last year to its common stockholders the enormous sum of $225,000. If we had divided with the city the excess above 8 per cent., we should have paid to the city of Boston about $22,500. That is all we should have paid? Well, now, what have we done? What are we endeavoring to do? In the year 1887 this Legislature authorized the consolidation of these roads. Whether or not it was in the interests of private individuals, it was certainly of some service to the State, and I believe that there is no intelligent and unprejudiced man familiar with the situation then and now but who is entirely willing to concede that, so far as that consolidation has gone, it has been for the benefit of this community.

And what were we authorized to do? We were authorized to issue a certain amount of stock. And the inducement for this company of men to take hold of it was what was contained in the charter granted by the State of Massachusetts. And what have we done? We have not only consolidated these roads, but we have taken up the problem of improvement in the transit. We found immediately



VIEW OF TEMPORARY DYNAMO ROOM NO. 2. CENTRAL POWER STATION OF THE WEST END.

after consolidation that the public necessity and convenience required that something should be done to improve this travel. I say that the limit of accommodation by horse-cars was absolutely reached. There was no remedy except in one of three directions. One was that fares should be raised. Another was that wages should be reduced, and the third was that you should find some cheaper system by which these people could be moved. And that was a large problem. And we found it, as we believe, and as experience for the last two years has day by day confirmed us in believing, in the electric system.

RESULTS OF THE ELECTRIC SYSTEM.

And what have we done with the electric system? Why, we have put in temporary plants, and we are running cars from the centre to the circumference of this city, with the saving of from 10 to 20 minutes of time on every trip. Is that no compensation? While you are legislating under this roof to reduce the hours of labor, this transportation company has come in, and, by simply changing the system by which people are carried to and from their places of business, has reduced the hours of labor, in some cases, nearly one-half an hour per day. Many and many a man in this city knows it. And we are endeavoring to go on and extend this system from centre to circumference. It is an enormous undertaking. The horse-power required to move all these people is greater than the water-power of Holyoke, or of Lowell, or of Lawrence, and as much as that of Fall River.

We have undertaken to solve this problem in a broad and liberal way. We have realized that in order to do this to the best satisfaction of this community it was necessary that it should be cheaply done; that instead of installing engines and boilers of a small capacity, it was much cheaper, considering the magnitude of the work, to put in an enormous plant. And that is what the road is now engaged upon. We are installing at our central station to-day, and will have in operation before next winter, more than 13,000 horse-power. And in Cambridge we are putting in a plant which is equal to 4,000 to 5,000 horse-power more. Now I say that is more horse-power than there is in all the city of Holyoke, and as much as there is water-power in the city of Lowell or Lawrence. And we have provided in these places, as the business grows, a capacity for increasing to 30,000

horse-power, which is as much as any city in this Commonwealth uses for all its purposes. Now, I say, is there no compensation to the people of this community in the saving of time by more rapid transit? Can you afford to discourage the corporation that is to-day grappling with this great problem and paying out its money to supply this great and growing demand for transportation?

GOOD FAITH OF THE STATE.

I say for myself that if the charter of the State of Massachusetts can be violated in its good faith in this respect, my usefulness in connection with this problem is gone. I have been acting under what I supposed to be the good faith of the State of Massachusetts. I have called around me my friends and capitalists, have shown them this charter and have shown them what we can do. I have said that it seemed to me entirely reasonable that if we can give these people, for the sum of money that they now pay, this additional means of transit, of course the people will be satisfied and pleased; and until this year it never entered my head that the State of Massachusetts could induce a body of capitalists to engage in this enterprise and then listen to a proposition to take them by the throat.

Mind you, sir, that we are doing all this, we are giving all this accommodation without a single cent of cost to any individual. And I say that it is the only way of dealing with this problem. And we have done more than this. Last year, believing, knowing, that the capacity of these down-town streets was becoming so crowded as actually to make it physically impossible to bring the cars through them that the community desired to use, we undertook to investigate some other system. Now, my proposition is, and always has been, that any system of transportation which shall meet the necessities of this community must be one that is worked in connection with the West End surface system, or with the surface systems. Now, I care not at all who builds that road. I have conceived it to be my duty, acting as the representative of the people who desire to ride, and acting as the representative of those men who are endeavoring to give these facilities, to come to the Legislature, and, so far as I could, point to them the only way, as I thought, in which it ought to be done, and to say to them: "With your leave we will endeavor to undertake it." And we were granted a charter. What is the result?

Why, we have gone and spent money under that charter, and here, this year, comes up an order from the board of aldermen asking that the city of Boston should be allowed to attach terms and conditions to it.

NOT AN ENCOURAGEMENT TO SPEND MONEY.

Well now, what encouragement, under such a condition of things, is there for anybody to spend a cent? I, for one, do not care to do it. I say that, looking at this question as it appears to me, I desire nothing to do with any charter that can be changed by the State of Massachusetts or anybody else, from year to year. So that my view of this question is this: That if these things are desirable, if it be desirable that a better system shall be provided, without increasing the cost to the individual, if it be wise to encourage the extension of lines as they have been extended for the last forty years—to which, in my judgment, is due the healthy, social condition of Boston and its surroundings—if it be desirable to do that, is it at all desirable to interfere with the profits that are supposed to be made by this corporation? You cannot discourage this corporation without affecting and embarrassing the whole enterprise.

I say that we need every resource that we have to carry out this transportation problem. We receive now, as the total amount that every individual pays us who travels back and forth on our line in the whole year, less profit than $7. Sixty-four hundredths of a cent per passenger is what we have paid in dividends, and the whole amount we received last year, in dividends and surpluses, was .91 of a cent per passenger. Now, we carry the people back and forth, to and from their homes, for a whole year with the payment of a dividend to the capital invested of less than $7, and nobody can do it any cheaper.

The idea that anybody else will come in here, if the West End goes out of this, and pay a large sum of money for doing it is a perfect delusion and a snare. Nobody in this Commonwealth can be found to invest money in this business, which promises any less rate of interest than is produced to-day under existing circumstances, and the treatment of any corporation, such as these gentlemen indicate here, would be absolutely destructive of all investment in this enterprise by anybody excepting on the condition that such a change should be

provided by a State law that there should be a long term of years within which the property should be undisturbed. And I predict that when anything is done with an elevated railroad, or with any underground railroad hereafter, some limit of time must be fixed that will make the capital invested in it secure.

TWO WAYS OF LOOKING AT IT.

Now, there are but two ways of looking at this question. You must either say to the West End Company, "Go on as you are, and act under your charter," as I think the State and the city and these communities are bound in good faith to say, or else you must provide by some new law for the procurement of the capital in some other way. It is useless to expect a man who has money to lend, to lend it upon terms on which the borrower can say: "Notwithstanding your rate of dividend, or rate of interest, is such a per cent. to-day, I propose that to-morrow I shall change it, and the next day I will undertake to deprive you of a certain portion of the principal."

I say that nothing can be so unfortunate for the State of Massachusetts, in my judgment, as anything which shall lead the people to believe that the State of Massachusetts does not regard the rights of property as inviolate, whether expressed or implied. And that is the case here. We have gone on and spent our money in perfect good faith, and have accomplished what the people desired without any expense to them. We have been saving them time and money, and we are endeavoring in every way to solve this problem. And for what reason? Why, because we have supposed that the State of Massachusetts stood by us, and would protect us in the money we were investing in this enterprise. Now, if the State of Massachusetts says it will not protect us, that, far from that, it will undertake to deprive us of part of the dividends which we are fairly entitled to earn, and pay it to the city of Boston or somebody else for some other purpose, and that we must take charters that can be revoked at will, what can I do further in connection with this transportation business? You compel me to retire, and I must retire, because I can not ask men to invest money in this enterprise upon any such terms, and I will not.

THE ONE JUST WAY.

I say there is one other way, and that is this: Every person who has been up before the Committee on this question has said this: "We think that in justice to the corporation it ought not to be compelled to go to the Legislature every year, or to the board of aldermen every year, but that its charter should be absolutely fixed for a term of years." I say that if the charters under which we are acting to-day are liable to the interpretation that these men have put upon it, then I certainly desire, and it is absolutely necessary, that it should be conceded, in order that this work may be done, you should look at this thing as a business question; and any charter which any one of you gentlemen sitting here at this table would take for an investment of your own, I will agree to take on behalf of my corporation. I ask no greater security for the money that I am inviting to invest in this enterprise than you would ask if you were proposing to lend money or invest it yourselves. We ask that we be secured, and that is not only wise public policy, but is absolutely essential at this stage of the transportation business.

Now, then, I say this: Make, if you please, this thing secure. Relieve us from the necessity of coming before your Legislature every year and pleading for our rights and endeavoring to prevent excessive taxes being laid upon us, and save us from the necessity of going to the board of aldermen for our rights from day to day, and allow us to manage this as a business enterprise, and you will put it upon a sound foundation. If you think that the rate of interest charged is excessive, I am perfectly willing, if you will so fix this charter as to open the door to new capital: we will agree upon a change which shall accomplish it. Do not disturb the law as it exists, but, if you should see fit to grant us a permissive charter under which you will provide that for a long term of years we shall be left in undisturbed possession of this property, providing we will sell the new stock at auction, we are perfectly willing so to do.

A BILL PROPOSED.

It makes no difference what amount of dividend is paid if you only pay the market price for money; and if these things are objects of desire, if it is important that this transportation business

shall be extended, if it is desired that some elevated or underground system should come in and be operated in connection with this surface system, then I know that we must get the money for that as cheaply as we can; but I know full well that we cannot get it and it cannot be done so long as these ideas prevail with respect to the rights of property under the present charters.

If I had any new proposition to make to this Committee, it would be this: Touch not the charter as it is, but give us a bill which provides that, if hereafter we will sell the stock at auction, we may be left in undisturbed possession for a term of fifty years. I say fifty years for this reason, because I know for the next ten, fifteen, or twenty years, and, I think, for the whole fifty years — because I apprehend there will be no difference in the situation from year to year — I say fifty years for the reason that it gives a longer period to accumulate a sinking fund against possible losses; and that is in the interest of the community. Make this so secure that any man in the community would feel perfectly safe in investing his money. Give the savings banks the right to invest in it, open all the doors to capital throughout the State, let us sell the stock at auction, and it makes no difference whether you make 8 or 10 or 12 per cent. dividends, or more, because the higher the dividend the less stock will have to be issued to pay dividends upon. And, if you leave it at 10 per cent., or make no provision with reference to it, it will bring exactly the same amount of money; the amount paid in dividends will be precisely the same. If you would do that, if it were possible to make a law which should accomplish that, I, for one, would be satisfied.

A REQUEST FOR CO-OPERATION.

Under the present law the directors of the railway company have a perfect right to say how that stock shall be distributed. It is within the power of the railway company to distribute all the new stock at auction without any provision of the Legislature, and therefore whatever we have done we have done under that provision, and if the directors of the road should see fit to make that disposition of its new stock, the stockholders would not complain.

But I see, as I know that no other man in this community can see, the magnitude of the undertaking and the great advantage to

this community, if the thing can be done. I plead with you on behalf of the people of this community, and especially of the poor people whose carriages the horse-cars are, to join with us and help us so to frame a statute that every man in the community will feel it to be a security that he can safely invest in, and then we shall get our money at the cheapest possible rate, and if we are wise and judicious in the expenditure of it, everything will be done which it is possible for human ingenuity to do in the solution of this problem. And I, for one, should be exceedingly glad of such a condition of things. I desire that the people who have been associated with me in this enterprise up to this time shall not be wronged by the State of Massachusetts. I ask that I shall not be compelled to go to the men who have stood by me and are now standing by me and doing this great work — that I shall not be compelled to go to them and say that the State of Massachusetts has broken her faith. The other way is the loyal way. The other way is the right way. Let the past stand as it is. These men, while they have consulted, perhaps, their individual profit, have done a substantial service to the State, which is entitled to recognition. And if you will take the other course now, give us a bill which involves the absolute protection of this property for a term of years, and hedge it about by any provision as to the character of the service that you please. I care not at all what provisions you incorporate in it which shall be for the protection of the enterprise; but if you do that, and enable us to get the capital at the lowest rate of interest, not confining us, as we are now confined, to a small circle of capitalists, I am perfectly willing that it should be done. But until this Legislature is ready to do that, it ought not to disturb it at all.

HOW THE PROBLEM MAY BE SOLVED.

I can see how, by such a bill as that, the whole problem may be solved; and men may go to the outermost limit of the present system, extending, as you see there [referring to map], ten miles from one end of it to the other. I can conceive how, if you will take that view of it and allow us to keep every single resource that we can get, and even to lighten our taxes, it would be in the interest of public policy. I say that, if you will take that view and stand by us, we can work out a system of transportation in this city which will be the admiration of the world. There is no city in the world to-day

which, for a surface system, can compare with it. I know that. I have taken pains to be informed of it. I know that, so far as the system exists to-day in the city of Boston, for the money that is paid, there is no city in the world that can compare with it.

Now, what I have said with reference to the Street Railway Company in Boston and vicinity applies equally to the street railways throughout every community in this Commonwealth. Their cars are the carriages of the poor. They extend their lines always a little faster than they can afford to, for the accommodation of the poor people and those of moderate means who desire to live in cheaper places in the suburbs. In the summer time they put on their open cars, and the poor people, with their families, for a few cents can go to the parks and the pleasure grounds, and it is the poor people who are interested in this problem. Take it in the city of Boston. Here your parks are located at the extreme limits of the city, and we are obliged to carry everybody there from Charlestown, Somerville, and everywhere else for a single fare of five cents. That is one cent a mile, almost one-half of what it is anywhere else. Now, this system of transportation throughout the State, instead of deserving your condemnation and being loaded with heavier taxes, is a thing for you to preserve. You can, in my judgment, do nothing more for the interests of all these communities than to lighten these taxes. You certainly can afford to do nothing that shall increase their burdens and discourage them from doing the work they are now engaged in or are undertaking to do.

And I say that it is important that whoever invests his capital in these enterprises, which are so greatly for the interests of the people should be encouraged and protected.

ADDRESS OF PRENTISS CUMMINGS, ESQ.

The closing argument against the bill was made by Prentiss Cummings, Esq., a gentleman who has been identified with street railways almost from their inception, and who was president of the Cambridge Street Railway Company at the time of its consolidation. As will be seen, Mr. Cummings effectually disposes of the erroneous opinions entertained by some people in regard to the use of the public thoroughfares, and as the address is interspersed with other matters interesting to those seeking information on the subject of transpor-

tation, it is printed in full. In opening this argument Mr. Cummings said :

I do not think it necessary to discuss at length the legal aspect of this question. The claims with which the petitioners started out — that the city had peculiar property in the streets which might be leased to a street railway company, and that the locations granted by the board of aldermen are grants by the city — have all been fully exploded. I think it will now be conceded by every one that the fee in the street ordinarily belongs to the abutter, while the easement or right of way belongs to the public. I go a little further than my friends who have preceded me, who have stated that this public easement belonged to all the citizens of Massachusetts.

In my judgment, it belongs equally to the citizens of Texas or California, and, indeed, belongs equally to the unnaturalized foreigner upon our shores. The nature of this public easement is probably inherited from the common law of England. As I understand it, Mr. Chairman, you and I have the same right to make a proper use of a street in England which we never saw or heard of, as Queen Victoria has, and an Irishman, Italian, or Russian has the same right to a proper use of the streets of this city as the mayor himself. The Commonwealth is the guardian or trustee of this public easement for the benefit of all mankind. Unless the streets were taken possession of by military force in time of war, or by a squad of police in some exigency like a fire, that is, unless the war power, or power to make police regulations be lawfully invoked, I know of no authority by which any person can be debarred from a proper use of the public streets ; and officers having charge of the streets are in fact public officers, however they may be appointed or paid. It has been held by our Supreme Court, for example, that surveyors of highways and superindendents of streets are public officers, and therefore that cities and towns are not liable for their negligence. At the time when street railways were first chartered, boards of aldermen, were surveyors of highways, and in Boston they also had the power of county commissioners. Authority to grant locations was vested in boards of aldermen, not in their capacity as legislators or executive officers of the city, but as being surveyors of highways, and public officers, representing the State in the charge of the streets.

BY STATE COMMAND.

The city, it is true, takes care of the streets and keeps them in repair, not because it owns them, but because the State has ordered it to do so. In order to induce obedience the State has further provided that cities and towns shall be liable in damages if the streets are defective. There is nothing in the common law, or in the nature of a municipal charter which makes them liable, but this liability is purely a matter of statute law. It is also true that the city is at expense in the laying out of streets, but they are laid out under authority of the Legislature; and when laid out are dedicated to public use—the free use of all mankind. In Boston many of the old streets were laid out directly by the State, as I am informed; and many of the most important streets in Charlestown, Brighton, Dorchester, and Roxbury were laid out by, and at the expense of, the counties of Norfolk and Middlesex.

Now, street railways do not occupy the fee of the street, but simply the public easement, and I do not altogether agree with what some of my friends have suggested here, that such location would have any force if the street was discontinued; for the location inheres in the easement, and in my judgment would expire with it. But the use of the street by a street railway is for the accommodation of public travel, and, therefore, the direct and legitimate use for which streets are laid out. For cities and towns to make a charge for a legitimate use of a public easement, which does not belong to them, is repugnant to every instinct of a lawyer—to all the legal training I ever had. Who would think for a moment of allowing the city to make a charge to the Boston Cab Company, or the Herdic Phaeton Company, or a teamster with 100 trucks, for the use of the public streets. Yet there is no reason on principle why they and all other citizens should not be so charged, if we are; for their use is no more legitimate than ours. In fact we already do more than private citizens in the care of the streets, since we pay our municipal taxes, and in addition expend large sums in constructing and keeping in order a considerable portion of the street where our lines run. The West End Company has from one fifth to one quarter of its entire capital invested in the pavements of the street, on which we have to pay interest or dividends, and our annual expenses in keeping the pavements in repair, irrespective of the rail, is estimated at 10 cents

per lineal foot of track, or, in all, $150,000 annually. One or two city solicitors have expressed the opinion that the existence of railway tracks causes expense to the municipalities in excess of this, but my opinion is based upon actual experience, and I think those gentlemen are mistaken, and that the reverse is true.

STREET CARS DO NOT CAUSE OBSTRUCTION.

But it is urged that street railways should pay for obstructing the streets. Nearly all the local travel in the vicinity of Boston is in the street cars, and I would like to inquire how the 300,000 people who ride daily in our cars could get through the streets, and occasion less confusion or obstruction, than in that manner of conveyance? It is a serious question, whether that amount of travel could pass on the surface of our streets in any other known way; certainly in no convenient way. I believe you will be satisfied on a moment's reflection that street cars facilitate travel, and so far from causing obstruction, are an efficient agent in preventing obstruction.

TRACKS AUTHORIZED.

The peculiar use of the streets by street railways lies in the fact that they are authorized to maintain a track. There is no doubt that this track is an inconvenience to light vehicles, but the public benefit is something enormous. It enables one horse to do the work of ten. The West End Company now has 7,600 horses, and were it not that it uses electricity, it would require 10,000. The use of the rail, therefore, is equivalent to an enormous increase in horse-power. This increase in power is so much addition to the public wealth, for the public gets the benefit of it all.

First — They get cheap fares, which but for the rail would be absolutely impossible. The West End Company carries its patrons from two to nine miles for 5 cents, which is the ordinary price of a good apple or orange as retailed on the street, or a cup of coffee in a cheap restaurant. I have often asked the question of parties making complaints of lack of accommodations if they could think of anything wherein they got so much for 5 cents as from our company, and never yet has any such person lacked the candor to confess that there was nothing. If I personally should ride in a cab from my

office to my home, it would cost me $3 in the daytime and $5 at night; yet I can take a street car at the Tremont House which leaves me near my door, for 5 cents. The cheapness of our fares is nothing less than wonderful. That it is the rail which effects this is shown by the fact that the cab and herdic business is not very profitable notwithstanding their high prices.

Second — It is this rail that saves obstruction to travel in the streets, for one pair of horses and a compact car handles readily a large number of people.

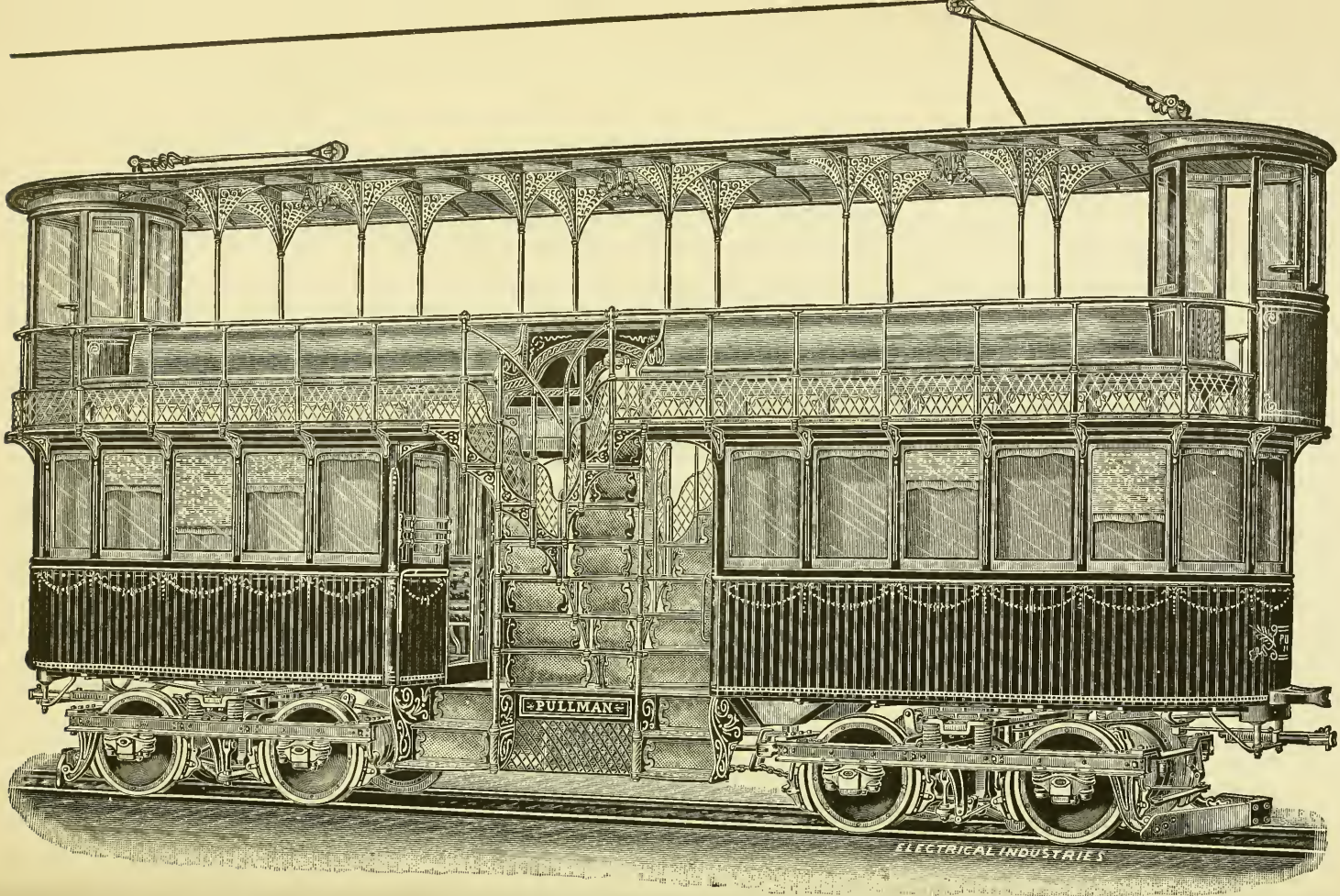
Third — The use of the rail is a great safeguard against accidents; every teamster knows just where the car is going, and can govern his own vehicle accordingly.

THE CHAIRMAN. Is it not a fact that the Herdic Company, of which Mr. Nathaniel J. Bradlee was trustee, actually failed and went out of buisness because it could not afford to pay the damages that were found against it by juries for accidents in the streets?

MR. CUMMINGS. Yes; and I understand the Hathorne Company lost money for years before they gave up the business, and as for cab companies, I judge that their property is of very little value at the present time.

THE CHAIRMAN. Is not the meaning of the leases to the drivers of these cabs to be found in the fact that the owners cannot stand the damages by accidents; is not that exactly it?

MR. CUMMINGS. Yes, sir, I so understand. There is no doubt that passengers in our cars are much safer than they would be in their own carriages, and meet with fewer accidents in proportion. Judging by the number of accidents to passengers happening during the past year, I have made a computation, and discovered that a passenger taking two rides daily in our cars, on the doctrine of chances would not meet even with a slight accident but once in 118 years and would not be killed inside of some 60,000. Indeed, a person who might be born on our cars, and ride in them every trip they run daily, who got on and off the usual number of times, rode on the platform or the running board the average number of times, and was intoxicated the average number of times — in short, was exposed to every risk, would live 8,000 years before he would be killed, according to the doctrine of chances.



THE "DOUBLE-DECKER" OF THE WEST END.'

SAFETY ON BOSTON CARS.

A passenger on our cars is as safe as in his own house, and safer than he would be in any vehicle or in walking the streets. I have ridden in the street-cars myself for the last thirty years constantly, a portion of the time riding a great deal officially, and not only never had an accident, but never saw a street-car accident of importance enough so that a claim was made. I have seen carriage accidents and wrecked carriages frequently, yet we carry more people in a day than ride in carriages in a month. It appears, therefore, that the track in the streets, though attended with some inconvenience, is the cause of great benefits to the community.

It has been urged that the street railways pay something to certain municipalities in other States. I do not think the evidence presented by the petitioners indicates that the practice is a success, and for the public good, where it exists. But I wish to call your attention to one important fact, and that is, that street railways labor under certain difficulties in Massachusetts not common elsewhere.

DIFFICULTIES FROM CLIMATE.

The first difficulty under which all our street railways labor grows out of the severity of our climate in the winter. This is attended by a great decrease in earnings, so much so that all the roads with which I am familiar make a deficit in January, February, and March. That is not true farther south. In New York City the profits are even greater in winter than in summer. Our winters also occasion a great increase of expense. The expense of clearing the tracks of snow is very heavy, and many extra horses are required. The mere expense of carting snow, to the West End Company, in an average winter, exceeds $100,000, and we have at least 1,000 extra horses for the emergency of four-horse time. It costs 50 cents a day to keep a horse, and that 1,000 horses, therefore, cost $500 per day. During the two winters prior to this one (1890–1) those extra horses were of little use, but we did not venture to get along without them. That expense is not necessary in more southern climates. All our street railways also are obliged to pay more for hay and grain than in the cities of the West. If electricity should be substituted for

horse-power, we shall all be handicapped by the high price of coal, which in Massachusetts will cost some $5 a ton; while in most of the cities of the country the price is much less — for example, in Chicago the fine coal used for engines is from $1 to $1.50 a ton.

THE CHAIRMAN. Do you mean to say the price for soft coal in this city would be $5 a ton?

MR. CUMMINGS. The price of the coal we use is from $3.75 to $5 a ton.

MR. CHAIRMAN. What kind do you use?

MR. CUMMINGS. We use a variety. The best we can use is hard. In the West they use soft coal. That is the best, if we can get it. If we could get Nova Scotia coal, that would help us out. In Boston the expenses in winter are greatly increased by the narrowness of the streets, since the snow, from the tracks and from the sidewalks cannot be leveled off, but must all be carted away; and during the whole of the year, these narrow and involved streets add greatly to the number of accidents, and to the expense for street aides and switchmen. I never go into any of our large cities without some feeling of envy, when I see the ease and cheapness with which their railways are operated. The Broadway road in New York, whose charter occasioned a scandal, to which my brother Proctor alluded, has about seven miles of double track, running from the Battery up Broadway to a single building under whose roof all the horses and cars of the company are kept, and in which are situated all their repair shops, blacksmith shops, offices, and other departments. It is obvious that such a road as that cannot fairly be compared with ours.

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The first street railways in Boston began to run in 1856. To give you some idea of what street railways have accomplished here, I will state a few facts. Prior to that time all the public conveyance between Cambridge and Boston was a half-hourly line of coaches; and when the Cambridge railway was projected, the general public had no faith that it could succeed, because they thought there was no public demand for it. West Boston bridge was then a toll bridge, owned by a private corporation; and it may be worth while to say that the two bridges to Charlestown were also toll bridges. A Charlestown or Cambridge business man, if he rode to Boston in

a one-horse vehicle, had to pay 5 cents toll to get across the bridge; if a two-horse vehicle, he had to pay 10; if he walked across, it cost him a cent. You see it then cost a Charlestown business man as much to drive across Warren bridge as it now costs him to ride to Franklin Park. It is worth saying that in order to make the West Boston bridge a free bridge, the Cambridge Railway Company paid $36,000 and issued stock for that amount, which is a part of the capital of the West End Company to-day.

THEN AND NOW.

Cambridge was then a city of some 20,000 inhabitants, and Charlestown and Roxbury were small cities, having comparatively little connection with Boston, and insignificant public facilities for travel to the city. The Cambridge Railroad, which was the first to run cars, carried the first year less than 1,500,000 passengers. In 1860 that road collected about 8,000 fares daily, and it was mentioned in the newspapers as a remarkable fact that that number of fares corresponded to one-third of its population. It was a remarkable fact, considering the condition of things four years before, when a half-hourly line of coaches satisfied the public demands. At the present time Cambridge is a city of 70,000 inhabitants, and on that branch of our road we collect from 50,000 to 60,000 fares daily, corresponding to five-sixths of the population.

Cambridge is peculiarly situated, since it is unusually dependent on street-cars, and the ratio is not so great elsewhere. The population of Boston and vicinity, where our cars now run, amounts in round numbers to 600,000; and we collect on an average 300,000 fares, which correspond to one-half the entire population. The effect of the street-railway has been to concentrate business in the city proper of Boston, while the business men and the working men have homes in the suburbs. * * * * Since these hearings began I casually met with a statement in Macaulay's History of England, which I think will interest you, as coming from a high authority. He was describing the great difficulties in England owing to the bad roads throughout the kingdom in the year 1685. He says:—

"Of all inventions, the alphabet and printing-press alone excepted, those inventions which abridge distance have done most for the civilization of our species. Every improvement of the means of locomotion

benefits mankind morally and intellectually, as well as materially, and not only facilitates the interchange of the various productions of nature and art, but tends to remove national and provincial antipathies, and to bind together all the branches of the great human family."

The moral benefit of street railways has been shown. I wish to call your attention to the material benefits, and show the ways in which they have enriched the community. First of all, in this vicinity they have greatly cheapened the cost of living. The suburban population are enabled, for a nominal sum to go to Boston and do their trading; and thus the profit of one middleman or local trader is saved, not to mention the fact that in Boston the customer finds a much greater variety of goods from which to select. The difference in the cost of provisions in the Boston markets and in the suburban markets is 30 to 40 per cent., and the same is true to some extent in nearly all kinds of goods. Land and rents, however, in the suburbs are much cheaper; and the aggregate saving to the community in the cost of living in these various ways can only be estimated, but amounts to an enormous sum. Street railways also cheapen the cost of doing business; it is a great advantage to have business concentrated.

BENEFITS OF CONCENTRATION.

Lawyers find it a benefit to them professionally to have their offices in the same district, and the marketmen, leathermen, and the large drygoods dealers find it a great advantage to be near together; all business men like to be near the banks; and business itself is greatly benefited by the street railways. Imagine for a moment the effect upon the business of Jordan, Marsh & Co., R. H. White & Co., and others, if they had no customers except such as could come to their shops in carriages and omnibuses, or walk. As it is 600,000 people have an opportunity to be landed at their very doors for a nominal sum. Some of these drygoods establishments have more than 1,000 employees, and where those employees would live if the means of conveyance were so expensive that they could n't afford it, and they were obliged to be so near their work that they could walk, is a problem. I am alluding to that question now merely as to economy in doing business. The simple fact is that but for the street railways there would be no large retail establishments such as

I have named : There would be no demand for them , and yet they are a manifest benefit to the community, and every business in the city is more or less benefited by the street-car.

EFFECT ON REAL ESTATE.

Again, the street railways have effected an enormous increase in the value of real estate, To give you some idea of this, I will say that the town of Brookline, in which I live, had in 1856 a real estate valuation of about $5,500,000. It had very good steam-car accommodations, and subsequently two street railway branches were built a little distance into the town. During the thirty years, from 1855 to 1885, the valuation of this real estate had risen to between $16,000,000 and $17,000,000, being an average increase of about one-third of a million a year. Since the West End extended its lines through Beacon street, and built two branches of about a mile each in another part of the town, there has been so great an increase in value that in 1890 the real estate valuation exceeded thirty millions. During the last five years the real estate of the town has nearly doubled in value, and increased two millions more than it had during the thirty years previous.

The cities and towns now comprised in Boston, in 1855 had a real estate valuation of about $160,000,000. In 1890 its valuation was $619,985,400. In general, I will say that, while the population of Boston and other places where the West End cars run, has about doubled during the past thirty-five years, the value of real estate has more than quadrupled. It is easy to see how cheap street-car accommodations affect real estate in the suburbs favorably, but in my judgment, real estate in the business wards of the city is benefited even more.

Ward 10, which is the principal ward of Boston, in 1855 was covered with buildings as thickly as at present, and it might be supposed that its value would remain nearly constant, and be little affected by street railways. In 1855 its real estate valuation was $35,120,500; in 1860 $38,259,300 : in 1885 $83,368,900 ; and in 1890, $114,122,700. The population of that ward is less than any other ward in the city. In 1860 it was largely occupied by dwelling houses ; but it has not been injured by the change, since the business blocks now covering it are much more profitable. The value of business blocks

is almost in direct ratio to the number of people who can easily and cheaply be brought to them. The relative increase in value has not been so rapid as in some suburban places, but the gross amount of increase in ward 10 has been greater. The gross increase even of ward 11, which is one of the finest residential districts in the world, and rapidly growing, has been less than in ward 10 during the past five years, by more than $13,000,000.

INCREASE IN VALUATION.

The increase in the real estate valuation of ward 10 between 1855 (the year before street-cars started in Boston) and 1890 was $79,002,200, while the entire real estate valuation of ward 11 in 1890 was $78,890,200; that is, its increase exceeds the entire valuation of ward 11, which is the second ward in the city, by $112,000. For several years I represented ward 10 in the city government and in the Legislature, and always felt that I was representing not simply my constituents, but more than 100,000 business and laboring men, who were engaged in business in that ward, but had homes elsewhere. The simple truth is that the real estate owners in ward 10 levy tribute on all the surrounding country; and the fact that 600,000 people can be conveyed to that district for 5 cents is largely what concentrates business there and gives it its value. Ward 11, which is the Back Bay ward, it might be thought would be little affected by street railways. It is sometimes said that the street-car is the poor man's carriage. I wish to add that in Boston it is also the rich man's carriage. There is no district where our cars have more patronage than on the Back Bay; and I venture to say, had there been no street railway there, its growth would have been much less rapid, and it would be much less desirable as a place of residence, and much less valuable to-day. I have sometimes put the question, what the effect upon the value of real estate in the cities and towns where our cars run would be if the street railway system should be suddenly abolished and could not be replaced. The usual answer has been: "It would not be worth 50 cents on a dollar."

THE CHAIRMAN. I think, Mr. Cummings, it costs me more to run my buggy from the centre of Roxbury to Park Street church than the cost of two fares, assuming you carry two people in the buggy.

MR. BAILEY. Is the damage caused by the horse-car tracks?

THE CHAIRMAN. I think the actual cost to a buggy costing $200 or $300 would be more than 10 cents.

MR. BAILEY. You mean the extra damage caused by horse-car tracks?

THE CHAIRMAN. No, I do not mean that. If I avoid the tracks, the wear of the buggy would be more than 10 cents.

MR. CUMMINGS. I know a great many people who keep horses, and people who keep horses ride five times in the horse-cars where they ride once in their own carriage, although they have a carriage and a driver. The estimate that the abolition of the railway system would decrease the value of property 50 per cent. may be an exaggerated estimate, but I trust that this committee will consider this question and form an opinion for themselves. Some localities would be affected very little, and some would be almost ruined; and I believe there would be an average depreciation of 25 cents on a dollar.

THE HELP OF ELECTRICITY.

The mere change from horse-power to electricity has caused a further increase in the value of real estate in places where they have had horse-cars for thirty years. A resident of North avenue, in Cambridge, informed me that there had been a general increase in value on that street of 25 per cent. since the electric cars began to run there; and I know personally of one lot of 60,000 feet, which in 1887 was offered me at thirteen cents a foot, with a discount of $1,500 besides, which now cannot be bought at thirty cents a foot. The increase in Brighton has been even greater. The real estate valuation of all the territory accommodated by our cars exceeds $800,000,000; and if it be true that 25 per cent. of that value is dependent upon the street-cars, that 25 per cent. would exceed $200,000,000, the annual interest on which, at 5 per cent., would equal our capital stock. The money value of our system in cheapening the cost of living and the cost of doing business, in the benefit to business and in the increased value to real estate, at all events amounts to a stupendous sum, in comparison with which the dividends paid to our stockholders, or the amount of money which might be exacted from us by the city, is of slight consequence. This

aspect of the question is so important that neither the mayor nor your committee nor the Legislature can afford to disregard it. If I am correct in my estimates, it follows that $1,000,000 invested in the street railway has benefited the community $20,000,000. Provided the street railway should pay the city of Boston in increased taxes $1,000,000, the city would only receive $1,000,000, or one twentieth of what it receives if the same sum is invested in the business.

This matter, Mr. Chairman, is one of the most important that has been presented to the Legislature for many a year; it deserves a most careful, broad-minded and liberal consideration, and the community cannot afford to have any mistake made.

It has several times been sneeringly remarked to this Committee that street railways are not charitable companies. It is true, but they are beneficent companies notwithstanding, and, in my opinion, in their selfishness contribute more to the civilization, convenience, happiness, and general good of this community than all the charitable institutions in Boston. We are represented as a giant, oppressing the community. In fact, we are a giant, who, partly from selfish motives, is working for the community might and main. We bear a charmed life, and the community cannot afford to have us ruined or even crippled. These roads at the outset were an experiment, and their rights were therefore made revocable. They are an experiment no longer, and this committee can do nothing more statesmanlike or public-spirited than to give street railways security and strength.

ADDRESS OF PRESIDENT WHITNEY.

Before the Central Club of Somerville, April 30, 1891.

In his address before the above club, Mr. Whitney elaborated the subject of transportation in this country as compared with the systems in vogue in foreign lands, and being armed with more complete data in regard to the latter, his speech has an added interest for those who would still further pursue its social bearings. After referring to the meagre statistics he had obtained from the Encyclopædia Britannica, he said:

At the time I spoke before the Committee on Cities of the Legis-

lature I was unable to find any statistics which would throw any light upon the subject later than those contained in the Encyclopædia Britannica, which brought them down to 1872 ; but only last week a friend of mine, who was in Washington, brought me one of the reports from the consuls of the United States. It is Consular Document No. 98, issued in October, 1888, and contains in the last part of the volume some exceedingly interesting translations from distinguished Germans upon the homes of the German working people ; and I hope I shall not weary you by reading from this paper some of the facts connected with the social life of Berlin and other cities.

Here is an article — these are all translations from German papers — translated by James Henry Smith, United States consular agent at Mayence : "The tenement, or flat, system of dwelling prevails in Germany, and a whole house occupied by but a single family is a rarity." Now, in the great city of Berlin of 1,315,000 inhabitants, in 1885 there were but 2,820 private houses, and in the city of Somerville there are almost 7,000 ; and in the city of Leipsic, a city of almost 150,000 inhabitants, there were of private houses only 148. "This naturally leads to an overfilling of houses, and in the large cities to the massing of the lower classes in the old tenements as they become abandoned by the people of means for newer structures. In time this herding together, as the buildings become even more rickety, gets to be a public evil. They are let and sublet until they become perfectly packed with tenants and subtenants, and through overcrowding, uncleanliness, bad drainage, and lack of ventilation, they become a place like Berlin, for instance, perfect pest-holes and generators of all kinds of disease and infirmity."

There were of underground, or cellar, tenements in the city of Berlin, in 1880, 23,289, and in those cellar tenements lived a population of 100,827. There were of garret tenements 10,416, and there lived in those garret tenements 39,019 people — almost as many people as in this city of Somerville dwelt in the city of Berlin in garret tenements.

That overcrowding of tenements in general is evident from this, that in Berlin in 1880, out of a population of 1,122,330, there were 478,052 persons living in tenements of but one room that could be heated, or an average of 3.75 inmates to a room ; 302,322 living in tenements possessing but two rooms that could be heated, or

an average of 2.23 to a room, and 127,346 in tenements with three rooms that could be heated, or an average of 1.56 to a room. There were thus 907,720 inhabitants of Berlin, out of a population of 1,122,330, or more than three fourths of the entire number of people, dwelling in tenements having not more than three rooms that could be heated, and having on an average 2.51 inmates to a room. In some of the other cities it was even worse than this. For Leipsic in 1880 the figures were even higher than for Breslau, being 3.84, 2.53, and 1.80 persons in a room in the three catagories respectively; and Breslau was higher than Berlin, being 3.84 to a room, "Only 29,323 of the large population of Berlin lived in tenements having eight or more rooms to a tenement; only 3,550 in Breslau in such tenements, out of the population of 272,000."

I have referred to these cellar tenements. It is astonishing how people can live in such places. These are all below the street. Thirteen and three-tenths per cent. of them were less than 3.28 feet below the outside sidewalk; 38 per cent. were four to five feet below the sidewalk; 10 per cent. were five to five and a half feet below, and 5.9 per cent. were five and a half to six and a half feet below the sidewalk. The people often do their work there, and they sleep there and they live there.

Now, how do the rents compare? How do the rents in this great city of Berlin, in these miserable tenements, compare with the rent or the cost of a small house, or with the cost of the larger number of houses in the city of Boston, and possibly in the city of Somerville? There were in 1890, in the city of Boston, something over 50,000 houses, according to the estimate of the assessors of Boston given in the auditor's report. I hold in my hand the report of the year 1889–90. The number of dwelling houses, exclusive of hotels and family hotels, in the city of Boston for that year was 49,716, and the number of houses of the value of $3,000 and less was 21,846. Take the cost of these houses and estimate them at 5 per cent. Of course the interest on the cost of a house is $150, and the taxes, say $50, making the whole $200, varying with the cost of the house. Now the cost of these tenements in the city of Berlin varies as follows: in the cellar tenements in 1875 the rent of a cellar tenement was $111 for a single tenement, the ground floor was $234, the second story $216, and the garret $70.

So far as I am able to judge, the cost of one of these tenements

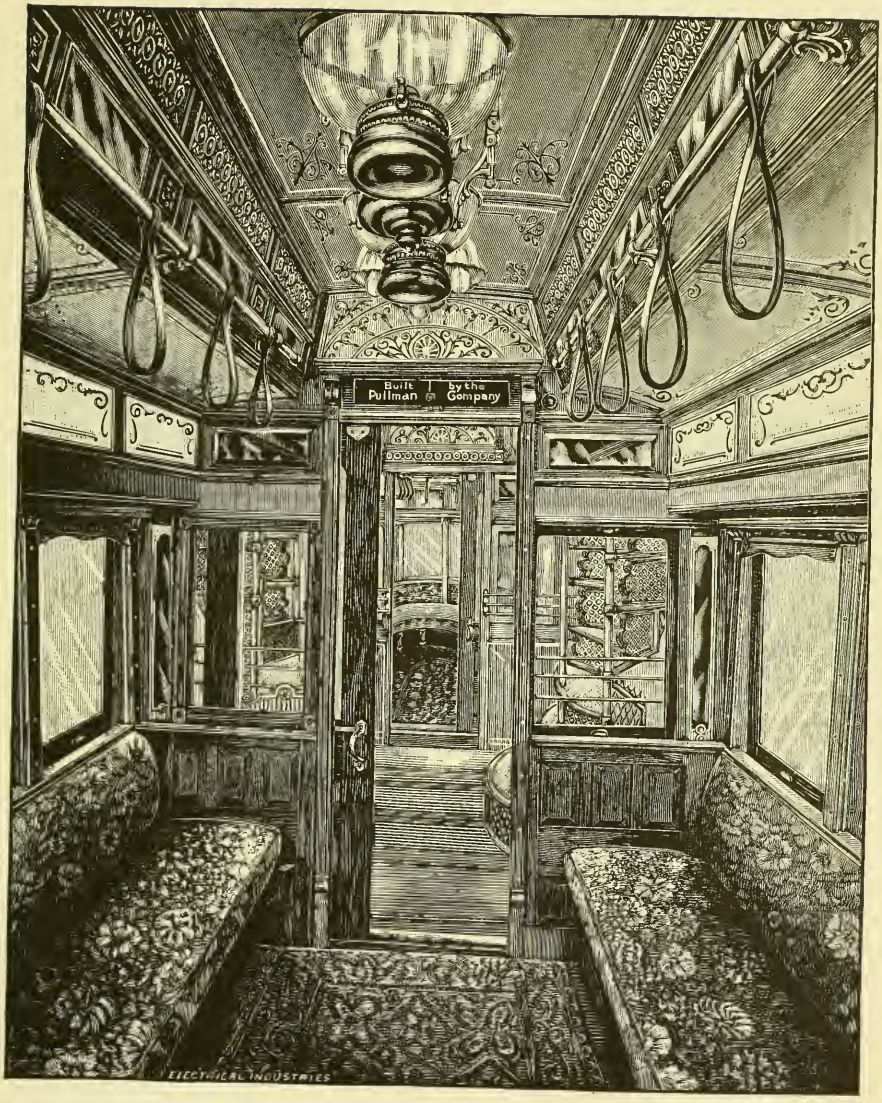
in the city of Berlin is almost as much as the cost of the largest proportion, or one-half at least, of the houses in and about the city of Boston. The fact is that in the city of Boston, and I dare say it must be so in the city of Somerville, the cost to the people of Somerville of a whole house is not much more, upon the average, than the cost of a single tenement in the city of Berlin. Well, now, these people are obliged to live so, in the first place, because their income does not permit them to live in any other way in the city of Berlin. It comes back to that in the end — the income of these people. It varies from twenty-five to seventy-five cents a day. In one of these papers is given a list of the weekly wages of 1885, a list of wages that are received by people in the different trades. The weekly wages, for instance at Leipsic, in the general trades, are given at the following figures per week. These are all translations from German papers and I assume they are correct: blacksmith, 11 hours per day, $4.28 to $5.47 per week; coopers, $4.04 to $4.09; masons, 11 hours per day, $4.88 to $6.20 per week; saddlers, $3.57 to 4.99; hodcarriers, 11 hours per day, $2.38 to $3.57 per week. Now, that is a specimen. Those are the facts connected with the social life of the people of Berlin, and substantially of every city throughout Germany, so far as I have been able to ascertain by careful observation of these statistics.

Now, the social life of these communities in Massachusetts and these United States is so entirely different as to be almost incomprehensible. I procured from the bureau of statistics a sheet showing certain statistics relating to the social life and population of the cities and towns in the State of Massachusetts for the last census, and I found, as I stated before, that in 1890 the number of persons to a house in the city of Somerville was 5.90, and I found that it had absolutely fallen — that while in 1880, the time of taking the last census, it was reported at 6.07, in 1890 the number of persons to a dwelling had fallen to 5.90, showing that there had been an increase in the dwellings among the poorer classes, and that there was absolutely a less number of people in a house, on the average, than there was ten years ago. Finding this proportion was so small, I was curious to see how this compared with the number of people living in the agricultural communities. I was unable to get the complete census for 1890, but the census for 1880, which I happened to have in my library, is as follows: in the State of Illinois the number of persons to a dwelling is 5.72; in Indiana, 5.47;

Ohio, 5.45 ; in Pennsylvania, 5.73 ; in Kentucky, 5.87. Well, now, that is a most astonishing record to me, that in the city of Somerville, of 40,000 inhabitants, within five miles of a great city, the people of this city should be able to live in such a manner as this, and that the life in this community is so nearly the life that is led by these agricultural communities as these statistics show it to be. I found that in the city of Boston in 1880 the number of persons to a dwelling was 8.26, while it had increased in the last ten years to 9.82. In Cambridge it was 6.38 in 1880, and 6.58 in 1890. The cities of Lowell and Lawrence, large manufacturing centres, are places where you might expect to find the people crowded into tenements, if you would expect it anywhere in the State of Massachusetts, but even in the city of Lowell there were only 6.86 people to a dwelling, and in the city of Lawrence 7.70.

Now, does the system of transportation in the city of Berlin have any bearing on this question? I think it does. The system in the city of Berlin is simply this : they go a certain distance for a single fare, and the maximum distance in the city of Berlin — and it is farther in the city of Berlin than any other German city whose statistics I have investigated — is a mile and a half. You can go a mile and a half for 2 1-2 cents, but when you cross that mile and a half — it makes no difference whether you go 100 yards this side or 100 yards the other side — you are obliged to pay two fares if you go beyond that limit, and a single fare is 10 pfennigs, which is 2 1-2 cents. You can ride one and a half miles in Berlin cheaper than you can in Boston, but if you want to ride two miles it is just the same as if you were to ride three, three and a half, or four miles. The maximum distance at which these stations are apart is one and a half miles, and they vary from that to eighty-four one-hundredths of a mile.

Now, you will see that the payment of 2 1-2 cents twice a day, going back and forth every day, for a man who receives only from 25 to 75 cents a day for his labor, is a much larger proportion of his daily earnings than the sum that is paid in the city of Boston, and it is impossible for these laboring people to pay, with the income that they receive, even the fare of 2 1-2 cents for the purpose of getting out of this particular district, and the same thing has operated in Berlin as would be absolutely sure to follow here if the fare were so high that the people could not go into the suburbs and avail themselves



INTERIOR OF THE "DOUBLE-DECKER" OF THE WEST END.

of the opportunities to get cheap houses and cheap lands, where they can build better, healthier homes.

Now, the system of Berlin is two cents and a half for every mile and a half. That system, if applied here (our road could be operated at the cost of roads in Berlin), would have brought to the West End road a net income of nearly three millions of dollars more than it received. There are 16,000 acres of land in Berlin, and less than 8,000 acres are occupied. These 28,000 buildings, holding 1,315,000 people, occupy less than one-half of the building land in the city of Berlin. Now, there is an elevated railroad in the city of Berlin, built at a cost of nearly $20,000,000. It is almost 20 miles long, and the best elevated railroad that there is in the wide world, and it carried last year 15,000.000 people and earned less than 4 per cent., in the aggregate, of its cost. It was started by private capitalists, and so expensive was it that it was abandoned and was finished by the government, and is owned by the government, and the same system of fares holds there, excepting that there is no fare less than five cents, and it goes from that to ten cents. In that great city of four times the population of the city of Boston there were only 15,000,000 people carried in 1890 on that elevated railroad, and the West End Street Railway Company carried on its surface system last year 114,000,000. Now, what would the West End Railroad Company, or what would these communities do, with an elevated railroad like that in the city of Berlin? Why, they would simply connect it with their outlying lines, and give the people the opportunity of going back and forth over these surface lines and over the elevated lines, and doing it for one fare if possible. See what the effect would be upon the social life of these communities!

What is the system of transportation in the city of Boston? Do we discriminate against the suburbs? Not at all. Isn't it a system that is calculated to send people to the suburbs because we make no greater charge for a person coming from Somerville than if he got into the cars at Causeway street and rode to State street? I agree that there seems to be some measure of injustice in that. I agree that, perhaps, we ought not to charge quite so much for a half-mile as for five miles, but I say that I believe that it is entirely due to this system that this condition of social life exists to which I have called attention. I believe that if you draw a line, a mile line, or a two-mile line, or a two-and-a-half-mile line, and say, "Thus far shalt

thou go, and no farther, for a single fare," then you compel large numbers of people to dwell within that distance; and there is some compensation — I say there is a large compensation — to the people that live within the narrow circle in the fact that some people will go farther within that inner circle, which is less crowded in consequence of it. They are willing to spend longer time in the cars, they are willing to be subjected to the discomfort of a longer ride and a crowded car, for the purpose of living in these cheaper and healthier places, and, in that way, it reacts upon the social life of the people within the narrow circle, and I have come to the conclusion that that is some compensation.

Coming down to the substantial transportation between the city of Somerville and the city of Boston, I want to call your attention to the fact that from Central street in this city of Somerville, I believe from this corner here, which is somewhat near the centre of Somerville, to Boylston street, Boston, it is about 4 1-2 miles. In fact, the cars run something farther than this point — it would be fair to say that the cars for the city of Somerville, about five miles each way, taking the distance of Boylston street or Temple place from near the centre of Somerville. We run the cars also beyond Boylston street, so that Somerville people have the opportunity to go beyond in this direction and further than Boylston street in the other. Now, what does it cost to run a car? There are a great many people who have an idea that cars can be run and give everybody a seat.

Well, now, it cost last year, the fiscal year ending October, 1890, including our taxes, a little more than 26 cents a mile to run a car. This year, owing to the increase in the cost of grain, the cost is nearly 28 cents. That is made up of about 12 cents a mile, while it costs us to feed the horses and pay for their depreciation, their harnesses, and one thing and another that comes into the cost of the motive power. It costs between 8 and 9 cents for conductors and drivers. That is absolute money paid out, and that is about 20 cents a mile, and it costs for repairs of the cars, repairs of our tracks and stables, and all general expenses and our taxes, from 6 to 8 cents. That gives nothing at all as a dividend for the capital invested. Now, in order to earn 6 per cent. upon the money that is invested to do this business, it costs about 6 cents a mile on the cost, making about 34 cents a mile as the cost. I presume that nobody here will consider that 6 per cent. or even 7 or 8 or 10 per

cent. was an extravagant sum to be allowed to the capital furnishing all this transportation, and taking care of it, and everything of that kind. Well, now, what does that mean? That means that the cost of running a car to and from the city of Boston, which is 10 miles, is $3.40. That further means that if each one of these passengers pays 5 cents, you must get 68 passengers on the round trip in order to pay your expenses and to pay your 6 per cent., and that means 34 passengers in the car each way, and that means not only 34 passengers in each car each way, but it means that for every trip that is run too; and if you do not get the 34 passengers each way for every trip that is run, you must make it up by getting more passengers into some of the cars, and that, I assume, is what is done. (Laughter.) But, unfortunately for us, we did not get over 34 cents from the city of Somerville, notwithstanding the fact that the city of Charlestown and its shorter haul was on this line, and notwithstanding that the people that get into the cars at the northern depots, going up town, are credited to the city of Somerville — notwithstanding all that, for last year the earning of the Charlestown line, of this whole division, the shorter haul and all was about 31 cents. That was all there was of it, and many of these Somerville lines do not pay. I say this in no offensive sense at all, but simply that you may appreciate the real facts of the situation, and then I am going to tell you what the remedy is. The first thing is that you should appreciate and understand the real facts of the situation, and these figures that I have here are not any figures that were made up for presentation to this Association; they are the reports that are made by our treasurer and auditor, and when they were made they had not the slightest knowledge, and neither had I, that they ever would be used for any such purpose; they are simply our business statistics for the year.

There is one line that we run in the city of Somerville called "the Highland-avenue transfer line." We ran 22,447 miles last year, and we received the enormous sum of $827.01 — that one cent is very important — or an average of three and seven-tenths cents per mile for that Highland-avenue transfer line. It cost us to run those 22,447 miles $6,000, and there was loss on that Highland-avenue transfer line of $5,000. There are people who believe that we can carry people and give them a seat all the way from Somerville to Boston, and for a single fare of five cents. If we carried

an absolute car full we should earn, with twenty-two seats, $1.10, and the absolute cost would be $1.40, and nobody can do it cheaper than that.

Well, now, what is the remedy? Is there any remedy for it? There is but one practical remedy, for I believe that the city of Somerville, the people who ride, would be unwilling to consent to an increase in the fares, and I am certain that we cannot buy our material at less, and I do not believe that the men that we employ will consent to any reduction in their wages; therefore, those two alternatives are impracticable, and there is but one other that I know of, and that is by the introduction of a cheaper system of motive power. There is a system of motive power which two years ago was in the experimental stage, and which the West End Railway Company has been introducing ever since, and I am happy to say that the expectations indulged in at that time have been more than realized; but when I look back upon it, and see what we have done or what we undertook to do two years ago, it looks almost like recklessness. I do not mean to be understood that up to this time we have realized any very great degree of saving, for the thing is in its early, incipient stage, but we are building power-houses which shall provide power at the cheapest possible cost. Great improvements are being made in the machinery, and along with this we have been able to use a much larger car. We are able with this power to run a car which shall seat thirty-six passengers at less than the cost of seating twenty-two, and that is what you are interested in having done. If we could run a car seating thirty-six passengers at the same cost as that of a car that seats twenty-two passengers, and we could fill it every time, we could afford to give everybody in Somerville who rides back and forth a seat, and have some money ourselves. Now, that is the system that the city of Somerville is interested in having adopted, and having adopted at the earliest possible moment; but this thing cannot be done without money. Now, the money that goes into this transportation business, in my judgment, should be made as secure as possible and it ought to be made a favorite investment, for I believe that there is no money spent in the community, and none given away for any charitable purpose whatsoever, that does any more good than that invested in this transportation business, and if the city of Somerville realizes its own interests in this respect, it will stand by the West End Railway

Company in what it is undertaking to do, and co-operate with it in its efforts. (Applause.)

We have been called before the Legislature this year with such attacks upon our property, upon our rights, as to be absolutely destructive of any further investments in this business if the attacks should be successful; no man can do it, and no set of men can. I cannot work out this problem for this or any other community unless it be understood implicitly that the money that is invested in this business shall be secured. So far as the taxation question is concerned, although I have differed with your city of Somerville, or some of the aldermen of the city Somerville, in this respect, I know that it was because the city of Somerville did not understand this question. It would be decidedly better for Somerville to relieve the railroad of every cent of tax, if thereby it could promote and encourage and develop this system of transporation, which is so important to this community.

Now, the city of Somerville is a city of very rapid growth. I congratulate you and every citizen of Somerville on your magnificent showing for the last twenty years, and especially for the last five years. The growth is something perfectly astonishing. It is paralleled only by the suburbs surrounding Boston — West Roxbury and Brighton and Everett — and it compares with the cities of the West and South. But along with this growth, and as a very important, if not the most important, factor in the growth and prosperity or comfort of the people that are to occupy these homes in the future, is the question of how they shall get back and forth to and from their business. We live in a most surprising age. When I see the very great difference between the wages paid abroad and the wages paid at home, I wonder if this condition of things can continue. I know that the fare between the city of Somerville and the city of Boston to most of you gentlemen here is of very small consequence. I know that very many of you would be perfectly willing to pay ten cents for a seat in and out of Boston, if thereby you could get it and if it were possible to arrange a system of transportation which should give the people who are willing to pay this ten cents back and forth a class of cars by which it could be done. I know that would be very satisfactory to great numbers of your people. But that is impossible: I apprehend that the day may come when the difference between five and ten cents will be a very great factor in determining the question where people shall live.

Now, then, how can we improve this system? How can we shorten the time without increasing the cost? That is the next problem with which we and this community have to deal. I have, personally, no desire for anything that I can make out of the elevated road or the underground road, to undertake it. The pecuniary compensations have not the slightest temptations for me, because it is such a tremendous question, so full of possibilities, it is true, but so full of dangers to any concern that undertakes it, I am free to say to you that I shrink from the task. I know there are plenty of men who will come into your hall to-day, or will go to the legislative hall, who will tell you that if you will give them a charter they will build the elevated or underground railroad for you, but it is perfect nonsense to listen to any such talk as that. The granting of any charter to anybody at this time would simply be an embarrassment of the whole question, for this is a question that will task the utmost capacity, in my judgment, of this community and Cambridge and Boston and all the communities that desire to see this thing done. I desire to see it done, because, seeing how the people live abroad, and seeing how important it is that the people shall continue to go to the suburbs, in order that they may live in this healthy way, I say there is no question of equal importance which confronts these communities. I shall do what I can to point out the proper way, but if any other man or set of men are willing to undertake the solution of that problem, and will build that underground or elevated road, and will give us at each end of that line a connection which will permit us to carry you to your homes and the people on the other side of the city of Boston to their homes, I shall be very glad of it. I believe that it will require some aid, some relief from taxation, instead of added taxation, in order that the thing may be done, and I hope that this Association will give to that question, when it comes up, careful consideration.

I have not the slightest idea what will be proposed, but I tell you that if the thing is done at all, it will have to be done in a way which the people little expect at this time, for, unless I am mistaken, there is a very general belief that there is money in the enterprise. Well, I do not believe that there is; but still I think — I know — it ought to be done. I know that there ought to be found some way by which, say from Thompson square to Roxbury postoffice, there shall be, before many years, some new and improved means of transit,

accommodating the dwellers within that section, and through the surface roads reaching the people beyond the termini.

This transportation question is a question that merits the careful consideration of your people. You have reached the limit of accommodation by horse-cars. Neither the West End Railway Company, nor any other corporation, nor any other parties, can do anything better by you than we can do to-day. It is exceedingly fortunate for this community that it has such excellent steam railroad facilities, and I do not begrudge it in the least. I am heartily glad of it, and I hope that the West End Street Railway Company may have the cordial co-operation and support of your Association and of this community in anything they may undertake to do which is reasonable towards the working out of this problem. Give us a chance to get the money, consent that the money that is invested in this be made secure, encourage people to invest their money, come to understand the question, and then you will do something toward the working out of this problem.

POWER HOUSES.

GREAT CENTRAL POWER STATION OF THE WEST END STREET RAILWAY — LARGEST ELECTRICAL POWER PLANT IN THE WORLD — DESCRIPTION OF THE BUILDINGS AND EQUIPMENT — MARVELOUS MACHINERY — MAGNIFICENT EXHIBITION OF MODERN ELECTRICAL AND MECHANICAL SKILL — SKETCHES OF THOSE WHO CONTRIBUTED TO THE GRAND RESULT, ETC., ETC.

IT is justly a matter of pride with Boston people that the largest and most thoroughly equipped electrical power plant on the face of the globe is located in their city, and that what is by all odds the most comprehensive system of electrical street railways in the world is also to be credited to "the Hub of the Universe."

The history of electricity as a motive power is unique ; as, young as it is — scarcely a decade since the first crude experiment with the subtle fluid as a propulsive force — electricity is already fast supplanting all other power for manufacturing purposes, and another ten years will undoubtedly see it installed as the motive power in the transportation service of this country.

To America belongs the credit of discovering this mysterious force, and to her indefatigable scientists and inventors is to be given all the honor of its practical application to the uses it is now or may hereafter be applied. Although the science is still in its swaddling clothes, enough has been developed to assure its future, and as the experiments made with electricity as a motive power have thus far been almost entirely confined to the propulsion of street cars, a brief description of the great plant of the West End Street Railway Company must prove of more than ordinary interest to all who take pride in our country's progress.

Preliminary to this description, however, it will be necessary to give a few facts in regard to the experimental stage of the present

system, that the reader may better comprehend the rapidity with which its present state of perfection was reached.

We have already referred to the consolidation of the various lines of street railways, and the improved service rendered the public in consequence; how the rapid growth of Boston demanded even better accommodations than was afforded under the new order of things in a very short time thereafter, and how the question of relieving the city of its overcrowded tenements and affording egress to the suburbs began to engage the attention of leading men. Various schemes were devised to keep pace with the pressing need of better transportation facilities, and at one time a cable system for Boston was seriously entertained; but at this juncture, fortunately, electricity was being introduced in some cities, and the subject at once attracted the attention of those who were most interested in the solution of the problem of still further relieving the congested streets of the city and providing comfortable, quick and cheap transit to its magnificent suburbs. Richmond, Va., was among the first to adopt electric power, and as it was about the time that the subject of a change in Boston's system was all-engrossing, Mr. Henry M. Whitney, president of the West End Railway Company, went to that city to investigate the merits of its electric railway.

It is almost needless to say that Mr. Whitney's investigations strongly impressed him with the possibilities of the electric car, and the favorable report which he made to his company at once determined the fate of the cable project and the adoption of electricity instead. Accordingly, in the early part of 1888 a contract was made for the electrical equipment of a line running from Park square, Boston, to Oak square in the Brighton district, the line from the former point to West Chester park being operated by an underground conduit and the balance by the overhead system. The conduit was shortly abandoned and the overhead wire was substituted its entire length.

In February, 1889, the Thomson-Houston Electric Company equipped the line from Bowdoin square, Boston, to Harvard square, Cambridge, with 20 cars of their own make, which they maintained for nearly six months at their own expense and demonstrated most satisfactorily their practicability. The West End Company at once gave them an order for 600 of their motors, and this was the beginning of the great system which is now in operation. Formidable

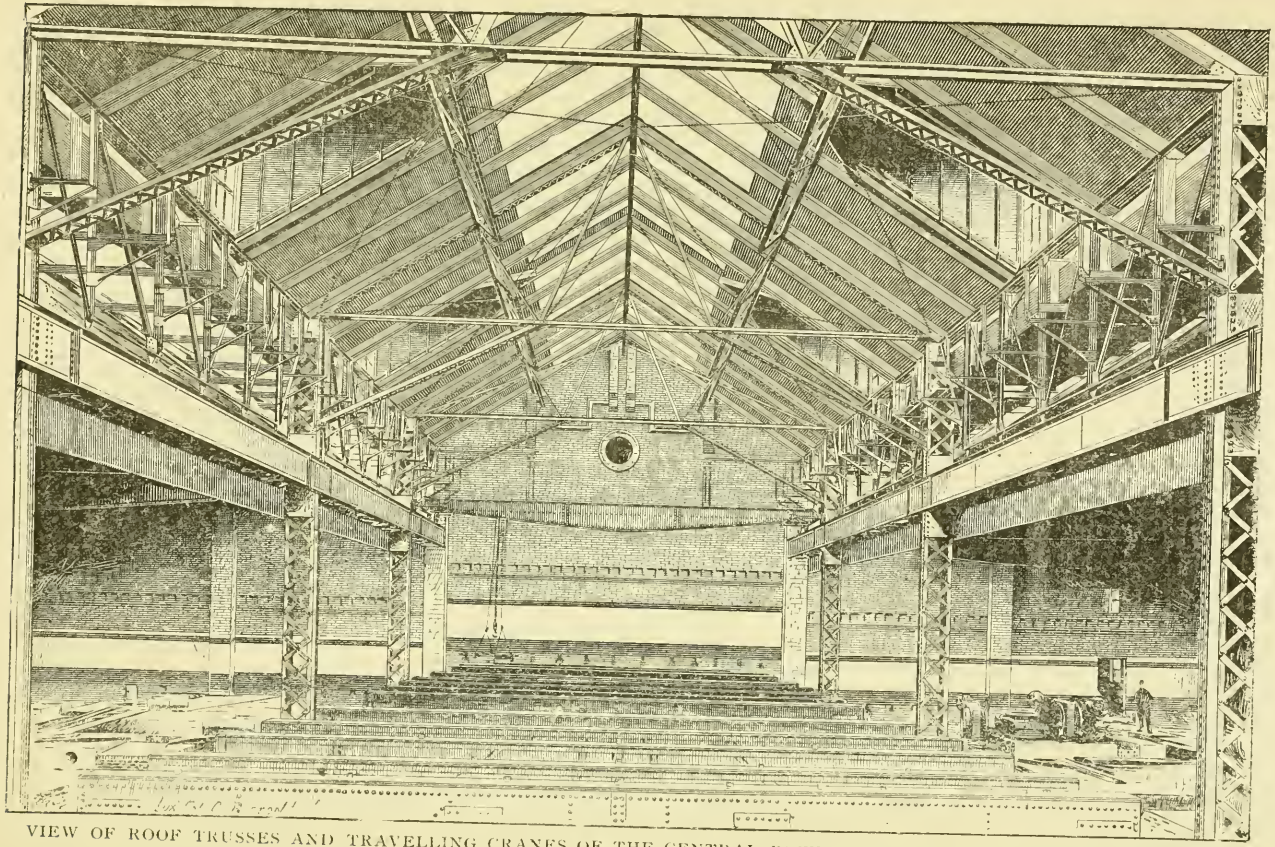
opposition to the overhead system was at one time raised, but this was gradually overcome, and when the West End Company applied to the Board of Aldermen for pole rights for their entire lines no one opposed the application.

Power for operating these lines was furnished from the Allston power house of the company and by the Cambridge Electric Light Company, but it was seen that these sources would soon prove inadequate and plans were at once consummated for a central station on a grand scale. For this purpose the property known as the Hinckley Locomotive Works on Albany street, Boston, was purchased and here is erected the great plant which, with its auxiliary stations, will furnish the power for all present needs as well as for any future extensions which may be required. The description of this plant in detail is as follows :

THE BOILER HOUSE.

The boiler house occupies a space 161 feet long by 85 feet 10 inches in width. It is built, as might well be supposed, in the most substantial manner, the roof being an iron truss of single span and the walls of the best brick masonary two feet thick. The roof, which was built and erected by the Boston Bridge Company, contains about 175 tons of iron, and in addition to the weight of material, is calculated to sustain a snow load of 20 pounds to every square foot of surface and a horizontal wind-storm blowing in either direction against each square foot, at 40 pounds pressure. It consists of two-inch planking, then seven-eighths inch boarding, then the same thickness of plaster, held in place by screeds, to which are fastened the slate. There are two large cupola ventilators on the ridge, while light is supplied by three large dormer windows on each side.

The interior of this house is of the most imposing character, the twelve batteries of water-tube boilers set in white glazed brick, a description of which is given further on in this work, presenting at a glance not only the magnitude of the work, but a scene rarely if ever to be witnessed in this country. Between the two sections or series of boilers is a space 20 feet wide, in the centre of which is a track for hand trucks which convey the coal from the pockets and is handled automatically in supplying the furnaces.



VIEW OF ROOF TRUSSES AND TRAVELLING CRANES OF THE CENTRAL POWER STATION, WHILE UNDER CONSTRUCTION, BY THE BOSTON BRIDGE WORKS. See pages 82 and 85.

Underneath this space is a unique mechanism for taking care of the ashes, which are emptied through a chute which connects with the fire door of each furnace directly into a pit, where they are received by iron hand cars and conveyed to another pit at the end of the boiler house. Here the ashes are emptied into a recess in which is constantly travelling an endless chain gear attached to bucket conveyors, which carry them to the top of the boiler house, whence a similar device conveys them to the ash dump, to be hauled away by cartage. The smoke flues are supported from the roof and are located behind the boilers. They are 11 feet wide by 13 feet high, tapering to 5x5 feet at the further end. These flues connect the boilers with the economizers and are covered with the "Magnesia" insulating covering to prevent radiation. Brass piping runs along the walls of the boiler house with branches to each side of each battery, with valves, etc., complete, adding materially to the appearance of the boilers. The usual gauges, test cocks, etc., are provided.

THE BOILERS.

The boilers which supply the power at the central station are the Babcock & Wilcox water-tube tpye, and are arranged in 12 batteries, six on either side of the boiler-room, each battery capable of supplying steam for 2,000 indicated h. p., or an aggregate of 24,000 h. p. in all. Each battery consists of two distinct boilers, occupying a space 23 1-2 feet long by 22 feet wide. Each boiler consists of three horizontal steam and water drums, 3 feet in diameter, running the full length of the setting, beneath which are arranged the sections of water tubes forming the principal part of the heating surface. These sections are built up of wrought-iron lap-welded tubes, expanded into suitable headers, with handholes opposite each end of each tube, the sections being placed side by side to the number of 14 tubes wide and 9 tubes high in each furnace. The tubes occupy an inclined position, and connect at the front and highest end to the steam and water drums by short expanded pipe connections, and at the rear end by long connections of a similar character, forming circulating tubes, and all sections are connected at their lower end — at the point furthest from the fire — to a mud collector, in which the majority of the sediment is collected as it is swept around by the circulation past the openings leading into it. The gases are com-

pelled to travel from the furnace across the tubes three times on their way to the stack, and consequently are reduced to the lowest possible temperature before being delivered into the flue.

Each boiler is hung up entirely independent of the brickwork on a set of iron columns and girders, so that the boiler is free to expand in all directions without straining the brickwork. This latter is finished in white enameled brick, and presents a very handsome appearance.

Boilers of this class have attained their popularity after many years of experimenting, mainly on account of their economy in fuel, ability to carry high pressures, and small amount of space required for a given amount of horsepower; and though the failures have been numerous, the demand for high pressures called for by such advanced engineering as is shown in the West End plant could only be satisfied by some type of sectional boiler.

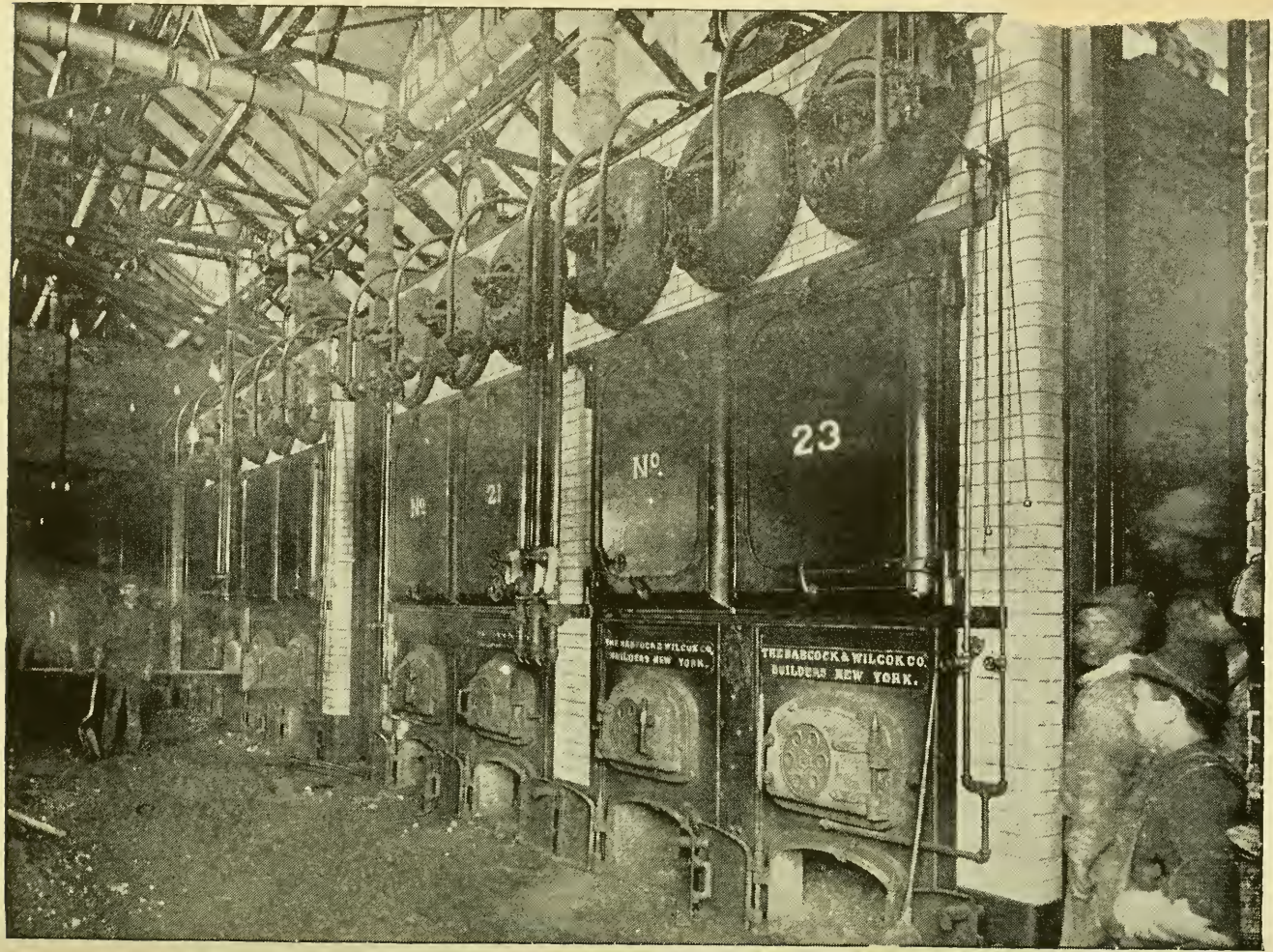
THE ECONOMIZERS

are the most complete it was possible to obtain, being made in England and imported expressly for this station. They consist of a series of vertical cast iron tubes, 10 feet high and 4 inches in diameter. There are four pairs of the economizers, each containing 600 tubes, connected at top and bottom, and through which the circulation of the feed water is maintained.

THE ENGINE ROOM.

The land on which the electrical plant is located is a portion of the reclaimed territory of the city, and this fact made the foundations of the buildings of paramount importance. Such care was expended on this part of the work that a brief description of the way the foundations were laid will prove both interesting and instructive.

The surface of the ground on which the buildings are located is some 17 feet above low tide, and the excavations for the foundations were made to that depth. The area occupied by the engine room, the economizers and smokestack was then thickly driven with piles 45 feet long and about 12 inches in diameter, at intervals of about 30 inches apart. Close piling is also underneath all the walls of the buildings. The piles in the engine room were cut off at 5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THE BABCOCK & WILCOX CO.
BUILDERS NEW YORK.

feet from low-water mark, while under the smokestack the piles were cut off just at that point. Under the chimney there are 810 piles, and under the engines and machinery 6000. After the piles were driven, the whole excavation, extending across the engine and machinery room, was filled with six feet of solid concrete, upon which the foundations rest. In the boiler house each battery of boilers is supported on six stone piers, each resting on five piles, but no concrete was used. The total foundations, including the excavations, piling, concreting and masonry cost nearly $300,000.

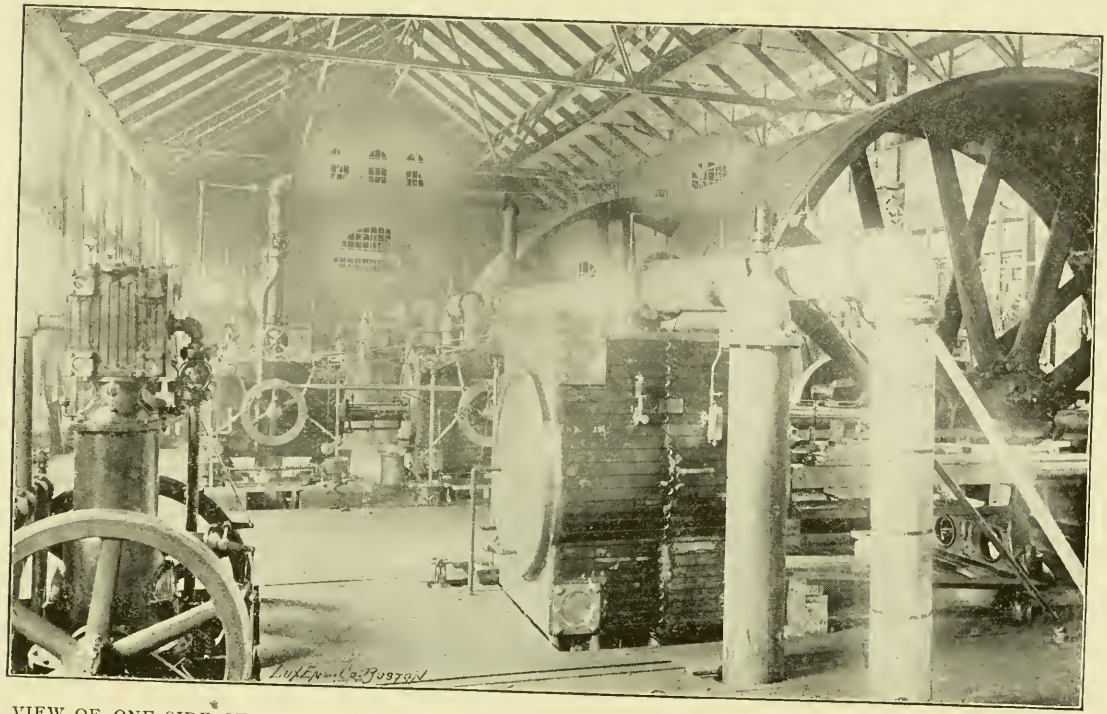
The roof of the engine room is a triple span riveted lattice truss with iron purlin, and is of the most substantial character. The material is all wrought iron, and during the process of construction all parts were subjected to tests, all the plates being required to show a strength of 48,000 pounds for every square inch of area. All rolled forms of iron were obliged to sustain 50,000 pounds per square inch. The plates and angles were subjected to a test of sharply bending them to a right angle at a working heat without showing any signs of fracture. The rivets in the structure were subject to the test of bending double, either hot or cold, so that the sides came into close contact without showing any signs of fracture : all iron was subject to the test of being bent cold 90 degrees around a small curve without showing any signs of fracture, and the workmanship was subjected to the most critical inspection.

The material and construction of this roof, as also the boiler house and East Cambridge power stations roofs, are most substantial evidences of the high class products of the Boston Bridge Company, by whom they were built. This company has done most creditable work wherever its services have been called upon for the execution of large contracts, notable instances of which are found all over New England in bridge and roof constructions for railways, municipalities, towns, etc. The new Harvard bridge connecting Boston and Cambridge over the Charles River, the Fitchburg Railroad bridge at Greenfield, Mass., and the New York and New England Railroad bridge at Hartford, Conn., both the latter spanning the Connecticut river, and also the two immense iron roofs of the new State armories in Boston are fine examples of their product.

On entering the engine room one is almost awed by the proportions of the great machinery and equipments. Of course the massive

are the central attraction, and are well worth a journey of miles to see. They were built by The Edward P. Allis Company of Milwaukee, Wis., and can be worked at 2,000 horse power, being simply grandly massive in their proportions, and built with especial reference to a high rate of economy and great durability. The high pressure and intermediate cylinders are tandem, on one foundation, being 23 inches and 36 inches in diameter respectively, with a 48 inch stroke. The low-pressure cylinder is on the other foundation, and is 52 inches diameter by 48 inches stroke. The intermediate receivers, of which there are two for each engine, are placed between the cylinders just beneath the floor, and with the steam pipe connections are all covered with "Magnesia" insulating covering to retain the heat. The cylinders are all steam-jacketed and are also completely surrounded with the same material. The fly-wheel is of mammoth design, being 28 feet in diameter, 10 ft. 7 inches face, and weighs 80 tons. It is double in its structure, being divided in the middle of its circumference, and built up of two rows of 10 sections each, with two sets of 10 arms of elliptical section, bolted to the rim of the fly-wheel at the intersections, and also bolted to the hub, which was cast independent of the arms. The fly-wheel is double-crowned, and carries two enormous double-ply leather belts, each 54 inches wide and 150 feet long, to drive the counter-shafting in the basement, the belts being carried under the floor by means of a mammoth belt tightener. Each engine requires two separate foundations, with a wheel pit between, each of which consists of a substructure of seven courses of granite, 12 feet high and about 9 feet wide at the top. Upon this is built the superstructure of brick 9 feet high and 8 feet wide, into which are set the capstones on which the cylinders and engine beds rest. The air pumps and condensers have independent foundations of granite, as also the engine belt tighteners and two rows of counter-shafting.

Steam is supplied to the engines from two mains, there being a connection to both mains, though only a single pipe comes to the engines, the two branches being connected by valves half way between the mains and the engines. This one steam pipe then enters a separator of special design about 36 inches diameter by 6 feet high, located over the throttle valve of the high-pressure cylin-



VIEW OF ONE SIDE OF THE PERMANENT ENGINE ROOM OF THE CENTRAL POWER STATION OF THE WEST END, SHOWING TWO OF THE REYNOLDS–CORLISS ENGINES, MADE BY THE EDWARD P. ALLIS CO., OF MILWAUKEE, WIS. See page 86.

der. Similar connections are made to each engine. The main steam pipes, which are duplicate throughout, just as in the boiler house, are 20 inches diameter at end nearest the boilers, tapering to 18 inches at the further end. Directly behind the low-pressure cylinder is situated the Corliss vertical circulating engine, also built by The Edward P. Allis Company, which performs three distinct functions, namely, circulates the salt condensing water, operates the air pump for the condensers, and acts as a feed pump for the boilers. Each engine is provided with a surface condenser, the cold water for which is provided by two lines of cast-iron pipes, drawing water from the South Bay. These pipes, which are entirely underground, start from the South Bay with a diameter of 36 inches, one being the inlet and the other the outlet, and retain this diameter till they enter the basement of the power house, where each pipe branches into two, one for each side of the house, each branch being 29 inches in diameter at the first engine, tapering to 11 inches at the furthest engine, with 10 inch branches to each pump and condenser. These pipes are also designed large enough for the whole station, and will be sufficient to supply 20,000,000 gallons of condensing water per day. From the condenser the condensed or hot water is pumped into the hot well, which is situated in the wheel-pit, and consists of a wrought-iron tank, there being one for each engine. From there it is pumped by a plunger on the same engine to the boilers, passing through the economizers, and being controlled by a complete set of valves in the pump room. A duplicate system of piping 20 inches in diameter has been erected next the walls of the building, to be used in cases of emergency as a free exhaust. No expense has been spared to make the steam part of the station absolutely reliable and capable of taking care of any possible emergency, and supplying any future demand likely to arise from increased buisness.

While speaking of the engines, a few words in regard to the immense business and facilities of their builders may not be amiss, and they are certainly entitled to it. The plant of The Edward P. Allis Company, as we have before stated, is located at Milwaukee, Wis., and is undoubtedly the best equipped and largest of its kind in the United States, the area of floor space in the various buildings aggregating 17 acres, or what would make quite a respectable farm if it represented so much land; 1,500 men are employed, and 80

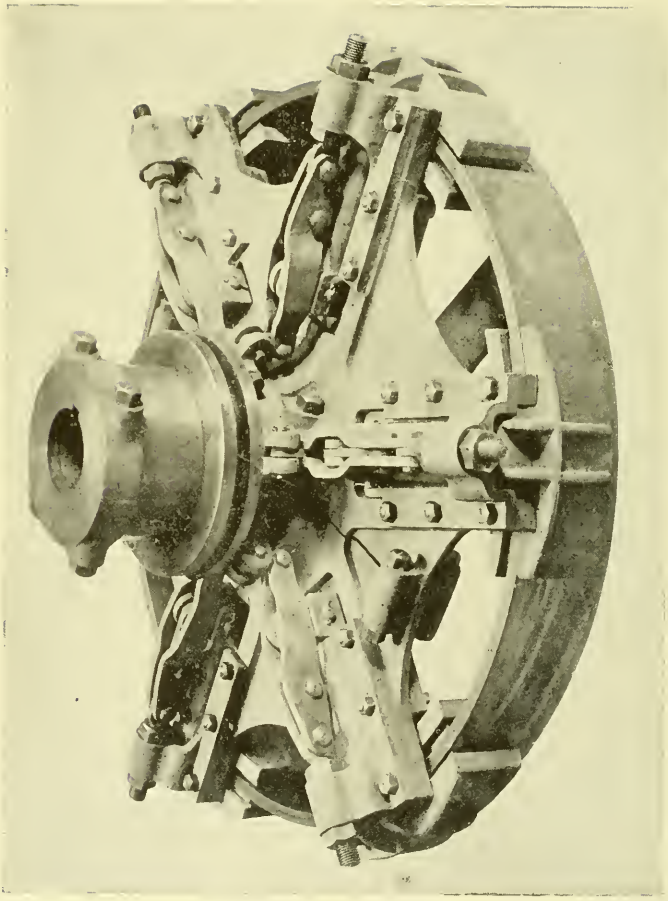
tons of pig iron are melted every working day and used in the manufacture of saw mills, flour mills, machinery of various kinds, and the Reynolds-Corliss engines, the sizes of which range from 25 to 2,500 horse power. For the past year the average output of these machines has been 23 per month, average size of cylinders 24x48 inches, or about equal to one 300 horse power engine a day. It is no uncommon thing for this company to ship 30 engines per month. To accomplish such a large amount of work requires facilities of the most complete character in all departments of the great plant, and these are provided on the most elaborate scale. Single castings weighing 22 tons are sometimes made, and for the purpose of handling them electric cranes of 40 tons capacity are used, while for carrying these immense pieces to the various tools gib cranes are employed.

THE PACKING.

The packing used on the engines is known as the Tripp Patent Metallic, and was selected on account of its being the only article suitable for the work, and is justly claimed by its makers to be the only really scientific packing on the market for all cases where such an article is adapted. It is so constructed that no section or piece is independent of the others, consequently they must open and close equally and all wear alike, giving the least possible friction, for all parts bear equally on the rod. This packing is manufactured by the Tripp Manufacturing Co. of 180 Summer street, Boston.

THE COUNTER-SHAFTING.

The system of counter-shafting adopted in the central power station plant is an elaborate one, and as much time, care and expense were expended in perfecting it, the description will be appreciated by those who care for its mechanical details: One section of this shaft represents part of the largest counter-shaft for electrical purposes in the world. The design is unique and perfect, and embodies the latest improvements in the way of clutch connections and devices for disconnecting the power speedily and safely. It presents a solid and compact appearance, and is provided with all the latest appliances for reducing the amount of useless friction and wear



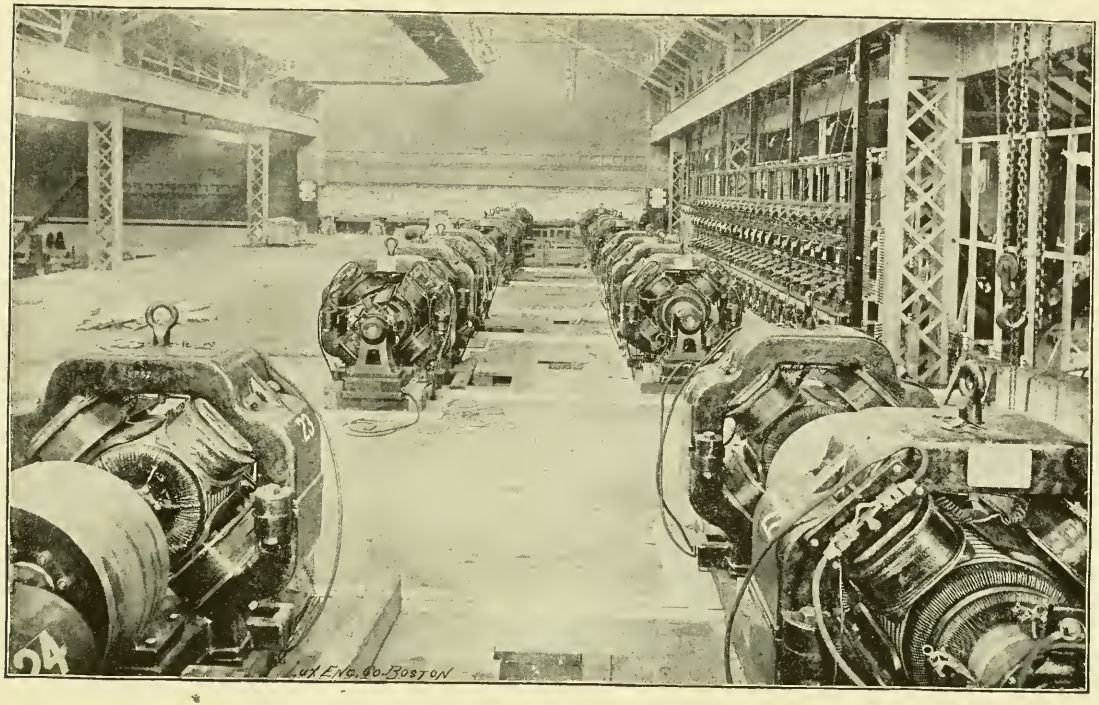
VIEW OF THE "84 COUPLING" FURNISHED THE WEST END BY THE HILL CLUTCH WORKS, OF CLEVELAND, O. See page 89.

and liability to accidents. Each section consists of a 10 inch steel shaft, 40 feet long with four 9 inch bearings. At the centre of the shaft, and supported on a steel quill or hollow sleeve, with independent bearings, is the main pulley 8 feet in diameter by 10 feet 7 inches face, cast in two circumferentially, and bolted together, and carrying the main driving belts. This quill allows the shaft to pass freely through without touching the pulley, so that the shaft can move, if clutched to another engine, without moving the pulley, and allowing each engine to be started and stopped independently of the others. It also allows the weight of this large pulley with the heavy belt strain to be borne independent of the shaft, and when running, the strain on the shaft is taken outside and close to the bearings instead of between the bearings. To this sleeve is attached the clutch ring, and on the shaft adjoining the ring is keyed an 84 inch Hill friction clutch, specially designed for this purpose. Over the whole clutch there is a casing finished on the outside, so that there are no revolving arms or projections in view, thus preventing much liability to accident. Each shaft is provided at one end with a clutch ring and at the other end with a clutch proper, so that it can be connected at any moment with the adjoining shafts. On either side of the main pulley are two dynamo pulleys, 32 inch face by 8 feet in diameter, driving the generators on the floor above by means of a 30 inch double-ply belt. All the boxes of the counter-shafting are jacketed for the purpose of having a cold-water circulation, to prevent any danger of becoming overheated. Each dynamo belt can be released from the driving pulley and supported on a cradle carrying rollers beneath each pulley, so that any dynamo can be stopped while the engine is still running. The mechanism for releasing the belts is operated by wheel-stands on the dynamo floor. The tightening pulley moves horizontally, and the frame is supported on horizontal beams. These pulleys are moved by means of a screw passing through the box on which the pulley is mounted, which screw is operated by bevel gears from the vertical shaft leading from the hand wheels on the dynamo floor above. The counter-shafting pulleys and belt-tighteners, including the main engine belt-tighteners, were all supplied by The E. P. Allis Company, while the clutches were manufactured by the Hill Clutch Works of Cleveland, Ohio. The main engine belt-tighteners are the largest that have ever been built, and were specially designed. Each belt-tightener consists of a heavy

upright cast iron frame, supporting two independent pulleys 6 feet in diameter and 5 feet face, which are situated on vertical sliding carriages, controlled by a heavy worm shaft operated in the basement by four 30 inch hand wheels. The clutches are the largest and most powerful friction clutches ever built. Fifteen of these monster clutches were furnished, each having a transmitting capacity of 4,000 horse power, at a speed of 233 revolutions per minute. The system of leverage used in these clutches is entirely new, and the most powerful and efficient ever devised. All parts of the clutches are finished accurately to guage, as are parts of a well made engine. All the bolts are turned, and the holes reamed, and every part made to fit together in the most perfect manner, all parts being also made interchangeable with like parts. These clutches measure 7 feet in diameter, weigh a little more than four tons each, and are easily operated by one man, when working under full load. The Hill Clutch Works have special facilities for manufacturing heavy work, and have perhaps been the most successful of all clutch manufacturers in their special line of business, as many of the largest and most modern and complete power stations have been equipped by them with power transmission machinery.

THE DYNAMO ROOM.

The floor of the dynamo room has been carefully designed, and is of unique structure, everything having been done to make it as solid as possible, and is supported on hollow iron girders and posts. These structures span the counter-shafting room, and are about seven feet apart, and rest upon the foundations already described. The posts are 6 feet by 1 foot cross section, and the horizontal girders 5 feet deep by 10 inches wide. These form the transverse girders and are all filled solid with concrete, being also braced with longitudinal girders 2 feet by 18 inches cross section. Between the transverse girders and over the longitudinal girders were placed brick arches 8 inches in depth, the whole upper surface being then covered over with 18 inches of concrete, in which were embedded the spiking pieces for the finished flooring, which consists of two inch planking and one inch hardwood boarding. So massive and solid is the whole structure that there is absolutely no vibration. The dynamo room floor measures considerably over 300 feet.



VIEW OF PERMANENT DYNAMO ROOM WITH TEMPORARY INSTALLATION. CENTRAL POWER STATION OF THE WEST END.

The generators are arranged in four parallel rows running the whole length of the floor, four dynamos being driven from each engine. These generators sit right on the floor, the adjustments of the belt being made by the belt tighteners. They measure 9 feet high, 8 feet wide, 16 feet long, and weigh each about 35 tons. They are each driven by means of a 30 inch belt from the counter-shafting below. Apart from its electrical properties this generator possesses many interesting and novel mechanical features. Each generator has four bearings, and the pulley has a self-contained double jaw clutch, which adds materially to the flexibility of the whole system. The armature shaft is provided with two bearings, and is entirely independent of the pulley shaft, but extends into the pulley passing through the pulley quill without touching it, far enough to support a clutch ring, by which the power is communicated to the armature. The pulley is 56 inches in diameter and 32 inch face, and is split on the circumference and bolted together, each half being supported on a separate quill, having one bearing each. The outer quill carries the clutch mechanism of special design with levers extending outside to a controlling hand wheel. The pulley of the generator can thus be run independently of the armature, and the generator cannot be started up, even though the engine and counter-shafting are running, without throwing in gear this clutch. By this means a perfect control of each and every generator is attained, and any generator can instantaneously be stopped from the generator floor without waiting for engine or counter-shaft or generator pulley to stop.

These generators are of the Thomson-Houston multipolar type, 53 of which are of 100 horse power, 48 of 80, and 17 of 360 horse power respectively, furnishing a total generating capacity of 15,260 horse power at a very conservative estimate. The total motor capacity as supplied by the Thomson-Houston Company is over 23,000 horse power, and comprises 725 motors of 15 horse power, and 500 of 25 horse power each. It will be seen by the above that the power stations have been equipped with reference to all possible requirements for years to come and also to meet any emergency in the shape of extra service that may be required, like that of the week of August 13, 1890, the event of the 24th National Encampment of the Grand Army of the Republic in Boston, when nearly one million passengers were transported by the West End Railway.

It would take a volume much larger than this to give an ade-

quate idea of the development of electrical science since its birth ten years ago and the marvellous achievements in adapting electrical energy to the demands of modern transit and the conditions of modern cities; and as the credit of nearly all this belongs to the Thomson-Houston Electric Company, a few facts concerning it will prove instructive. This company in 1881 was known as the American Electric Company, and had a small plant at New Britain, Conn. Two years later the plant was moved to Lynn, Mass., where enlarged quarters were obtained, but these in a short time proved inadequate to the growing demands and they were enlarged from time to time, until to-day the area devoted to floor space is about eight acres. Its capital, which was originally $50,000 has been increased to meet the growth of business, and the authorized capital is now $15,000,000, of which $10,000,000 has been issued, $6,000,000 in common and $4,000,000 in preferred stock. To the $10,500,000 paid in from this stock a sum of $6,000,000 or $7,000,000 has been added from the earnings. The various workshops are veritable hives of industry, 3,226 operatives being employed in the several departments, 388 of whom are females. From this small beginning at New Britain, which was principally devoted to electric lighting, has sprung a work now destined to soon solve the problem of transportation in all its phases. The development of the electric motor to its present prominence is indeed the most remarkable event in the world's commerce, but the Thomson-Houston Company have just taken another step which, in its magnitude and importance, is past comprehending, for it will eventuate in a new era for freight transportation unequaled in the annals of that traffic. The new device is an electric locomotive, and a recent trial developed an energy far beyond the calculations of its inventors, and gave ample proof of the capabilities of the new power for this service. When this locomotive is fully developed the plant of the Thomson-Houston Company in the near future will be something positively colossal in its proportions. Although but about five years have elapsed since the electric motor had a market, within the space of twelve months just past, over 5,000 motors and dynamos were shipped from the works of the Company at Lynn. It is only about three years since the first street railway was equipped with the Thomson-Houston motor (July 4, 1888,) and successfully operated. This was at Crescent Beach, about six or seven miles from the city of Boston. Now

note the growth of this system and conjecture, if you can, what the future will be, when, added to the street car service, freight trains will be drawn by electricity and almost everything operated by steam will also derive its power from the same source. At the present time (January, 1892,) the Thomson-Houston Company has in operation and under equipment 201 roads, with nearly 2,700 cars and a trackage of upward of 2,200 miles. Although there are other first-class systems of electrical transit, the Thomson-Houston Company seems to have the greater portion of the field to itself, and with its great resources, the untiring investigation and researches of its scientific experts, its large army of skilled mechanics and its magnificently equipped plant, the future of this great power is assured beyond all possible doubt.

HOW THE GREAT MACHINERY IS LUBRICATED.

All the machinery in the station is lubricated by a system peculiarly adapted to its great speed, and so arranged that streams of oil are in readiness at any point where they are required. The device for this purpose consists of large receiving tanks located over the economizer room, from which a series of supply pipes lead to the various bearings of the machinery, their elevation forcing the oil to all parts where it is to be used. In the engine house, at a very low point, are placed discharging tanks, into which the oil from the machinery after use is drained, and from which it is pumped back into the distributing room, carefully filtered and used over again.

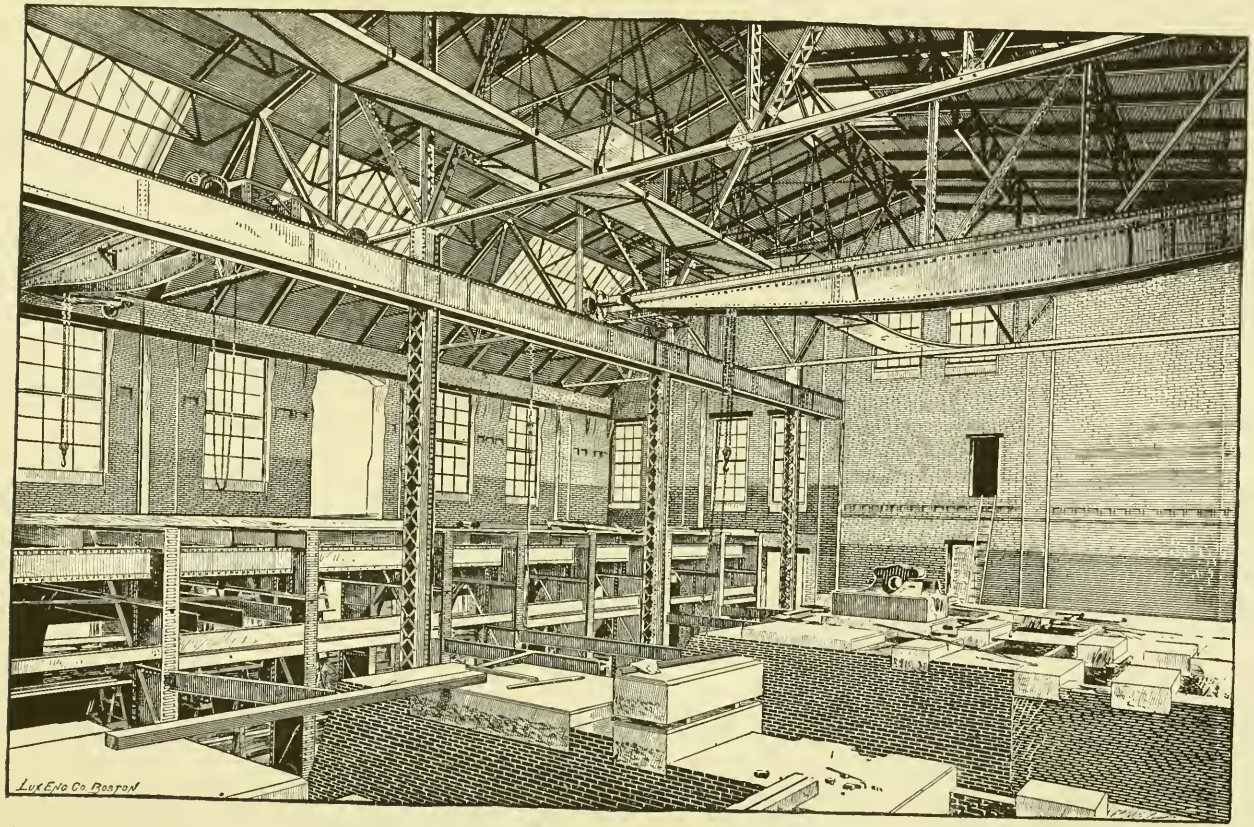
THE MAMMOTH BELTS.

The belts used in the power station are, as may well be imagined, of mammoth proportions, and the order for this part of the equipment was the largest ever received by a belt manufacturer, as far as is known, in the world. The large belts are each 54 inches wide and about 150 feet long, there being two to each engine, making a total of 1,800 feet of 54-inch belting. Their approximate breaking strain is 64,800 pounds. They are made from the centres of extra heavy hides of pure oak-tanned leather, carefully selected and double throughout. On the side next the pulley it is made of two 27-inch widths, and on the outside there is one 20-inch width in the middle and

a 17-inch width on each side. The centres of five hides were required for one width of belt, and it took 165 hides for each belt, or 1,980 hides weighing 79,200 pounds for the twelve belts. Two belts being used on each pulley, the width of belt service on the pulley is therefore 108 inches, the largest belt surface ever used on a single fly-wheel, and is wider by 34 inches than any leather belting known in this country. The belts for the generators, numbering 24, are 30 inches in width, and are made of the same high quality of stock. These consumed 625 hides, or 27,000 pounds of leather, making a grand total for the six engines and 24 generators of 2,600 hides, or 104,200 pounds of leather. Each pair of the large belts will transmit 2,000 horse power at a speed of 6,000 feet per minute. All the belts are endless, made of the best stock and of the heaviest leather, and are cemented only, there being neither pegs, rivets or sewing. This belting was all made by Mr. Charles L. Ireson of 97 High street, Boston, who has the distinction of having made the largest amount of leather belting in one order ever given out to a manufacturer. It must be borne in mind that the above description of the belts is simply for such as have already been supplied by Mr. Ireson. When the plants are fully equipped, they will require about 5,000 hides, or 200,000 pounds of leather, and a total length of 4,500 feet of 54-inch belting. For the manufacture of these immense belts special machinery is required, some of which is peculiarly unique, and it is safe to say that no other establishment in this part of the country is equipped with special reference to producing them.

A MONUMENTAL CHIMNEY.

We have already described the pile and concrete foundation of the immense smoke stack. Above this was built a granite foundation 17 feet in depth, 60 feet square at the base, tapering to 30 feet square at the top, solid throughout with the exception of three or four courses at the top, in which allowance was made for a soot-chamber. The chimney is 28 feet square at the base, extending to a height of about 30 feet, the level of top of boiler house, from which point it is circular in section, 26 feet in diameter, tapering to 17 feet near the top, where it bulges out in a neat design to 22 feet in diameter at the extreme top. Its altitude is 252 feet, or some 30 feet higher than Bunker Hill monument. The flue is 13 feet 8



VIEW OF ROOF TRUSSES, TRAVELLING CRANES AND DYNAMO FLOOR OF THE EAST CAMBRIDGE POWER STATION, WHILE UNDER CONSTRUCTION BY THE BOSTON BRIDGE WORKS. See pages 82 and 85.

inches in diameter, and is parallel all the way up extending to within a few feet of the top. The chimney consists of an outer shell 32 inches thick at the bottom, tapering to 16 inches at the head, and has 12 internal buttresses extending the whole length, but not touching the inside core or shell, which is left free to expand by the heat of the gases. The inside shell is 21 inches thick at the base and tapers to 8 inches at the top. The top of the chimney is provided with a finely designed cap of cast iron, made in 24 sections, and weighing nearly four and a half tons. To this cap is attached a series of lightning rods. Inside of the chimney and near the top is a means of taking the temperature of the escaping gases. This consists of an iron bracket and pulley with a wire rope, by means of which a thermometer can by raised to the top and the heat registered. This immense stack, as well as all the brick and other mason work, was constructed by Messrs. Whidden & Co. of 101 Milk street, Boston, the bricks being furnished by the Bay State Brick Company, whose works are described under the division of this work headed "supplies." In the erection of the chimney no outside staging was used, the entire work being performed from the inside by means of an elevator.

THE MACHINE SHOP.

Connected with this great plant of course is a well equipped machine shop, located in the building on Albany street formerly occupied by the Hinckley Locomotive Works, the front portion of which is reserved for offices. Here all work of equipping the electric cars is performed, as well as all repairs, etc.

THE ALLSTON POWER HOUSE.

The first power house erected by the West End Railway Company was at Allston, about six miles from Boston. This will be continued in service, and is equipped so as to afford about 1,200 horse power. The engines are of the Armington & Sims pattern, the generators being of both Thomson–Houston and Edison makes.

THE CAMBRIDGE POWER HOUSE.

In addition to the above sources of power, the West End Railway Company is erecting a large station at East Cambridge, the con-

struction and equipment of which will be similar to the Central Power Station when completed, although not so elaborate in details. This will provide 9,000 horse power, making a total of nearly 36,000 for the electric system.

SOURCES OF SUPPLY.

Corporations, Firms, and Business Houses, which Contributed to the Magnificent Equipment of the Great Power Station — Representative Concerns in other Supplies for Street Railways, etc., etc.

OF course in the erection of all great plants supplies must be drawn from sources which admit of no delay in the work, and which, as in the present instance, can be relied upon to meet the requirements of the most advanced and progressive ideas in mechanical construction. For this reason those who have in any way contributed to the successful results attained in the erection of the electrical plant of the West End Company are deserving of mention as among the representative concerns of the country whose facilities enable them to fill orders of the most gigantic proportions, and in a manner satisfactory to the scientific demands of modern engineers. It is therefore of special interest to all concerned in the erection of great plants of any description to learn of such establishments as are specially equipped for the work, and the following houses are representative ones in the matter of such supplies. Reference may also be had to the advertising pages of this work for such as are not mentioned in this connection.

WAGON WHEELS.— ARCHIBALD WHEEL CO., LAWRENCE, MASS.

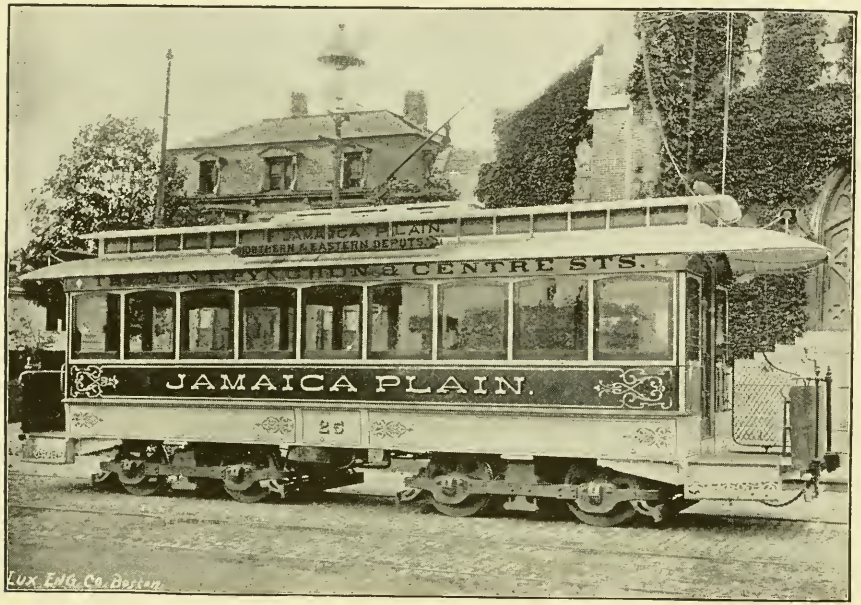
The West End Railway Company use a large number of carts, wagons, etc., in their business, and the wheels for these vehicles are all of the celebrated iron hub pattern made by the Archibald Wheel Company of Lawrence, Mass. For hard service these are unquestionably the best that can be produced, being particularly adapted for express and other heavy teaming, trucks, carts, hose wagons, portable and steam fire engines, and are the leading wheels used for these purposes throughout the country.

STREET RAILWAY CARS — J. M. JONES' SONS, WEST TROY, N. Y.

Boston has always maintained a high standard in the matter of street railway equipment, and no little credit for this is due to the fact that nearly all of its cars have come from the establishment of J. M. Jones' Sons, West Troy, N. Y., a house established over half a century ago, and which unquestionably has as wide a range of patrons as any similar concern in the world. Its cars are to be seen on nearly every line of railway in this country and South America, while across the water the tourist meets them in cities of the German Empire, in France, England, the West Indies, Australia and at far off Bombay, India. The Messrs. Jones supplied the cars for nearly all street railways entering Boston, previous to and up to the time of consolidation, and since that period have furnished the West End Street Railway with a majority of its cars. This firm also built the first equipment of cars for the Highland Street Railway of Boston, some twenty years since, and they were models of excellence in both design and finish, even for that early date. At the present time they are engaged upon a large order for the electrical equipment of the West End Company.

OILS — VACUUM OIL CO., ROCHESTER, N. Y. E. A. RECORD, MANAGER OF THE ELECTRICAL DEPARTMENT 45 PURCHASE STREET, BOSTON.

The advent of electricity as a motive power and for purposes of illumination naturally worked a revolution whose effects were such as to reach nearly every branch of industry and to call for a radical change in methods and materials employed. Ordinary machine oils were found wholly inadequate to meet the changed condition of things, and a lubricant adapted to the swift running machinery required for generating the subtle fluid at once sprung into demand. The first to meet this requirement successfully was the Vacuum Oil Company of Rochester, N. Y., whose New England branch is located at 45 Purchase street, Boston, and the electrical department is under the management of Mr. E. A. Record, a gentleman of extended acquaintance among prominent electrical people. This company conducted many careful experiments before offering to electrical men oils for their use, but when they did so their products not only were



VIEW OF CAR FURNISHED THE WEST END BY J. M. JONES' SONS, OF WEST TROY, N. Y. See page 98.

found adapted to the new era of locomotion, but gained for the house a prominence which has placed themin the front rank as manufacturers of electrical lubricants, and their goods are known and used in all parts of the world where electrical machinery is employed. To supply the great and increasing demand for their oils, the company have established branches in nearly all of the principal cities of the United States, with convenient points for distribution in Canada, England and other parts of Europe, India, etc. A special study is made of the fitting of lubricants to all classes of machinery so as to develop the best results at the least expense of power. It is not often realized how much power may be saved or wasted through the lubricants used. The proper oil is the one which saves the most power, and this is the one to use, irrespective of cost.

The Vacuum Oil Company publish a series of carefully prepared pamphlets covering different phases of the broad subject of lubrication, which they distribute free to any interested enough to ask for them, and the fact that these books have all run through several large editions shows that they are very well received by the machinery-using public.

Users of the Vacuum Oil Company's goods give a strong endorsement of their high quality, and particularly of their uniformity, something which is necessarily one of the most important requirements in lubricants for electrical work.

LINE EQUIPMENT. — WALWORTH MANUFACTURING CO., BOSTON.

In the electrical equipment of the various lines the poles are of the Walworth type, manufactured by the Walworth Manufacturing Company of Boston, whose extensive plant is located at City Point, South Boston. These poles have been adopted by all the leading electric railway and illuminating companies of the country, and have the unqualified indorsement of the Thomson-Houston Electric Company, the Sprague Electric Railway Company, and many other high authorities in the electrical power world.

CASTINGS AND FITTINGS. — THE MECHANICS' IRON FOUNDRY CO., BOSTON.

Elsewhere we give a fine illustration of the plant of the Mechanics'

Iron Foundry Company of Boston. The works, which are located at the corner of Kemble and Gerard streets, cover an area of two and a half acres and consist of several buildings devoted to iron founding and allied work, pattern shops, moulding rooms, large floorage space for storage of sand, iron, lumber, etc. The capacity of the works is from 26 to 30 tons per day of castings, with an average output of 23 tons for nearly every working day. The work performed is of every kind imaginable, from heavy to light castings, and the most reliable as to quality and workmanship, a fact well attested by the patronage of the West End Company. Our illustration shows the property of the company, two large buildings, 124x60 feet and 124x88 feet respectively, located directly across the street from the office ; also a new pattern shop 85x60 feet, fronting on Gerard street. Nothing but the celebrated Bannister rocking grate for furnaces is carried in stock, the house devoting itself entirely to order work, for which it is especially equipped.

THE G. W. & F. SMITH IRON CO.

This company, whose works adjoin the above described plant, are large producers of building iron, such as store fronts, girders, etc. It was formerly located on Federal street, but increasing business made larger quarters imperative, and in their present location they have amply provided for this. In the erection of the great central power station of the West End Railway Company, this establishment was drawn upon largely for supplies and material in its particular line, and it is needless to say that it was equal to all requirements in both the quality of its work and promptness in the filling of all orders.

FLY WHEELS, BELT TIGHTENERS, ETC.—SOUTH BOSTON IRON WORKS.

In the equipment of the power plant the South Boston Iron Works has played an important part. This company has built and delivered to the power stations, fabricating this work for The Edward P. Allis Company, the following material, viz : 5 28-foot by 10-foot fly-wheels ; 45 sole plates ; 45 floor stands ; 34 belt cradles ; 30 8-foot by 32-foot jack pulleys ; 1 8-foot by 5-foot pulley ; 3 8-foot by 10-foot pulleys ; 8 1000 horse power engine belt tighteners ; 1 500

horse power engine belt tightener; 34 dynamo belt tighteners; 8 1000 horse power tack shaft gun iron sleeves; 1 500 horse power do.; 36 9-foot ball and socket boxes; 18 14-foot balls and socket boxes, and pillow blocks and bearing.

The total weight of the material supplied by the South Boston Iron Works *exceeded one thousand two hundred tons.*

INSULATING COVERINGS — S. C. NIGHTINGALE & CHILDS, 134 PEARL STREET, BOSTON.

The insulating covering used to prevent the loss of heat by radiation from the engine cylinders, heaters and connections, also the direct and exhaust steam pipes, hot water pipes, etc., for the several power stations of the West End Street Railway Company were furnished by Messrs. S. C. Nightingale & Childs, 134 Pearl street, Boston, and are the celebrated "Magnesia" non-heat conducting coverings. This firm has meet with signal success in placing this article in the New England States and Canada, 250,000 feet and upward having been applied to steam surfaces in New England alone during the past year. So valuable and durable is this covering found to be in practical use that the foremost engine builders, mill engineers and architects prefer it to any other known material for this purpose. By its use the possible loss by radiation of heat and condensation of steam is reduced to the minimum, and its remarkable efficiency saves the cost of application many times a year.

From the nature of the material and the process of manufacture it is entirely unaffected by heat, however long exposed to its influence, hence it retains its powerful insulating quality and structural form indefinitely.

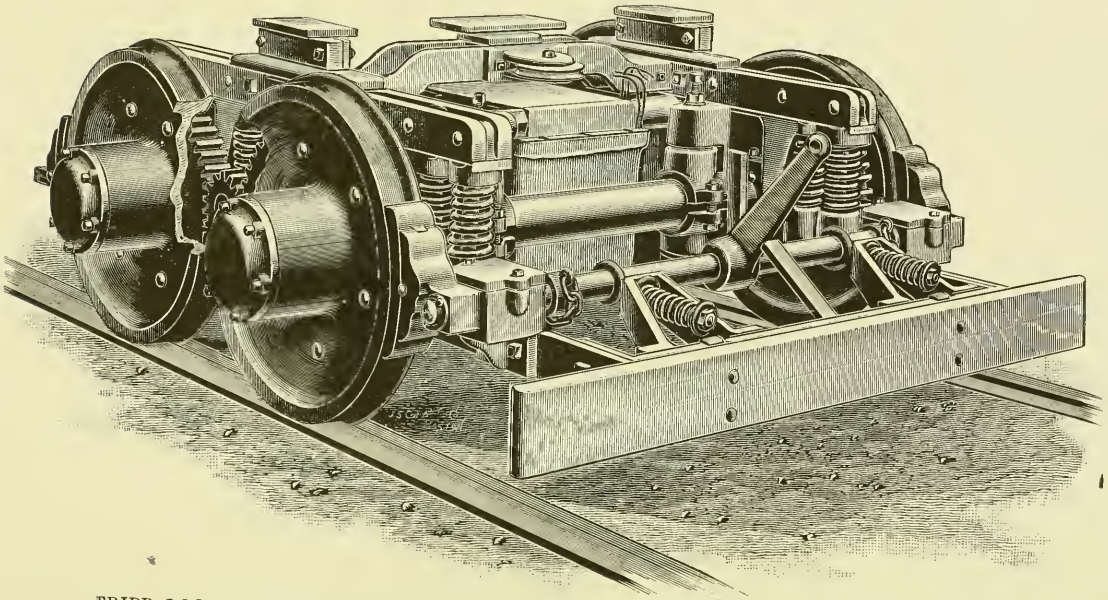
VALVES — CHAPMAN VALVE MANUFACTURING CO., BOSTON MASS.

As is well known among steam engineers, the tendency of to-day among the best and most expert engineers is to carry steam at high pressure and the compounding of engines, as a matter of economy; but in order to do this with safety and economy, it has been developed that all that pertains to this service requires extra strength and reliability, meeting as it does extraordinary expansions and contractions and all that is incident to this extremely hard service. In

view of this, efforts have been made to secure a steam valve that should not only be strong enough to be safe, but one that could be manipulated easily under heavy pressures and shut tight when required. To meet this pressing want the Chapman Valve Manufacturing Company have recently patented and put upon the market a straightway valve with a removable and adjustable seat of bronze, with extra heavy shell to withstand the expansion and contraction, with either gun metal or steel spindle, all of which is constructed with care and with a view to meet this hard service. The construction of these valves comprises the following cardinal features: A plug or gate in one piece, guided closely in body of shell by means of the ribs or splines and taking all strain upon the splines instead of coming in contact with the faces of the seats until the plug is seated, thereby insuring a true and easy vertical movement of plug as against any other form of plug. The seats are made from hard gun metal bronze for steam, or from any other metal for gas, acids, etc. These seats are pressed into their proper position in the body of shell and are held to their exact line by means of the screw gland inserted through the pipe ends, which can be worked forward and back by means of spanner coming in contact with the splines in the inside of screw gland. These seats are interchangeable and removable. By means of taking off the cap and removing the plug, the seats may be forced towards the inside of valve by means of the screw gland until they are released and another can be inserted, and is the only valve built with metal seats that are strictly removable. These valves, although but recently patented and put upon the market, have the complete endorsement of the best steam engineers of the country, and are being put into the best plants now being constructed for electrical and other purposes, where heavy pressures are carried.

ELECTRIC TRUCK — TRIPP MANUFACTURING CO., 180 SUMMER STREET, BOSTON.

In the accompanying engraving, we illustrate an entirely new and improved form of truck recently patented and placed on the market by the Tripp Manufacturing Company, Boston, Mass. It is known as Tripp loose wheel electric truck No. 11. This truck is noteworthy in its construction for many novel features. The wheels, 26



TRIPP LOOSE WHEEL ELECTRIC TRUCK NO. 11, FURNISHED THE WEST END BY THE TRIPP MANUFACTURING CO. See pages 102 and 103.

inches in diameter, are loose upon the axle, and are fitted inside the hub with the well-known Tripp roller bearing, carried on a 4 1-2 inch journal. Upon the inside plate of each wheel is bolted a 20 inch gear, which fits into a pinion 8 inches in diameter, keyed on to each end of the armature shaft, thus applying power to four different points, and giving traction upon all the wheels. The entire weight of the motor is supported by two rigid axles, overcoming the necessary friction caused by the motor bearing upon a revolving axle. The truck is interchangeable; it will swivel under either an open or closed car, and will take any radius curve without interfering with the car sills or running board. The above mentioned advantages, in connection with the fact that this truck requires only a portion of the power needed to drive the ordinary truck, makes it most complete, and its manufacturers confidently predict its success. The West End Company have tested this truck and found it to meet all requirements.

INSULATED FEEDER-WIRES — SIMPLEX ELECTRICAL CO., 620 ATLANTIC AVE., BOSTON.

Of the many miles of insulated feeder-wires which the West End Street Railway has necessarily used for the proper distribution of its current, the larger part has been furnished by the Simplex Electrical Company of Boston, and the marked efficiency of this company's superior grade of insulation has undoubtedly resulted in reducing the loss of power to a minimum throughout the immense area over which it has been necessary to maintain an equal pressure. So great have been the calls on the Simplex Company for insulated railway feeders and conductors for electric light and power plants by companies desiring safe and efficient insulation, that it has been necessary several times during the past few years to increase the capacity of their factory. It has been the policy of the Simplex Electrical Company to not only maintain, but as far as possible improve, the quality of their insulation, and the wisdom of their course has been made apparent by an increase of orders from all parts of the world and by the fact that because of their excellence the "Simplex" wires have become the standard.

CAR WHEELS — A. WHITNEY & SON, PHILADELPHIA, PA.; DORNER & DUTTON, CLEVELAND, O., AND AMERICAN STEEL WHEEL CO. OF NEW YORK.

The most important part of a car naturally requires to be constructed with reference to durability without unduly burdening the trucks with weight, a result which but few manufacturers seem to have reached in their construction. For this reason the number engaged in making car wheels in this country is limited almost, we might say, to the three firms mentioned above — Messrs. A. Whitney & Sons of Philadelphia, Pa., and Messrs. Dorner & Dutton of Cleveland, Ohio, and the American Steel Wheel Company of New York city. The West End Railway Company obtains its supplies of car wheels from these manufacturers, and no better test of their qualities could be made than the constant service exacted by this great corporation.

FRICTION CLUTCHES, SHAFTING, ETC.— THE FALLS RIVET & MACHINE CO., CUYAHOGA FALLS, O.

This company, which has a finely equipped plant at Cuyahoga Falls, Ohio, are especially interested in the manufacture of power transmitting machinery for electric railways, power stations and electric light plants of all kinds. They make a superior friction clutch and the highest quality of shafting for electrical or any other service required, and their facilities are such that the largest orders or any special contract work can be filled promptly.

STEAM ENGINES. — M'INTOSH, SEYMOUR & CO., AUBURN, N. Y.

The McIntosh & Seymour engines in the Central Power Station were built by the above company, and are pronounced by mechanical engineers models of their class. This company make a specialty of compound engines for electrical service, and the large number of plants they are daily equipping with their engines is the best possible evidence of the high esteem in which they are held by electrical engineers. They have a large plant at Auburn, N. Y., and being on the line of the New York Central Railroad they are in quick communication with all parts of the United States and the Provinces.

ELECTRIC CARS, MOTORS, ETC — NEW YORK EQUIPMENT CO., 15 WALL ST., N. Y.

The demand for electrical supplies has already developed important bases for furnishing such equipments, the largest and most complete of which is the New York Equipment Company of 15 Wall street, that city. This company buy, sell or exchange electric cars, motors, generators, and everything else required for power or electric light plants. These articles can always be had, new or second-hand, at the lowest prices for cash, instalments, or on the car trust plan. Parties about to instal plants should place themselves in communication with this house.

OKONITE WIRES AND CABLES— PETTINGELL ANDREWS CO., 192–202 SUMMER ST., BOSTON.

The Pettingell Andrews Co. are large dealers in electrical supplies for power stations and light plants and contributed largely to the successful inauguration of the electric system of the West End Street Railway. They are sole New England agents for the celebrated "Okonite" wires and cables in use by this company, and promptly supply everything required in electrical equipment at the most reasonable cost.

RAILROAD BRUSHES AND DUSTERS — A. & E. BURTON & CO., 21 EXCHANGE ST., BOSTON.

Messrs. A. & E. Burton & Co. are very extensive importers as well as manufacturers of brushes and feather dusters particularly fitted for cleaning car upholstery and other work of this character, and supply these goods to nearly all the leading lines of railroads, steamboats, as well as hotels, etc., throughout the Eastern States, the West End Railway being among their numerous patrons for these supplies.

VARNISHES — JOHN BABCOCK & CO., BOSTON.

No vehicle taxes the wearing qualities of varnish like that of a street car, consequently when such an article is adopted by a company it is about as good a certificate of excellence as can be obtained. The cars of a street railway are constantly exposed to the

influences of the weather and subjected to the severest usage in the crowded streets of a city like Boston, which makes it a matter of importance to use a reliable article. The varnish used by the West End Railway Company on its cars, both for interior and exterior work, is from the well-known manufactory of Messrs. John Babcock & Co., 104 Water street, Boston, a house which has been in existence since the year 1832, and whose specialities are standard coach and car varnishes.

BRICKS — BAY STATE BRICK COMPANY, NO. 5 PEMBERTON SQUARE, BOSTON.

As stated in our description of the great chimney of the Central Power Station, the bricks in this structure as well as those used in the new buildings erected by the West End Company, were furnished by the Bay State Brick Company, whose works are located at North Cambridge and Glenwood Station respectively. This company make the ordinary building bricks, and are the sole dependence in this section of all contractors and builders who require the execution of large orders quickly and with superior brick. The two plants of the company are capable of producing 50,000,000 bricks a year; but this output, great as it is, has been found inadequate to meet the growing demands and the capacity of the works is now being increased to 60,000,000 a year. So complete are their facilities for the filling of large orders that a quarter of a million bricks or more can be delivered in a day if required. The products of the Bay State Brick Company are noted for the uniform excellence of quality and their adaptability to the construction of all buildings where strength of material is of paramount importance. Tests made by impartial persons within the last two years show that the Bay State Brick Company's bricks withstand a crushing pressure twice as great as any other bricks coming into the Boston market. Mr. H. P. Mallory is treasurer of the company, whose office is at No. 5 Pemberton square, Boston, opposite the new Court House.

NEWBURYPORT CAR MANUFACTURING CO., NEWBURYPORT, MASS.

An institution fast gaining a national reputation for the excellence of its vehicles is the Newburyport Car Manufacturing Co., located,

as its name indicates, in the thriving city of Newburyport, Mass. Many of its cars are in use on the West End Street Railway as well as on lines in nearly all cities of the Union, and they are fine examples of this class of vehicles, possessing all the points of excellence which unlimited resources in the shape of material, good workmanship and skill in designing can produce. The company manufactures all kinds of street cars for either electric or horse power, and is prepared to execute orders on the most favorable terms and in any quantity desired. The shipping facilities are as good as though located in the city of Boston.

GLASS — R. SHERBURNE, 20 CANAL STREET, BOSTON.

The matter of glass is a large item in the expense account of the West End Street Railway Company each year, both for the repairs of its cars and the great amount required for new structures, etc. This is supplied by Mr. R. Sherburne, 20 Canal street, Boston, who is the largest dealer in imported plate and American window glass in the New England States. A large proportion of the plate glass in Boston's fine store fronts is also from this house.

BUTTONS FOR UNIFORMS — D. EVANS & CO., ATTLEBORO FALLS, MASS.

The buttons for the uniforms of conductors and drivers on the West End Railway were made by Messrs. D. Evans. & Co. of Attleboro Falls, Mass. This firm do an extensive business in this line, being the largest manufacturers of fine gilt and silver plated buttons for corporations, army, navy, police, livery, clubs, steamboats and railroads in this country. They make any design, either plain or fancy, to order, and have special facilities for the execution of such work.

LUMBER— W. H. LEATHERBEE & SON, 520 ALBANY STREET, BOSTON.

The house of W. H. Leatherbee & Son was originally established in 1830 by Aaron Guild, who was succeeded in 1850 by Clark & Leatherbee. In 1875 they were succeeded by the present firm, consisting of William H. and Charles W. Leatherbee. Since the

organization of the present firm, the operations of the house have been greatly enlarged, until to-day this is one of the largest firms in New England in the lumber business. Three years ago the firm purchased the wharf at 520 Albany street, containing about two acres of land, which furnishes excellent facilities for their business. It also has at the corner of Albany and East Dedham streets, a planing mill and dry kilns, under the management of the experienced mill man, Mr. George W. Young. During the past few years the trade in floor boards has so increased, that this East Dedham street plant is now entirely devoted to kiln drying and manufacturing lumber of various kinds into floor boards. And, as it also has, at the same place a large store room for protecting kiln dried lumber, it is not exposed to moisture after leaving the kilns, and the firm is thus enabled to guarantee the floor boards as thoroughly dry. That the customers appreciate this fact will be seen by the business in the past year: Sales of rift yellow pine flooring, 1,200,000 feet; spruce, 1,700,000 feet; quartered oak and hard wood, 500,000 feet; besides 1,300,000 feet of kiln dried hard woods and pine which were sold in the rough. This firm has also a branch at Waltham in connection with the Boston house, and are able to supply customers at the lowest market prices. With the exception of these retail yards in Boston and Waltham, the firm does a strictly wholesale business, and makes a speciality of spruce, pine, hard woods, quartered oak, whitewood, North Carolina pine and all lumber used for railroad supplies.

WATER PIPE — MC NEAL PIPE AND FOUNDRY CO., BURLINGTON, N. J.

In the equipment of the great Central Power Station, described elsewhere in this work, the item of water pipes alone represents in money value a comfortable fortune, as the pipes are of large diameter and therefore required to be of exceptionally good material and sound in the matter of workmanship. The contract for supplying the large circulating water pipes was executed by the McNeal Pipe and Foundry Company of Burlington, N. J., an establishment which makes a specialty of this class of iron work and which has a wide reputation for the excellent character of its products.

LAMPS — ALEXANDER, BARNEY & CHAPIN, 20 CORTLANDT STREET, NEW YORK.

Messrs. Alexander, Barney & Chapin are manufacturers of the well-known "A. B. C." Lamps, which are made with especial reference to car service, and have been adopted by the West End Street Railway Company. These are the only lamps made which will sustain the vibration incidental to car use and the strain produced by burning in an inclined position. These are the standard car lamps.

PATENT CORRUGATED EXPANSION JOINTS — WAINWRIGHT MFG. CO., BOSTON.

The duplicate system of piping in the Central Power Station, to be used in cases of emergency as a fire exhaust for the engines, is fitted with Wainwright patent corrugated expansion joint, made by the Wainwright Manufacturing Company of No. 8 Oliver street, Boston. This company also makes the improved corrugated water tube feed water heater, corrugated pipes and other accessories for steam plants.

CAR TRUCKS — BEMIS CAR BOX CO., SPRINGFIELD, MASS.

Many of the trucks for the new electric cars are built by the Bemis Car Box Company of Springfield, Mass., and are the design of Mr. Louis Pfingst, master mechanic of the West End Street Railway. These are of the most recent type, and our illustration of both car and truck gives a good idea of their appearance on the street.

INSULATORS — A. & J. M. ANDERSON, 21 HAMILTON STREET, BOSTON.

In the line equipment of the West End Railway the "Aetna" insulators, manufactured by A. and J. M. Anderson, 21 Hamilton street, Boston, are used and have given the best of satisfaction. The Messrs. Anderson also manufacture switches and switch boards to order, and do a general business in electrical supplies. The Engineering Equipment Company of New York are agents for their goods.

BRUSHES — MESSRS. JORDAN & CHRISTIE, 25 CHARLESTOWN STREET, BOSTON.

The above named firm are manufacturers of brushes of all kinds, and of the most reliable character as to material and workmanship. For this reason they have a large patronage from the West End Company for such articles of this kind as are used in the various departments. A speciality is made of brushes particularly adapted for use in cars and steamboats, for which they have a large demand from all parts of the country and the Provinces.

STOVES — BOSTON FURNACE COMPANY, 79 AND 81 BLACKSTONE STREET.

The Boston Furnace Company do a general manufacturing and repairing business, and supply the West End Company with such stoves as are required in the various stations, offices, etc., not otherwise provided with heat. Their stores at the above numbers are stocked with an excellent line of heaters for public halls, hotels, schools, private residences, or, in fact, for any and all places where such articles are required. They represent the most advanced ideas in warming and ventilating, and are thoroughly reliable in any representation they make regarding their goods.

AMERICAN BOLT CO., LOWELL, MASS.

A matter of first importance in the construction of machinery, bridge work, iron roofs, boilers, etc., is the bolts ; and unquestionably the best equipped concern in this country for this class of work is the American Bolt Company of Lowell, Mass. The company manufactures bolts, nuts, washers, lag screws, cap screws, bond rivets, track bolts, tie rods, clamp forgings for electric railway poles, etc., furnishing these articles in large quantities to the West End Railway Company, and the test of the bolts used by this corporation given elsewhere in this work, is all that need be said in commendation of the products of the American Bolt Company.

VULCANIZED WOOD — HASKINS WOOD VULCANIZING CO. OF NEW YORK.

The rapid depletion of our forests has for some time been a matter of deep concern to those interested in building and other

industries requiring large supplies of material, and while metal may take the place of wood for many purposes, there can be no substitute for the latter substance in many cases, notably where there is a tendency to oxidation. Many preparations have been tried to prolong the life of woods, and for years the best results were secured by charring that portion of timbers, posts, etc., which was to be placed in the ground, as it is a fact well known for centuries that carbon is an indestructible substance. Acting upon this hint from nature, the Haskins Wood Vulcanizing Company of 40 Wall street, New York, improved upon it by inventing their system of vulcanizing, and ten years of practical tests have amply demonstrated it as the true principle for obtaining the highest degree of longevity for this material. The process consists of heating the wood under a heavy pressure, the sap and resinous matter being thus retained instead of escaping. These materials being by this process dried and coagulated, form not only a strong antiseptic, but impart a solidity and consequent strength unknown to wood treated by the absorption of a foreign substance. In short, the theory is that wood contains its own elements of preservation, and the vulcanizing process has amply demonstrated that this theory is the correct one. The company has a plant at 19th street, New York, which has lately been increased in capacity from 30,000 feet of lumber per day to 100,000 feet, the demand for the vulcanized lumber for railway, telegraph and dock construction necessitating the increased facilities and where every means of investigation are afforded those interested in this important subject. This material is largely used by the West End Street Railway for building purposes, ties, stringers., etc. The company has a large number of references, among whom are the following persons who have a practical knowledge of the superiority of the vulcanized wood :

Col. F. K. Hain, Gen. Manager Manhattan Railway Co., 71 Broadway, New York.

Robert I. Sloan, Chief Engineer, Chicago Elevated Railway, Chicago, Ill., formerly of Manhattan Railway, New York.

D. & J. Jardine, Architects, 1262 Broadway, New York.

Ichabod T. Williams, Lumber Merchant, 221 11th Ave., New York.

Geo. Edward Harding & Gooch, Architects, 40 Exchange Place, New York.

J. J. R. Croes, Chief Engineer, Suburban Rapid Transit Company, 40 Wall Street, New York.

John Waterhouse, Chief Engineer, Manhattan Railway Company, 71 Broadway, New York.

Gilbert Hodges, 19 Exchange Place, Boston.

West End Street Railway Company, Boston, and numerous other corporations and individuals.

Mr. Samuel D. Crafts, a gentleman of much scientific knowledge on the subject of wood preservation, is the New England agent at No. 45 Kilby street, room 1, Boston.

AMERICAN LOAN AND TRUST CO.

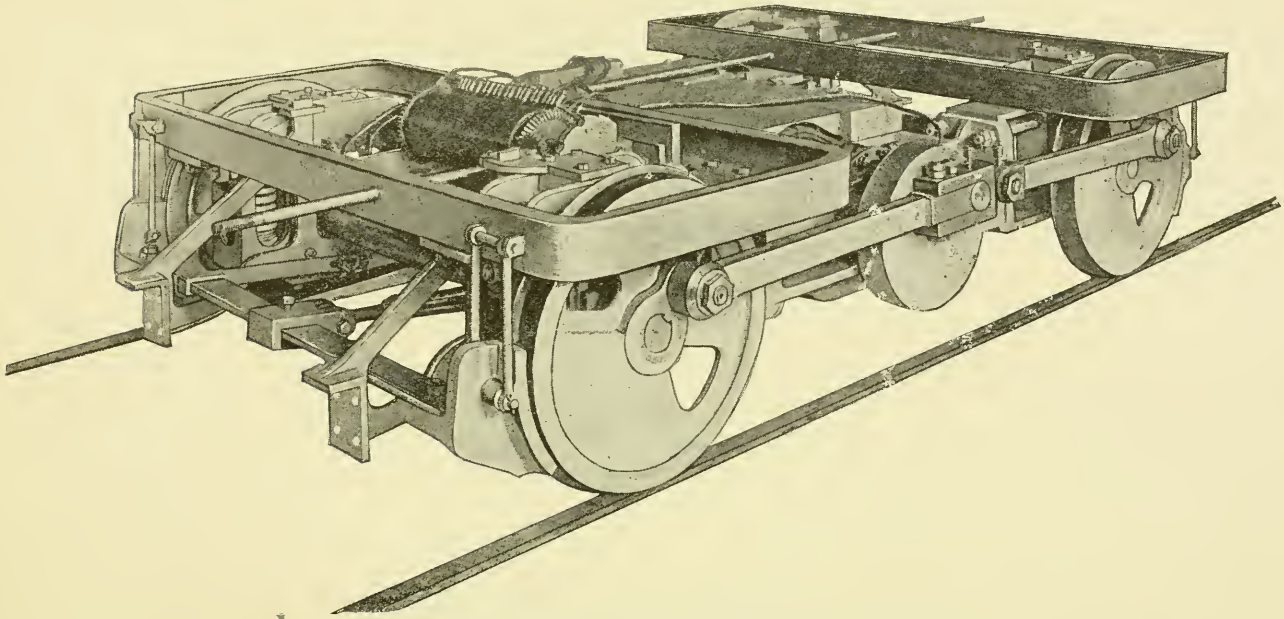
One of the strongest financial institutions in this country is the American Loan and Trust Company, with a capital of $1,000,000 and surplus earnings of $400,000, whose fine new offices are located in the new Exchange building, 53 State street, Boston. Some of the wealthiest and best known financiers are at its head and it offers exceptional security for the deposit of trust funds, the care of securities, etc. The special features of this company are that it allows interest upon deposits from the time of deposit until drawn, the careful attention it pays to its depositors' assets, and its large and increasing business as transfer agent and trustee under mortgages.

THE AMERICAN TOOL AND MACHINE CO., 84 KINGSTON ST., BOSTON.

This company are engineers, founders and machinists, being classed among the largest of the kind in this country. The works are commodious and contain all the necessary appliances to facilitate the work in hand. They manufacture turret and brass workers, lathes, centrifugal sugar machines, hydro extractors, wood pulp digesters, belt knife splitting machines, dynamo lifters, shafting, hangers, pulleys and general machinery.

THE EICKEMEYER & OSTERHELD MANUFACTURING CO., YONKERS, N. Y.

The Eickemeyer-Field motor illustrated on the opposite page is in use on the West End Railway as a single truck, while two



THE EICKEMEYER–FIELD MOTOR. See pages 112, 113 and 114.

similar motors mounted as swivel, or bogie, trucks (shown in another part of this work — see index to advertisements) are also in use by this road. The motor illustrated on the opposite page has nominally 35 horse power; the wheels are 24 inches in diameter; armature speed 150 revolutions per minute, and the weight, including wheels, axles and fittings, about four and a half tons. It will be noticed that the small diameter of the wheels employed enables the car body to be hung very low, giving proportionate ease of access to passengers. It is an interesting feature of the Eickemeyer-Field designs that they impose no limitations as to size or power of motor. Motors of a size and capacity not heretofore attempted can be constructed and their successful performance guaranteed with absolute certainty. Consequently, this mechanism is peculiarly adapted for use on elevated railroads or on surface roads where great speed of train movement is desired. There are many advantages derived in the use of this type of motor. All the wheels moving in unison renders a slipping on grades or wet rails almost an impossibility.

More power for a given weight can be had from one large motor than from two small ones, while on long cars two of these motors mounted as bogie or swivel trucks give an installation of greater power and flexibility than it is possible in many other designs.

The manufacturers claim for these motors the following points of superiority: 1st. The motor construction secures a utilization of all the lines of force produced by the current. 2d. The shape of the machine is such that the magnetic circuit is completed in the shortest possible distance. 3d. The method of winding permits of the greatest possible amount of wire in the minimum of space. 4th. The magnetic and electrical balance is so perfect in every way that sparking at the commutator is suppressed and that at the circuit controller reduced to a minimum. 5th. The method of supporting the motor entirely on springs relieves it from all strain due to track irregularity or construction. It also greatly lessens the wear upon the rails and road bed, and can be successfully operated on much lighter rails than is possible with many other systems. 6th. The connection between motor armature and driven wheels is almost wholly devoid of friction and consequent loss of power. 7th. The slow speed of the moving parts rendered possible by this combination ensures long life to the apparatus and materially diminishes the repair bills.

The feature of parallel rods as a connecting medium between the motor armature and driven wheels while producing the same beneficial results of shock insulation is materially different from the connecting rods as used on a steam locomotive. In the latter the connecting rods have a reciprocating as well as rotary motion. The impossibility of balancing the reciprocating motion is a feature which materially decreases the speed at which a steam locomotive can be driven. Not so, however, with the parallel rods of the Eickemeyer-Field mechanism, every point on which, when in motion, describes a true circle, with the centrifugal force perfectly balanced, so that no matter what the speed of rotation no jarring is experienced.

The momentum of a high speed motor is very much larger than that of the slow running machine, the momentum being in all cases in proportion to the square of the speed. The momentum has to be produced at starting and destroyed in stopping the car; it calls for an expenditure of current largely in excess of normal requirements at the start and great wear and loss of energy at stopping. The slow speed of the Eickemeyer-Field motors reduces this defect to a minimum.

The mechanical construction of this apparatus is exceedingly simple; all parts are readily accessible and interchangeable. The frame supporting the armature shaft is a single, nearly square casting, within which the armature shaft is mounted; its bearings being bored at a single operation are necessarily in exact alignment with the pole faces. This frame is entirely closed underneath, so that no mud or moisture from the street can penetrate it. At either end of the motor frame are bolted the pedestals carrying the springs and axle bearings upon which the whole motor and car body are supported. The motor is entirely governed by a detachable crank arm or wheel, located, preferably, on the dashboard at either end of the car. It is very easily controlled, speed and direction being governed by a single lever; as the diameter of commutation in this machine is at an exact right angle with the pole faces, it follows that the movement of the armature in either direction is accomplished without change in the brush position.

In the ordinary operation of the Eickemeyer-Field motor cars merely a trace of external magnetism can be detected. It, therefore, is impossible to cause any damage to watches or other delicate mechanism carried by the passengers.

STATION VOLTMETERS AND STATION AMMETERS — THE WESTON ELECTRICAL INSTRUMENT CO., NEWARK, N. J.

The Weston Electrical Instrument Company of Newark, N. J., supply electrical engineers and all others interested in electricity as a motive power, lighting and manufacturing purposes, station voltmeters and station ammeters expressly and admirably designed for switch board use. These instruments are in use by the West End Street Railway and are highly commended for their economical use of power and the certainty of operation they secure. They are of excellent workmanship and the most accurate in their indications of anything yet devised.

LINE EQUIPMENT.

THE MOST COMPLETE ELECTRICAL SYSTEM EVER DEVISED — MAGNIFICENT CARS — SCIENTIFIC AND MECHANICAL RESOURCES OF THE WEST END RAILWAY — AN EMINENT CORPORATION — A REMARKABLE HORSE, ETC., ETC.

A CAREFUL and altogether disinterested examination of the various departments of the great West End Railway has been made by the writer for the purpose of giving facts, and without any incentive or desire to present anything except as it was found to actually exist. The task has been an arduous one in many respects, because it was undertaken without any practical knowledge of street railway service and with a conception of its magnitude limited to that of the average person who has never taken the trouble to investigate the subject. It must be confessed that the further these investigations have been pursued, the more interesting have they become, not only as exhibiting the possibilities of modern science and inventive skill, but from the fact that all the immense work which has been accomplished in developing this, the greatest enterprise of its character ever conceived, must be credited to those directly interested in the West End Railway Company.

Indeed, so thoroughly and efficiently equipped is this corporation scientifically, mechanically, mentally and financially, that all its business is transacted without outside assistance of any kind, and in the erection and equipment of the great power stations, line construction, etc., all work has been supervised by its able corps of officers and engineers. No outside companies or individuals have had contracts for construction, and the high character of those who have been instrumental in bringing about the grand results is well illustrated in the fact that, young in years as electrical engineering is, and never before attempted on such a colossal scale as the West End Railway Company ventured upon, the practical operation of the

VIEW OF THE GROVE HALL CAR–HOUSE OF THE WEST END.

system as detailed by its engineers has not been found defective in a single instance.

From a corporation capitalized at $80,000 and with less than a dozen miles of road, has sprung a system of street transportation which challenges the admiration of the civilized world. Its properties embrace some of the finest structures in the shape of stables and car houses ever dedicated to such uses, and represent a value of many millions of dollars; and all this has been brought about without taxing the public to the extent of a farthing; but, rather, so judiciously has everything been managed, that every step of its progress has inured to the benefit of the public in the lessened cost of transportation or the superior accommodations and conveniences afforded. Nothing savoring of greed or grasping selfishness has ever accompanied an act of the West End Street Railway Company. This is saying a great deal for a corporation, but the facts warrant it. The success of this great company is due wholly to a business management, which, applied to any enterprise, could not fail of success. Those at the head of its affairs have never lost sight of the fact that all public undertakings, like all private ones, are the most successful when they keep in touch with the communities they serve and endeavor to meet by all means consistent with legitimate commercial transactions the demands of patrons.

The cars of the West End Railway Company at the present time number 2,131, all told, of which, according to the fourth annual report of the company, 1,662 are horse-cars, and 469 electric. As the electric cars are capable of accommodating, at a safe estimate, one-third more passengers than the horse cars, when the electrical system is fully established on the entire lines operated by the company, the number of vehicles will be reduced in that proportion, thus affording a great relief in the matter of blockades, and consequently more rapid transportation to all points in and out of the city.

Although but a trifle over 81 miles of the 260 operated by the West End Company are equipped with the electrical system, some idea may be formed of the aggregate benefits which will result from its completion from the fact that suburban property has already in many places appreciated over 100 per cent. in the districts reached by the electric lines, and the people are so gratified with the change from horse cars as to be unstinted in their praise of the almost magical transformation it has wrought.

The electric cars are beautiful specimens of the car builder's art; commodious in seating capacity; comfortable, not to say elegant, in upholstery; finely decorated inside and outside, and they certainly present a most imposing appearance, traversing the streets with the mysterious force which the Thomson-Houston Electrical Company has so successfully supplied in the over head system of electrical propulsion.

As we have before remarked, no great invention was ever introduced without the fiercest protest, and this has been the experience of the West End Company in the introduction of the new motive power. All sorts of prophesies have been made in regard to the calamities which would befall the community on its adoption; yet the company has steadfastly pursued the even tenor of its way against an opposition which would have disheartened most corporations, and the result of its course is already to be seen in the now almost unanimous verdict of the people in its favor.

Electricity as a motive power has become a fixed fact, and the West End Street Railway Company will some day, not far distant in the future, be credited with having distinguished Boston as the most prominent city in the world, for the part it has taken in the development of the science of electrical engineering, an epoch in its history which will stand forth more prominently than its well deserved literary fame.

The question arises, do the people show a just appreciation of what is being accomplished in this direction? Do they comprehend the magnitnde of the enterprise?

There are those who unquestionably do; but there others who, guided solely by prejudice, are incapable of looking upon but one side of the picture presented. They regard it as a money making scheme pure and simple, and seem altogether blind to the fact that the people receive a thousandfold more in proportion to their numbers than those directly interested in the great work of solving the problem of street transportation for the city of Boston. A person's gratitude should be in proportion to what they receive in return for the amount they expend, not what others make in the aggregate from small contributions, and this principle holds as good when applied to street railways as to any other business.

No other system of transportation affords so much for the outlay as the street railways of the country, and as the West End Railway

is acknowledged everywhere as without a peer in equipment, extent and general character of its service, it is an institution which should be fostered and encouraged as long as its managers continue to maintain this proud distinction.

Visitors to Boston have never failed to remark on the high character of the horses employed on its street railways, and Bostonians themselves have always evinced a personal pride in this matter. In striking contrast with all other cities, the animals used in this service in Boston have always been selected with reference to their appearance as well as serviceability, the greatest care being taken in these respects. Nearly 10,000 horses were employed under the old system, and among all this vast number it is safe to say that there were but few animals which were unfit to put before any gentleman's carriage. A newspaper was once forced to remark that "at the Hub of the Universe, street cars are neither drawn by used-up, broken-down equines, nor by the long-suffering but cantankerous and much objurgated mule, as in some cities. Here big, handsome, comfortable-looking steeds, sound in wind and limb, perfect pictures of health and strength, pull together in harness with a "pleased alacrity." Great pains in the matching of horses as to color, size and other characteristics were always taken, and as much care exercised in the matter of grooming as the most fastidious horseman could desire. Immense barns were erected for the care of these fine animals, one of which is the largest in the world, and it is needless to say that in their appointments and conveniences they are not excelled by the best private establishments anywhere.

Among this vast cavalcade of equines there was one which was a a veritable freak in the matter of longevity. He was known as "old Billy," and there can be no disputing the fact that he survived more years than any horse whose record is known. For years he served on the line of stages running between Boston and Brookline, and in 1856 he was purchased by the old Boston street railway, thereafter serving over twenty-five years as a car horse. "Old Billy" had nearly rounded a half century, being at the time of his death, which occurred on Christmas day, 1891, *forty-six years old.* His declining days were made happy by the performance of light duties at the West Lenox street stables. While a remarkably well preserved animal, he yet showed great age, and unusual care was needed in the matter of diet to keep him in health. The

service required of the veteran was just enough to give him the needed exercise, and consisted of drawing the feed boxes along the floor to the different stalls at feeding time. It is said that "old Billy" seemed to regret the loss of his powers of mastication, and occasionally took a bite of the tempting food prepared for his fellows, but was forced to forego its use from sheer lack of "grinders." He was a flea bitten Morgan, weighed about 700 or 800 pounds, was very hollow-backed, but retained up to his death some of the signs of his former good appearance. This remarkable horse was the object of as much solicitude on the part of the West End Railway Company and its employees as an infant, and, with the care he received, bid fair to have lived many years longer. He was exhibited at the last fair of the Boston Horse Breeders' Association, held in the Arena building, and his great age and remarkable condition made him the most prominent attraction of the exhibition.

It is estimated that during his long career "old Billy" had travelled over 125,000 miles between the tracks, and it is a remarkable fact that he never missed a trip through sickness. A taxidermist prepared the noble old horse for preservation by the company.

Corporations are not often credited with possessing souls, much less of indulging in sentimentality over a brute; but the above instance is worthy of record as showing the attention given by the West End Company to details which would naturally be regarded as of slight importance by an individual. Had "old Billy" passed the days of his usefulness in other hands he would never have received the credit due him for his long period of faithful service, and a bullet would have been his final reward years ago.

RAPID TRANSIT.

SOLUTION OF THE PROBLEM — ELECTRIC SURFACE ROADS THE ONLY FEASIBLE SYSTEM FOR BOSTON — SAFETY OF ELECTRIC CARS — WHAT THE WEST END COMPANY IS ACCOMPLISHING — PALATIAL VEHICLES — DEVELOPMENT OF THE SUBURBS — THE FUTURE OF THE ELECTRIC RAILROAD, ETC., ETC.

THERE is no denying the fact that electricty as a motive power has already permeated every-day life and business to such an extent as to be regarded as a necessity, and it is by no means an easy matter to comprehend how important a part it plays at this early stage of its existence in the industrial affairs of the world at large. When this subtle force was first proposed for the propulsion of street cars, the timidly inclined protested that it was dangerous — that the electric motor was little short of an unrestrained demon in the work of destroying human life, and this sentiment largely prevails to-day among those who have only a superficial knowledge of it, and that largely gained by hearsay. But what are the real facts — what has really been demonstrated in this particular even in its crudest application to the service of man?

In the first place, the fabulous stories in regard to the power of electricity have been set at rest by the execution of criminals, where the power and apparatus employed have been designed with especial reference to causing death; yet it is a matter of fact that a person may touch a wire carrying eight thousand horse power of electrical energy — sufficient to operate a thousand horse cars — and if the pressure was sufficiently low no harm would result. To use the words of a recent writer on the subject of electrical railroads: "The new motor is swift, the new motor is clean, the new motor takes people to their homes in one-third the time of the laboring horse, and it carries them in bright, attractive cars, instead of the dingy, ill-lighted, and even ill-smelling vehicles they have been used to. It

is probably true that no invention of man has more perfectly fulfilled its office than the tireless little motor, working away day and night under these cars, doing the work of a slave and relieving the suffering horse of the hardest service ever imposed on him. But no invention finds its place without protest, and no improvement is made without remonstrance, and against the motor was set up the plea of danger. On the face of it this looked like a serious objection; people reasoned, and naturally, that if this current were strong enough to propel loaded cars it was strong enough to hang as an invisible menace over their heads day and night. The electricians had anticipated all this, and in their knowledge of the subject had provided against it, but it was hard on the ground of pure theory to convince the public that the new method was safe. It is certainly very much to the credit of street railway men that they had the courage of their convictions and adopted electricity to a large extent on the authority of science and against the protest of public opinion."

Three years have now elapsed since the introduction of electricity as a motive power, and strange and improbable as it may appear to those who have not investigated the subject, although probably a billion people have been carried on the electrical cars of the country, not a single life has been sacrificed to the electric railway current, while the percentage of accidents is much less than on horse railroads.

Nor will the electric motor long confine its usefulness to street railways. As the electric railway can be constructed with grades which would prove a barrier to other means of locomotion, not only the suburban populations of great cities are to be benefited, but a practical illustration of the great good it can do for the farmer will soon be given in Maryland, where an electric railroad eighteen miles long is being run through a first-class farming country that the steam railroads have not touched. This road will not only be used for passenger traffic but will be equipped with freight cars that will have a capacity of five tons. These cars will be used for the special handling of all farm and mill products of the surrounding country. This new mode of rapid transportation of industrial and agricultural commodities promises to become a factor of the utmost importance in many districts which have hitherto had scant opportunities for the development of their resources in consequence of the wretched

condition of their roads in the winter months. Now, no matter how muddy the highways are or how stormy the weather, the motor trucks upon which the farm wagons are wheeled will always be ready to carry their loads to the nearest market and to bring back their return load when required. Before long the electric motor will bring into many a way-back, sleepy old farm such a shaking up of the dry bones as will mean a very appreciable addition to the agricultural prosperity of the country.

In regard to what the electric motor has accomplished since its adoption by the West End Company, nothing could be more convincing than the marvelous development of Boston's suburbs and the great appreciation in values which has taken place by the substitution of neat, clean, and ordorless car houses for horse stables, to say nothing of the advantages which have accrued under the new order of things in the matter of better homes, and consequently healthier moral and physical conditions.

As is well known to all who have followed the subject of rapid transit for Boston, Governor Russell and Mayor Matthews appointed a commission to investigate the matter, with the view of devising some plan to relieve the congested condition of its streets. At one of these hearings President Whitney appeared before the Commission and gave his views on the subject of rapid transit, which we produce entire, and which will be found instructive in regard to transportation in Boston. Aside from the practical character of the work which the West End Railway Company has done and is doing in this direction, Mr. Whitney's speech contains much valuable statistical information in regard to the passenger traffic on both steam and horse railroads. For this reason we reproduce it here in full :

Mr. Chairman and Gentlemen of the Commission : I desire that it should be distinctly understood at the start by this commission that I do not appear here as President of the West End Street Railway Company, asking for the privilege of spending the money necessary to carry out this or any other plan of rapid transit. Four years ago I became president of this consolidated system, and I then believed, as I believe now, that the only solution of this problem of more rapid transit, especially of surface lines, involved a tunnel under the Common ; but public sentiment was averse at that time to a disturbance of the Common even in this manner ; and public sentiment has favored very strongly for the last 10 or 15 years some ele-

vated railroad system. It became necessary, therefore, that the West End Company should consider the elevated system as well as the underground system ; and it has considered it from that day to this.

We proposed a plan a year ago which we deemed the best solution of this problem, so far as an elevated system is concerned, and we thought we were sufficiently accurate in our estimates of damages to make it possible for theWest End Company to undertake it ; but when we came face to face with the real problem, and met the owners of this property, and saw what their claims were likely to be, there was but one course for the West End Company to pursue and that was to retire.

And now, having had four years' experience in the management as president of this railway, having endeavored in good faith to do all that we can do for the improvement of this transit service, in the face of much hostile criticism and many attempts at hostile legislation, I am here prepared to say that the West End Company, under existing conditions, does not desire to have anything to do with this rapid transit matter. I say that because it was proposed in the legislative halls of the state of Massachusetts, after a grant of a charter for an elevated road was obtained, to so load it with conditions as absolutely to destroy the property in it. I say, under this existing condition of things, the West End Company is not a solicitor for the privilege of putting more money into these enterprises ; but I have felt it to be a public duty, because the position which I hold in this community is a quasi public office, to come before this board and give my best judgment as to the best means of solving this problem. No man, I believe, is more familiar than I am with the necessities of the case, and I believe that we have suggested to this board the only feasible and practicable plan under which it can be solved.

Now, for the last 10 or 15 years there has been this cry for some improvement in the means of transit, and everybody knows that it is justified, and this necessity does exist. Well, for the 10 years during which this cry has been most urgent, what has been the amount of this travel ?

The lines on the north side from Cambridge, from Middlesex and from East Boston, the lines now under the West End system, formerly run by the separate companies, transported in 1880, 50,000 people a day : that is, the Cambridge lines, including local travel,

carried 30,000 people a day in 1880; the Middlesex about 15,000 a day, and the East Boston lines about 6,000 a day; and on all the steam railroads on the north side of the city 30,000 a day, so that the movement of the whole population on that side of the city in 1880 was about 111,000 a day.

Take it on the south side: The lines now under the West End road, consisting of the South Boston, the Metropolitan and Highland roads, carried in 1880 in the aggregate 114,000 people a day, and the steam railroads a like number of 30,000 a day. You will find in the report of the railroad commissioners given every year the number of people carried to and from Boston by every steam railroad entering the city, the total movement of passengers in and out of Boston by the steam railroads, and the total movement of passengers over all the steam lines and the lines now controlled by the West End system was an average of 225,000 people a day.

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That includes travel in all directions. In 1890, exactly 10 years from that time, the travel had absolutely doubled over every single line then running, including the steam railroads. I hold in my hand a statement here of the steam roads comprising the northern group and southern group separately. In 1880 the northern group of roads brought to Boston 5,649,078. In 1890 they brought 11,573,759. There has been an increase of travel over the steam railroads during the last 10 years each way of 30,000 people a day more than were carried in 1880, and the growth has been steady and continuous, year by year, over all these systems.

As an illustration I will read to you the growth of the northern group. In 1880, 5,600,000 (I won't trouble you with the odd figures); 1881, 6,300,000; 1882, 7,088,000; 1883, 7,500,000; 1884, 8,200,000; 1885, 8,500,000; 1886, 9,400,000; 1887, 10,400,000; 1888, 10,400,000; 1889, 10,900,000; 1890, 11,573,509. The same is true of the line of roads on the southern side of the city. There is every single year a steady constant growth.

I give the figures from the last report of the railroad commissioners for 1890. I did not include the Boston, Revere Beach & Lynn railroad, and I did not include the Boston & Lynn street railway, because I did not have the figures, but these are the published returns of the group comprising the Boston & Lowell, Eastern, Boston & Maine and Fitchburg on one side, and the New York &

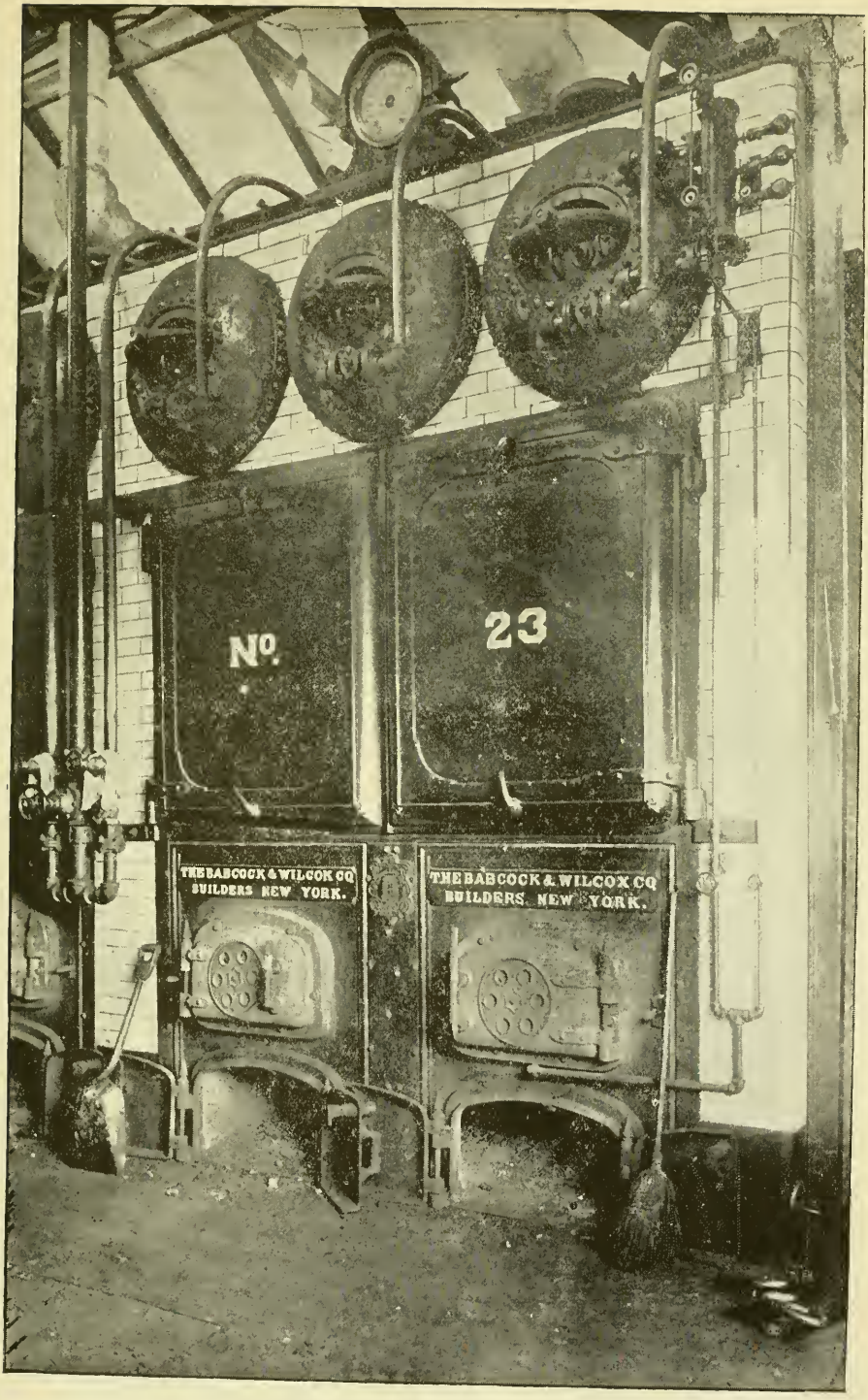
New England, Old Colony, Boston & Albany, and Boston & Providence on the other — those eight roads taken from the report of the railroad commissioners.

Now, the street railway traffic during that period has grown as follows: In 1880 the roads now under the West End system carried 59,000,000 passengers. The following year we carried 63,000,000; the next year, 69,000,000; the next year, 71,000,000; the next year, 76,000,000; the next year, 80,000,000; the next year, 86,000,000; the next year, 91,000,000; the next year, 97,000,000; the next year, 104,000,000; the next year, 114,000,000. Therefore you will see there has been an increased movement of population of something in the neighborhood of from 20,000 to 30,000 people a day every year more than in the previous year. The increase in the traffic on the street railways has been within that time nearly 150,000 people a day. While we carried 59,000,000 in 1880, we carried 114,000,000 in 1890.

There seems to be a steady growth, and it seems to be one of the most encouraging things in reference to the future of the city of Boston that this condition of things does exist.

Now, of these passengers brought in the year 1890, there were reported as season ticket passengers about 11,000 a day upon these eight roads, and reckoning them going each way, or reckoning two trips for each season ticket passenger, there is an average of 5,500 season ticket passengers a day brought into the city.

Now, where do these people go? It is much easier to say where they do not go than to say were they do go, because they scatter themselves all over this system; but I was desirous to get, if I could, some clew, some idea of how much of this travel was absolutely between the railroad stations, for it has been suggested that the travel between these stations was a very important element to be considered in this connection, and I went to the Armstrong Transfer Company and asked them how many passengers and how much baggage they carried, as they control the baggage transportation all over the city. I thought I might get something there upon which I could make some kind of a guess as to what this transportation was between the railroads. The Armstrong Transfer Company absolutely control the carriage service of many of these roads, and, so far as the baggage system of transfer is concerned, they control the whole, absolutely. I have had a letter from Mr.



VIEW OF ONE OF THE BABCOCK & WILCOX CO. BOILERS IN THE CENTRAL POWER STATION OF THE WEST END. See page 83.

Chamberlain, the manager of the Armstrong Company, giving me the number of passengers carried between the railroad stations in the month of November, 1891, which was 4,510. That is an average of 150 people a day, taken in carriages from one railroad station to the other by the Armstrong Company. Of course, I do not undertake to say that that covers the whole of the travel between these stations. Those people were carried in 2,793 carriages, and they had 1,531 pieces of baggage.

In addition to that the Armstrong company moved 12,000 pieces of baggage from all these stations to the other stations, which represented a very large proportion of the people who stopped in the city, and then found their baggage at the depot when it was sent in from other stations. Well, there are eight stations in this city, and it appears that the Armstrong Transfer Company carried in the month of November across this city 150 passengers from all these stations to every other railroad station, and that gives for each station 20 passengers a day carried directly from one railroad station to another; and if you choose to analyze it still further, reckoning the number of hours in which this travel would be taken of course, it becomes very small, and even if you take the whole amount of baggage at 12,000 pieces for the month, that amounts to about 400 pieces delivered from all these eight stations a day; that is, about 50 pieces of extra baggage a day that were moved on an average during the month of November from one station to another.

Now, of course, I do not wish to be understood as saying that this represents the total amount of travel between these stations, but it is evident to my mind that the amount of travel between these stations is very small as compared with the great amount of passengers throughout the city. It appears that very few come to the city of Boston for the purpose of passing through it, but come here to spend a little time, more or less, for one purpose and another, but they do not come to the city of Boston for the purpose of passing directly through it. Now, if the future development of this transportation system is to accord with the experience of the last 15 or 20 years, it follows that within the next 10 years the steam railroads and the street railways must be called upon to transport double the number of people that they are carrying to-day.

Looking at the statistics of the population of the city of Boston

and of the state of Massachusetts, I find that within the eight-mile limits is a population of 680,000 people. The West End system extends to every one of those towns, excepting Winchester. Chelsea also is reached by the Boston & Lynn road, and pours its traffic into the city mostly through that line.

On the twelve-mile limit the population in 1890 was 872,482, and I have made a calculation, based upon the estimate made by Mr. Wadlin, I suppose, as to the growth of this population within the next 10 or 15 years. Basing the estimate upon the experience of the last five years, the population now reached by the West End railway within the eight-mile limit will, in 1895, be 806,000. In 1900 it will be 955,000, almost 1,000,000 people, and within the 12-mile limit in 1900, there will be 12,029,111 people.

Now, it is a very significant fact in connection with this question that the growth of population in these towns surrounding Boston where the street system of transportation runs has been the largest average growth of any towns and cities in the state. The average growth of these towns and cities throughout this district is upward of 19 per cent. in the last five years, and the average growth of the city is 15 per cent.

Now, any system of transportation which can produce results like these, whether it be a system of street transportation or a system of steam transportation, cannot be very defective. I do not know at all what the system is on the steam railroads, but I say that if it has had the result of doubling this traffic within the last 10 years, it must in great measure meet the popular demand, and this system provides the best social conditions which it is possible for any community to live under. It encourages the people to go into the suburbs and live under the most healthy social conditions, and it preserves to them the advantages of the trade of a large city with all its amusements and all its advantages.

I see clearly, more clearly, I believe, than any man in this room, the great advantage which this commission can do to this community, to this whole state, by devising some measure which shall continue the system substantially as it exists; and how shall it be done?

Why, it seems to me that it can only be done by increasing the service on substantially the same lines as it is run on at present.

The experience of the street railways in comparison with the steam transportation service shows that the shopping communities

of these different suburban districts desire to use the street railway service wherever it is possible, and they desire to be carried to the nearest point to the shopping district, and, recognizing this fact in proposing that we should run an elevated railroad down Harrison avenue, we kept constantly in mind that this great community that we serve desire to be carried to the nearest possible point at which they can do their business.

They not only desire that, but they desire that they shall be carried for a single fare of 5 cents. To many of us here it is of very little consequence whether an individual trip to the city costs 5 cents or more, but it is of large consequence to many of the people who use this street transportation service for going to and fro. The street system of transportation now gives the people who come and go to and from the city of Boston a service they could not individually obtain for 10 or 20 times that sum. We take people from North avenue, or some point four or five miles distant, and for 10 cents bring them in and out of Boston, for business or convenience, a service which they could not get a single carriage to do for them for less than several dollars.

Now, it is greatly for the interest of the city of Boston and all this section that this system should be continued and preserved; that it should be extended, if possible; but we are brought face to face with the fact that the streets of Boston within this congested district are physically incapable of any increase.

The question, then is, How shall the room be increased? And I having studied this problem with the conscientious desire to find only the best way, not simply what may be best for the West End Railway — while I admit and uphold that the interests of the West End Railway and the community are identical and cannot be separated — I believe that I have endeavored with absolute sincerity to study this problem for the public interest and I believe there is no other way than this, except some system which no private corporation can for a moment think of undertaking, and which would involve so large an expenditure of money that the advantages of it, in consequence of the increased fare over it necessary to pay its cost, will be largely neutralized.

Now, this system that we have proposed is this: We propose to connect Tremont street, Shawmut avenue, Washington street and Broadway, to South Boston, with the northern part of the city by a

tunnel commencing at the junction of Tremont and Warrenton streets and emerging at Adams square.

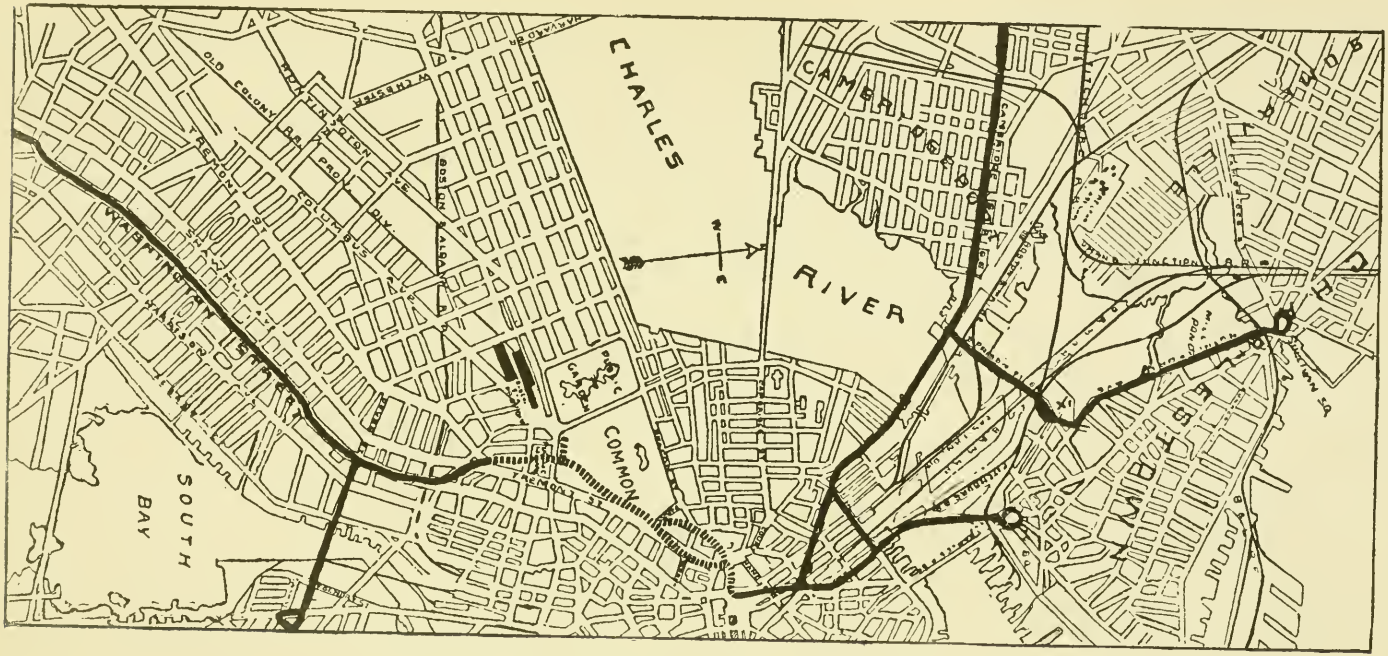
This preserves substantially the line of travel as at present exists, and we have provided, when public necessity and convenience shall require the development of an elevated railroad, that it shall enter and leave at precisely the same point.

Now, that has not only the advantage of being the cheapest system which can possibly be devised, but it has the advantage of giving to the people throughout this district the greatest possible advantage in the use of it. It places cars from all over this district, from South Boston and from Dorchester, Roxbury, Brookline and Cambridge on one side, and East Boston and Middlesex county on the other — it places them side by side, whether they come by an elevated or a surface system, and gives to everybody the common advantage of each. The depot is so arranged that any man coming upon the lines of the West End road from all over the district can at this central station take any other line, and go whithersoever he pleases. I believe that is the simplest, and, indeed, the only feasible, solution of this question.

I believe, that if in the judgment of this commission they should see fit to empower the West End Street Railway Company to do this work and the necessary legislation can be obtained under which it can be done, this system of street transportation which has done so much to keep the moral condition of this community pure, and has done so much for the building up of Boston as a trade centre, can be continued : but the West End Street Railway Company cannot undertake this work unless you are willing to strengthen its hands, and the state is willing to strengthen its hands by removing from them the danger of this hostile legislation.

I have no desire to waste my days and nights in anxious thought as to how the West End shall be preserved from this hostile legislation ; and even if it were different, it would be impossible for the West End Company to undertake to raise this money under the existing condition of things ; and I cannot bring this too plainly before the commission, if they desire to have this work done.

I believe this is the only way that it can be done. I believe that whosoever undertakes this work, whether it be the West End Company or not, the public necessity and convenience are so united in having this run as one system that sooner or later a practical con-



TUNNEL PLAN OF THE WEST END STREET RAILWAY.

Dotted lines show subway; solid lines elevated or surface tracks.

solidation of the two things will be brought about, even if they were to start separately. If the city desires to undertake this work, so far as the West End Company is concerned, it has no objection. But it seems to me that the carrying out of this plan, the further extension of this transportation system into the eight-mile limit, and then as time goes on, into the twelve-mile limit can be done ultimately by the West End Company, if the state and the city will strengthen its hands in the manner I have indicated.

Make secure, absolutely secure, the money which the community desires to have invested in this project, and thus the company can obtain it at the cheapest rate. Sell the stock at auction, if you like, but make this so secure that every man throughout this commonwealth shall feel absolutely safe in putting his money into the enterprise; and that is the only way in which it can be done. I believe there is no service which can be performed by any body of men in the state of Massachusetts equal to this which this commission has before it. A wise recommendation on this matter affects millions and millions of people.

I desire to say in this connection that, for the immediate relief of the community, I think some attention should be paid to the necessary widenings of our streets. During the last 10 years, as I say, the passenger service over these streets has doubled — so, likewise, has the team traffic, the teams necessary to supply the commissary department of all these cities and towns — and if the streets at the North End of Boston were as free to travel as the streets at the South End of Boston, the influx of travel from the North End would be equal to what it is from the South End. There is a greater number of people on the north side of the city within the eight and twelve-mile limit than there is on the south side of the city, and the growth within the last five years, leaving out wards 10 and 12 of Boston, which are in the centre of the city, and Charlestown, which has had so small a growth for the last five years, the growth on the north side of the city is absolutely greater in number and per cent. than on the south side, and therefore, if the city of Boston will but open its avenues and allow the people to come in, they will come in in much larger proportion than they have ever done before. The travel from this side will meet the travel from that side, and in well-nigh equal proportions.

The city of Cambridge has not shared in the general prosperity

of the towns surrounding Boston, largely, in my judgment, for the reason that Boston furnishes it no adequate entrances into the heart of the city.

The life blood of these cities and towns is largely drawn from the city herself, and the means of communication to and fro indicate the ebb and flow of the general prosperity of those communities. It is, therefore, a question which concerns largely this whole metropolitan district.

And I think that this plan that we have proposed, if it could be carried out, would relieve the situation more than it has been relieved for the last 25 years. If this commission feel like recommending certain widenings which would relieve the streets to some extent, and should consider that this plan which we have proposed was a feasible and proper one, why, the sense of relief, almost immediate relief, would be apparent everywhere, and would lead to a large increase in the value of property, because you make it so much easier for people to come here.

If nothing of this kind is done so that people from the north side of the city can, without the hindrances which now exist, reach the south side of the city where the shopping districts are, the consequence will be that, sooner or later, they will cease to come ; they will establish centres of trade and of amusements of their own, outside of the city limits ; but they desire to come here. It appears from all these statistics that the city of Boston is attracting year by year a larger and larger area of trade to herself. That should be continued ; it is to the advantage of everybody in the whole district, and it seems to me it is without doubt largely for the benefit of the city of Boston.

Now, Mr. Chairman and gentleman, I have stated the case, as I I understand it, so far as the West End Company is concerned. We come here in perfect good faith, and have endeavored to show you what seems to us the only feasible plan for solving this problem, and we say, furthermore, that if the state will put us into the position to do it, we believe that ultimately we can carry it out. Without that, it is impossible for us.

FOREIGN RAILWAYS.

Systems of Great Britain — The Great Berlin Viaduct — London's Famous Underground Railway — Equipment of Foreign Roads — Cost of Transportation, etc., etc.

IN the preceding pages it has not been our aim to give dry statistical matter solely, but to impress upon the reader the great importance and magnitude of the work undertaken, what has already been accomplished and what is laid out for future accomplishment by the West End Street Railway Company.

No one can review the work done without admiring the perfect system brought out of something like a score of lines owned by competing corporations, each one of whom was more intent on getting some advantage over its rivals than it was in improving its service. It is needless to say that the improved condition under West End management has been of inestimable value to the city and its suburbs, and that under the former condition of the street railways of Boston it would be an utter impossibility to accommodate one-half the present population who patronize street railways. Everything has been done that valuable experience could suggest to meet the growing demands of travel, and every inconvenience complained of by the public has been promptly remedied where it was possible to do so. But it was evident that the horse railroad lines could not, under the most favorable conditions, move the vast numbers who required transportation without creating another evil — that of blockading the thoroughfares to such an extent as to make them almost impassable, a trouble greatly aggravated by the non-enforcement of the city ordinance against allowing vehicles to stand in the street longer than the time specified. All sorts of suggestions were offered, and are being offered, to meet the changed condition of affairs, some of which have sprung from those who are sincere in their desire to see the city well served in this particular;

but, at the same time, there has entered into the discussion of the subject of rapid transit an element which savors strongly of demagogery, and which, no doubt, has had a tendency to influence those who are indifferent as to making the proper investigation for themselves.

That the plans now well under way by the West End Street Railway Company to improve the service is the best that can be devised for the city of Boston, is the testimony of the most expert engineers of the present day, and that it is not only the grandest, but most colossal in its proportions ever undertaken by a street railway corporation, is conceded by the highest authorities on both sides of the water.

The old world has been traversed to find an improvement on the system in vogue in Boston, but the testimony of those who have made the investigations has been invariably in favor of the former, and strongly so. One of the members of the rapid transit commission, who went abroad on such a mission, the Hon. John E. Fitzgerald, undoubtedly made a thorough investigation of the subject of street transportation, and his evidence is therefore trustworthy and valuable. It will be seen from his report, brief extracts from which are here given, that he saw nothing to compare with Boston's street railways in the service rendered or equipment. He says: "The street railway cars of Great Britain or the continent, which I have seen, are not brought to that perfection in build which has been attained with us. The cars are heavy and are behind the times, if the horse cars of Boston be taken as a standard. There are usually seats on all cars and omnibuses outside, much like the double deckers in use some years ago on the Highland line."

The street railways of Glasgow, Scotland, and Liverpool, England, are owned by the city and leased to the companies operating them, the companies equipping, and the city taking care of the lines, and as there is considerable talk in this country about municipal ownership of street railways, it is suggestive of what might be expected here under similar circumstances, when the commissioner says that "this double responsibility has been the cause of a great deal of friction between the city and the company running the lines."

The number of miles of horse railroads in Great Britain is about 1,000, representing a capital of over £15,000,000, of which 400 is double track. They carried in 1890 over 350,000,000 of passengers,

the North Metropolitan of London carrying about 36,000,000 of the number.

Their net receipts, after all expenses, was about £500,000, so that it will be seen the average percentage on the capital invested in street car management does not exceed three per cent, and in some cases falling much below this.

The commissioner gives the appended table showing the number of passengers and the average price per passenger, together with the average profit per passenger, on the eight largest street railways in Great Britain and Ireland for the half-year ending June 30, 1891, and compiled for private circulation:

	Number Passengers.	Average Fare.	Net Profit Per pass.
Belfast	7,754,320	1.14d.	.18d.
Dublin	8,251,440	1.69d.	.33d.
Edinburgh	7,398,160	1.60d.	.20d.
Glasgow	25,746,723	1.92d.	.12d.
Liverpool	16,592,443	1.98d.	.11d.
London	30,527,176	1.18d.	.15d.
London Street	12,174,904	1.24d.	.18d.
North London	35,615,027	1.31d.	.25d.

From this table it will be seen that the average rate of fare for every passenger who rides on the cars of these largest companies in Great Britain and Ireland does not exceed 3 cents per passenger, though the fares vary from 2 cents to 8 cents, according to the distance run, which is from one to eight miles.

The number of passengers carried by the West End Railway for the year ending September, 30, 1891, was 119,264,401, the receipts from which were $5,889,179.98, and net earnings $1,523,424.88; against which there were dividend charges of $888,317.50, leaving a balance of $89,991.37 to be carried to the surplus account. Compared with the cost of operating expenses in the places given in the above table, which are in some instances about half what they are in the United States, it will be seen that the earnings of the West End Street Railway show only a healthy business condition and a comparatively small surplus for the magnitude of its operations.

Another source of revenue to many street railway companies in Great Britain is the express business. Parcels are collected at

certain designated stations and the same are delivered at a cost of from 2 cents to 16 cents, according to weight. This, of course, is a great inconvenience to passengers in transit, who must wait for the loading and unloading of these parcels, a practice which would not be tolerated here for a day. Besides this, passengers in the old country are not allowed to take any luggage into a car or on the platforms without payment. Here it is not by any means an uncommon sight to see mechanics boarding the cars with tool boxes and other appliances used in their trades, while shoppers often pile the front platforms of cars with their purchases, greatly to the annoyance of the drivers and motormen, without adding anything to the receipts of the company.

It is quite evident from all the testimony on the subject that the means of transportation in vogue in the old country would not be tolerated here, even the best of systems there being manifestly inferior to the worst to be found here, the equipment of foreign railways being of the cheapest and most uninviting character imaginable, while the transit is as slow as poor horses are capable of making it.

As Mr. Whitney, in his several speeches, has given much valuable statistical information in regard to street railway service in the old country, especially Germany, a few extracts from Mr. Fitzgerald's report to the rapid transit commissioners in regard to his observations in England, Ireland and Scotland will be of interest in connection therewith. "As I said before," remarks the commissioner further on in his report, "in none of the cities which I have visited, did the horse cars come up to ours, either in Dublin, Liverpool, London, Paris, Brussels, or Berlin. They all seem to be built on the same heavy, lumbering pattern. I have seen nothing in any of these cities that a Bostonian might envy, so far as horse car accommodations are concerned, except the penny fares; but our long distance rides are much cheaper than in either of these cities, especially when it must be remembered that the working classes in any one of them do not earn one-half that which a mechanic receives here."

In regard to the underground roads of London, and his general impressions of the service here and there, Mr. Fitzgerald says: "In connection with the street cars, the cheap fare for short distance travel impressed me very much, and the testimony of those connected with the street car management invariably was that it increased

travel, and benefited both the public and the railroad corporation. The ordinance, too, prohibiting the loading and unloading of heavy teams in the business streets of London during certain hours of the day has much to do with the smoothness by which travel is facilitated, notwithstanding the enormous number of omnibuses and cabs that move in an unbroken procession along the streets of London. If a like ordinance were in operation here, and applied to Washington and Tremont streets, much of the congestion which now prevails would be lessened. Who has not experienced the frequent delays that occur on the streets mentioned by the unloading of safes, coal and flagstones, and the keen delight which often beams on the faces of the drivers of these heavy teams, feeling that they can retaliate on the horse car conductor and driver for being so often obliged to leave the track. Slow and heavy teams are seldom seen on the crowded thoroughfares of London.

"The electric underground railroad of London, I must confess, though it be treason, perhaps, to say so, did not impress me favorably as a passenger travelling along it, and that impression was shared by nearly every person to whom I spoke in my desire to get the ordinary passenger's views about it. I went to London to inspect it, and with a prejudice rather in its favor, I rode over it a dozen times or more. I inspected it from a rear platform by the aid of a lamp, and the oftener I travelled over the road, the less favorably it impressed me as a system for Boston. I found that the air is fresh enough in the tunnel with a temperature of fifty degrees, but that the cars are invariably closely shut, and the air in them is not good. This keeping of the windows and doors shut is necessitated by the great draught which the single track tunnel has. Then, in addition, there is a noise like the roaring of the ocean mingling with that which electric cars usually give, making the short trip of one quarter of an hour a very disagreeable one indeed. I asked the engineer if it were possible to do away with the sound. He answered, of course, no, but it could be lessened by lining the tunnel with some substance that absorbed sound. If such a tunnel were built in Boston, the temperature in it, I am informed by the engineer, would be forty degrees, not a very inviting place for delicate persons on a summer's day, with the thermometer outside in the nineties.

"As a piece of engineering I presume it is perfection, but, as a mode of conveying human beings from one part of a great city to

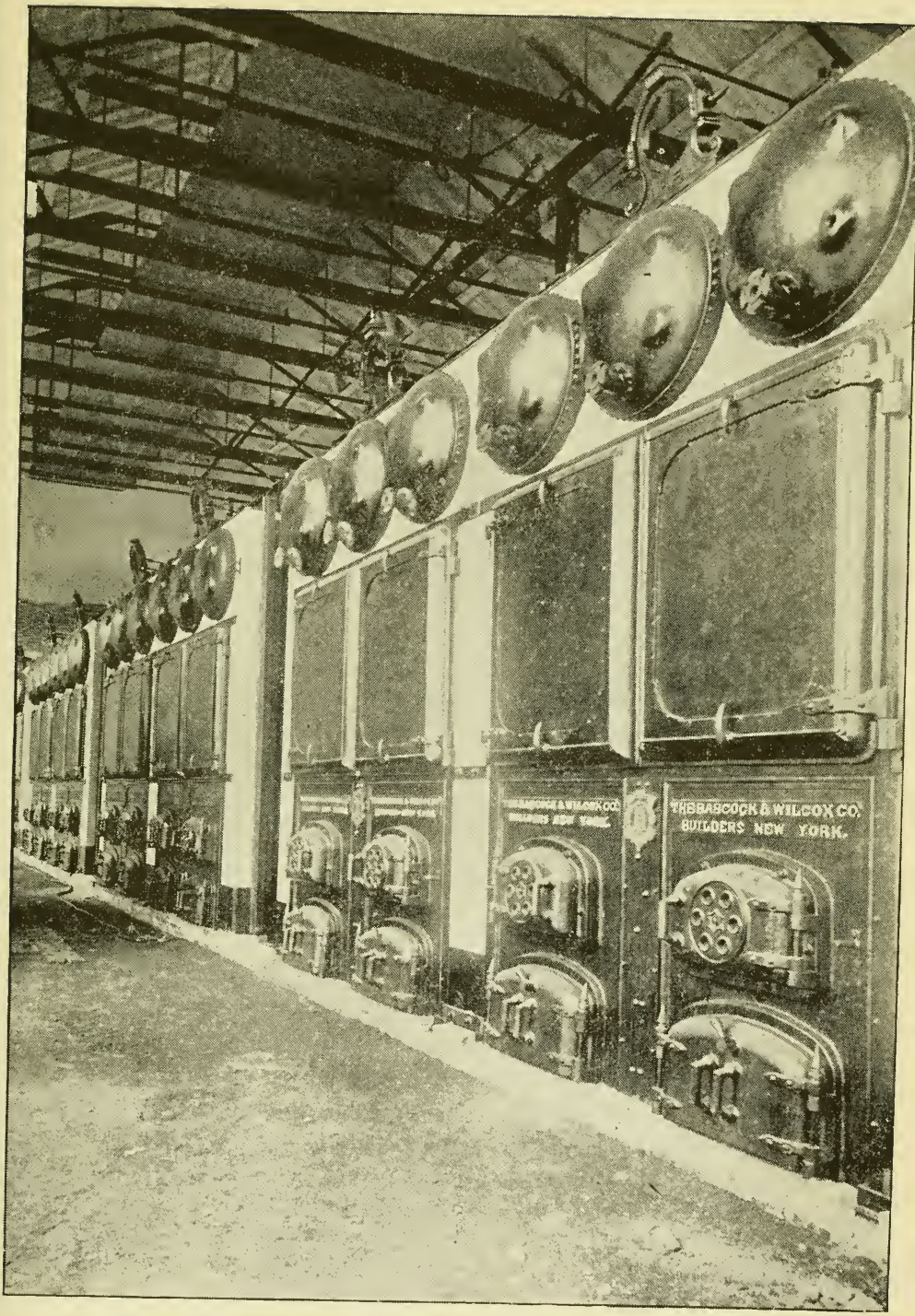
another, I should much prefer some other method and some other feeling when travelling than the burying-alive feeling which one experiences in this tunnel. The underground district railroad of London is entirely different. To be sure, the odor of gas is sometimes around, but a gleam of light comes in every few minutes. It is double-tracked, too, leaving plenty of space for air. It has open spaces wherever they can be got. The temperature of the tunnel is about the same as that of the outside air. There is no intense wave sound, and one feels in riding through it much more comfortable than when travelling through the tunnel of New York & New Haven road in the city of New York.

"One great feature of this road, too, is that it affords its patrons the opportunity of connecting with nearly all the great railroads that go out of London. In addition, it enables a person living 10 or more miles in an eastern suburb of London to travel to any part of London in a westerly direction or to a western suburb 10 miles out without change of cars, and what this underground system does for London the viaduct system of Berlin does for that city.

"By how much light is above darkness for a traveller, in the same measure is the railroad viaduct of Berlin above and beyond any of the other modes of conveyance which I have seen. But its perfection is not alone in its workmanship and the fact that it is in the sunshine, but it consists, also, in the facilities it affords for travelling in any direction east and west and to any part of Europe, thus not only giving the citizens of Berlin easy, cheap and rapid transit, but forming a direct line of communication between the great railroads of the German empire.

"If Boston had such a road, the people who live in its northern suburbs or in northern New England would come from their respective homes to one central station on the north side of Boston and travel over this viaduct road, which would have three or four stations in the city and near the business streets, and would connect at a central station on the south side with the southerly roads, and could go to any southern or western suburb or farther south or west, thus avoiding the necessity of buying tickets two or three times, of changing baggage or of travelling across the town.

"The German empire built the road I have described. I am much afraid no private corporation could afford to build such a road here. But if built, no matter by whom, nobody will deny that it



VIEW OF THE BABCOCK & WILCOX CO. BOILERS IN THE EAST CAMBRIDGE POWER STATION OF THE WEST END. See page 83.

would be of inestimable advantage to the people of Boston and its suburbs, and would solve a great part of the rapid transit question with which we have to deal."

The elevated viaduct of Berlin, to which the commissioner refers, is unquestionably the greatest railway in the world, but a brief description of it will serve to show the impracticability of such a system for Boston. For a large portion of its length the stadtbahn of Berlin is constructed of brick, and as it is nearly all double-tracked, such a structure would simply mean the arching over of the streets of Boston with masonry and shutting out the light of day from all who chanced to live below it. Objection has been made to an elevated road, for the reason that it would have a tendency to darken stores and dwellings, necessitating extra expense for lighting, besides rendering them unhealthy for their occupants; but what would be said were a viaduct of brick to be constructed along the Public Garden and Common, resembling somewhat in appearance an elevated canal. This is what the great stadtbahn of Berlin is — a brick viaduct — and in some parts of the city the structure reaches to the fifth stories of buildings. It is, however, a magnificent piece of engineering and mechanical skill and its two principal stations in that city are simply palatial, one of them, the Anhalter, having cost upward of $4,000,000. The whole system as it stands to-day in the German Capital is estimated to have cost upward of $100,000,000, and leaving out of the estimate entirely the stations, such a road could not be constructed in the city of Boston for less money, on account of the higher price of labor and material here. This enormous outlay of capital represents by more than $50,000,000, the total expenditure of all the steam railroads entering both New York city and Boston for terminals, and the total sum would, probably, be enough to cover the cost of every railroad in the United States in this respect. Aside from the impracticability of a viaduct road, it will readily occur to the least experienced financier that such a scheme would be simply chimerical from a money standpoint.

As has already been stated, the Berlian viaduct was built, and is owned and operated by the German government, and being located in the capital of the empire, there was every incentive to have it on as grand a scale as possible. The question of dividends for investors was not a factor in considering the project; if it did not meet

expenses, it was only necessary to make good the deficit with increased taxes. In a country where one man's will is law, such great enterprises are possible, as the common people are never consulted, or their interests rarely considered in carrying them out. Capitalists are not asked to invest in such undertakings by the monarchial governments, therefore they can have no parallel under a form of government like ours, to say nothing of the objections which might be presented topographically.

The enormous expense of a viaduct road for Boston, not to mention sanitary considerations or the ungainly appearance the streets would present by being walled up with masonry, pretty effectually disposes of any serious consideration of such a system for the metropolis of New England.

Every person, resident or non-resident, should be interested in the subject of street transportation in Boston, for various reasons. Those who are permanent residents are enabled by the street railways to live in more comfortable quarters in the sparsely settled outlying districts, thus securing cheaper rents and more healthful physical and moral surroundings, while to the occasional visitor they offer a relief from the bewilderment which is sure to be experienced in attempting to get from one point to another through its circuitous streets. The great number who daily visit Boston from all over New England and other sections of the country as well, makes the subject one of almost national importance, or, at least, wider reaching in its scope than would be the case were any other city in the Union under consideration. To this fact can doubtless be traced the great interest manifested in almost every quarter of the country when the matter of street transportation comes before the Legislature or any other deliberative body for discussion and furnishes a topic for the newspaper press from Maine to California. So difficult has the problem seemed to some that it has been made a subject for caricature, and furnished an inexhaustible theme for cranks, dreaming theorists and impracticable inventions of every description imaginable.

But the proof of the pudding is found in the eating, and not in chewing the string of the bag in which it was cooked. We have seen the street railway system of Boston emerge from a number of lines all at cross purposes with one another and placed under a management which made it the admiration of every country in the

world where street traffic of this character is known. This management is composed of men who have made street railway transportation the study of their lives, and many of them have been identified with it in the various details of construction, equipment and operation since the inception of the business in this country. That they are men of the highest type of character and unusual intelligence and experience for the positions they occupy, is confirmed by the success which has attended their efforts to furnish a system which should meet the requirements of the public.

Of course perfection is not to be expected in supplying the needs of a great and growing city like Boston in the matter of street railway service, but the question arises, Could any other set of men, under like circumstances, have improved upon what has already been done and what is being done by the West End Street Railway? To those who will take the pains to properly inform themselves on the subject there can be but one answer to the question, and that an emphatic negative.

The great electrical system which is now fairly inaugurated will meet all the demands for rapid transit, for many years to come, more effectually than anything yet proposed, or which can be devised for the purpose; but, like everything else new and radical in the change involved, people must be educated up to it. This is not an easy task where prejudice is so strong as to entirely overlook the advantages it offers, and people are not willing to be convinced under any circumstances, but throw every obstacle in the way of its success with a fiendish satisfaction. It is claimed by the opponents of electric railways that they are a constant menace to life, but this is not borne out by experience or available statistics in any place where they are operated. The testimony of expert electricians is altogether against such a theory, and that the danger from a current largely exists in the imagination of the over-sensitive, was amply proven before the Massachusetts Committee on Street Railways in the Legislature of 1889. Prof. Elihu Thomson of the Thomson-Houston Electrical Company, than whom no higher authority is known to electrical science, testified before that committee, and in the course of his testimony he said in reply to the question as to whether the current that is used in street cars is dangerous to life:

"The growth of electric railways has undoubtedly been very rapid of late, and as you have heard stated here, there are something like

fifty roads in operation at the present time (March, 1889). The experience of these roads has dated back several years. Some of them, no doubt, were crudely arranged at first, but the whole matter is becoming rapidly systematized and taking very much better shape. In order to convey electricity any considerable distance it is necessary that we provide conductors to convey the current. We must also use a certain pressure on the current, or the electricity will fail to be carried. In arc lighting this pressure rises to as high a point sometimes as 3,000 volts, and yet I have known men to come in contact with such wires, getting the full strength, and not be killed. There are a few other cases where people have met with fatal accidents by putting their hands on wires with a current of from 2,000 to 3,000 volts. By common consent, however, the electrical fraternity have dropped down to a voltage as low as 500 volts. That is the voltage which is now used on electric railways. The object of dropping the voltage is to get two things ; that is, to secure safety, and at the same time secure freedom from the tendency of the current to leave the wire, either on the car or anywhere else. The desire is, of course, to keep that pressure which will transmit the current over the line. We could operate the roads with 1,500 to 2,000 volts, but that is not feasible or advisable ; we would find more difficulties in the construction of our motors. We are forced to keep the current down in pressure. A great deal has been said about the volume of the current existing on these lines. I say that that has nothing to do with it whatever. The volume of the current is nothing ; it is merely the pressure which is to be taken into account ; and this whole question hinges on whether 500 volts is a dangerous pressure or not. That is the whole thing, — whether 500 volts is a dangerous pressure or not. Now, it is a fact, as I am told, that the Western Union Company use on some of their lines in New York city more than 400 volts ; they use dynamos for working long lines. I have heard of various instances where the leakage in bad weather has been so strong that the instruments were overcharged and the operators could not even adjust their instruments with the pressure being as great as that. They use the dynamos to replace a certain number of battery cells. The number which they would replace of the Gove type, taken as an example, would be about 240 battery cells. It does not seem to them that that voltage has any particular danger in it.

"They have substituted dynamos having a current of large capacity in place of their batteries, and still they find no difficulties with it. The pressure is not high enough to do any harm to the person. It is true that it is a pressure which will give a shock. Nobody denies that. Almost any pressure will give a shock, but the question here is whether it is capable of giving a fatal shock. I do not think any evidence has been produced here which shows that it can produce a fatal shock, or has produced a fatal shock, which is the important point. There are fifty roads in operation. We are prepared to produce testimony in regard to persons who have come in contact with a current and have not been injured more than to get an electric shock. I have occasionally touched conductors of very much higher voltage than these. I at one time caught hold of a conductor having a voltage of 10,000 volts for a few moments. I got a very severe shock, but it did not kill me. On one occasion I caught hold of an alternating current of 1,000, which you have spoken of as an exceedingly dangerous current, and that did not kill me. I do not say that I would voluntarily take hold of one of these conductors and take that shock, any more than I would go and have a tooth extracted without any reason for it. But I do say that the escapes from serious injury from much higher voltages than 1,000 volts are frequent. The voltage which is now used on electric railways has been reduced to that which has been agreed upon as the practical pressure to use, involving safety and efficiency throughout the whole system.

"A good many points have been brought up here which it is hardly worth while to touch upon, but I am impressed with their contradictory character in many cases. Sometimes we hear of the impossibility of touching the wires and of the impossibility of firemen cutting the wires, because they are dangerous. We hear the statement made that firemen will receive shocks. All they have got to do is simply to have nippers with a wooden handle. They can cut any wire without any trouble. The wires can be cut very nicely by an ordinary pair of pliers without any danger whatever. I can say that there is not the slightest difficulty in removing all the wires in a very short time, if you choose, without any danger to people standing by.

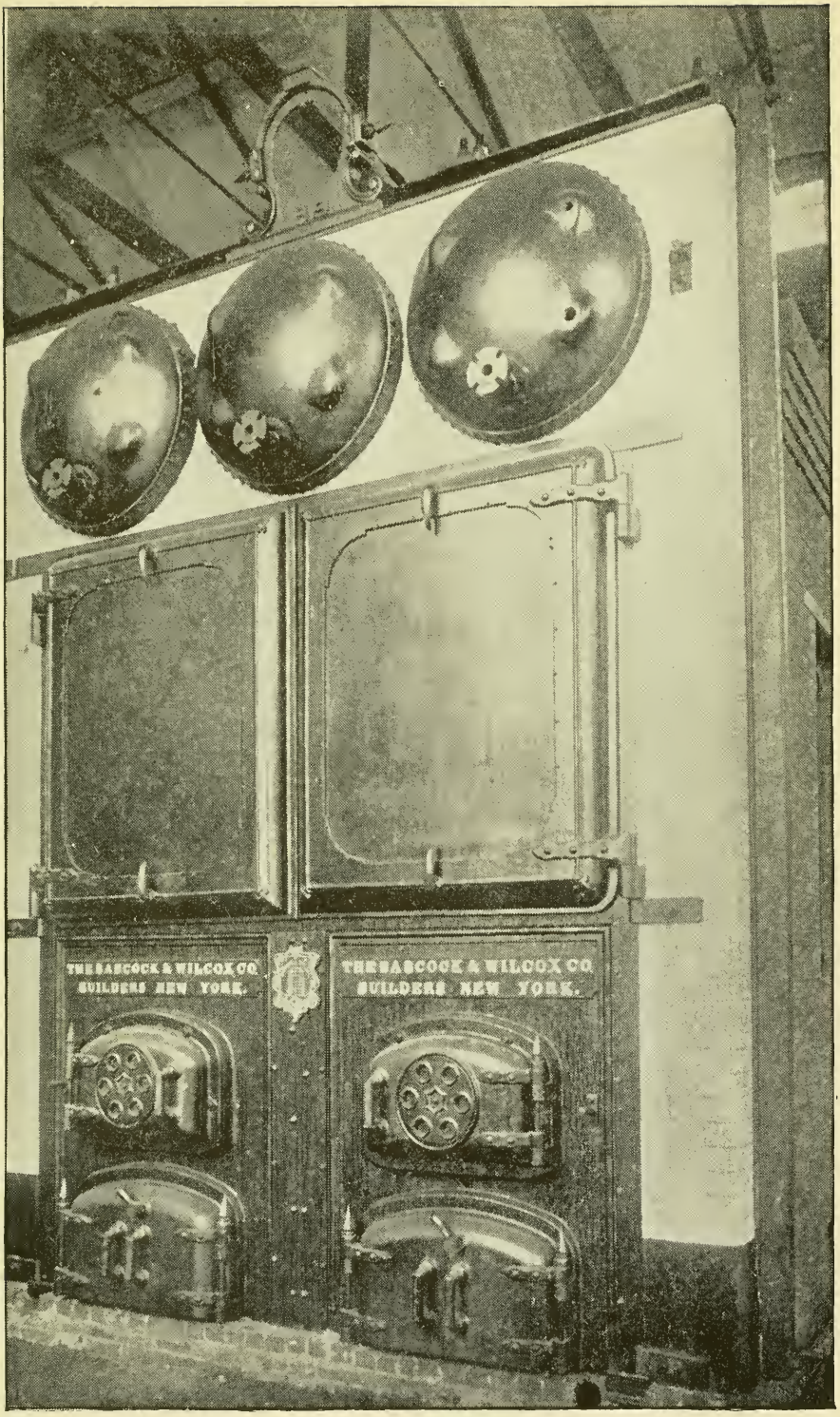
"The danger to persons is absolutely nil. The conductor comes up from the top of the car and is heavily insulated. That is neces-

sary in order to have it stand moisture. It would give out at once if we did not have the circuit on the car thoroughly insulated, covered in as fully as possible, to prevent it from coming in contact with the car track itself. In fact, a car body is constructed of material which will not convey a current of 500 volts at all. As to the danger to watches, although I have not heard any complaints of any trouble of that kind, I should say that there might be some little effect on watches not made non-magnetical; but the great watch firms now-a-days are making watches which will get over that difficulty. In fact, it is being regarded as essential that a man must be equipped with a non-magnetic watch in these days of electrical growth. I have in my pocket a time-piece of that character, which I can put in a dynamo with the strongest possible magnetic field and it will not affect its running at all."

As Professor Thomson's testimony is of a very instructive character in regard to the subtle fluid, the reader will pardon the space occupied by a few more striking points in his evidence before the legislative committee. In answer to the question of how the 10,000 volt current was taken by him, he replied:

"It was taken from an alternating machine working the primary of an induction coil, and the secondary of the induction coil was taken into my hands by accident, and I got the full strength. The probable reason I survived was that I jumped away quickly. I said, "Here, you jump out of this, or you are dead." I knew 10,000 volts would kill me. It was capable of leaping from one wire to another, and at a distance of three-eights of an inch, and without first contacting them. I got hold of the wires, and took the current in my body. The volume I had at that time, I was satisfied, was sufficient to kill me. But there was an enormous pressure, 10,000 volts; it had the power to jump through the air, and I got the full effect turned both ways. It went through me both ways fifty times a second, this way and that way, and the only effect I felt was that my arms were numb when I got away."

The Professor was then asked what would have been the effect had the current been 50 or 100 amperes, and he said he had never heard of such a case. He believed that a man receiving such a charge "would be instantly vaporized — would disappear in smoke. But 10,000 volts would not do that. It would require a lightning discharge. Cases have been reported," the Professor continued,



VIEW OF ONE OF THE BABCOCK & WILCOX CO. BOILERS IN THE EAST CAMBRIDGE POWER STATION OF THE WEST END. See page 83.

" where men have been struck with lightning where they have been found considerably burnt by a very heavy lightning discharge passing directly through them, an amount made up of so much horse-power, so that it practically disorganizes and vaporizes the whole structure. A tree may be struck by lightning, and every particle of moisture in it may be vaporized in an instant, and the tree be exploded in every direction, but I never knew of a case of that kind in a man. We are getting beyond any ordinary voltage produced by any apparatus at our disposal that could produce an effect like that."

In regard to the safety of the electrical system in thunder storms, Professor Thomson stated what nearly every one has observed, " that as the number of electric wires increase in a city, there is less trouble from thunder storms. That is, there are so many points of escape for lightning discharges that very few places in cities are struck and injured during a thunder storm. In the country, in a suburban district, a wire of course, might be struck, but look at the chances of its going to the ground! It is only insulated by a little porcelain knob from the side wires, which are often connected by a most complete circuit with the ground, and we also provide lightning arresters, putting them along the line as often as they may be needed, for carrying off any charge which could jump more than one-sixteenth of an inch. Lightning will jump a mile in many discharges. I would put a line of lightning arresters along the road which would carry off any current that can jump one-sixteenth of an inch, to the ground. Is not that sufficient protection? The fact is, if the lightning ever strikes a line it will find a number of points of escape, and will not affect the car, or go through the car; it will jump at once at the lightning arrester."

" Does it not happen in some cases that lightning flies along the overhead conductor, and is grounded without passing through the lightning arrester?" was asked; to which the Professor replied: " I should say some would pass through the motors, and in other cases the trolley wires would act as a first-class lightning rod to any person in the car. It would follow the conductor, which is able to carry an enormous current, and would go to the ground without entering the car at all. In other words, a man on a locomotive, with metal around him, carrying a circuit from the top of the cab to one below, is not going to be struck with lightning at any time, and that is the condition in all these cases."

To the question, "In case of a very heavy lightning discharge, wouldn't it fuse the motor wires?" answer was made that it would not. "It would simply jump when it got near the ground. Lightning doesn't have time to fuse that motor wire. It jumps to the ground when it is near the ground. It passes through the circuit of least resistance — the least inductive resistance, not the least electrical resistance. In other words, I must explain that a little further. Lightning acts differently from the ordinary electrical current. The lightning is discharged with great suddenness. Now, if I try to make it pass through a coil of wire, it will jump across a space in the air, rather than go through that coil of wire, which would be 700 or 800 feet in length; it would rather jump this space in the air and go to the ground that way. Suppose it comes down from the overhead wire, and finds the coils of the motor altogether too long for it, it would take the next nearest iron post, the nearest metal post, which is only probably a quarter of an inch away at any point, and will go to the track that way. In other words, it will shunt the motor, and we put on devices for that very purpose, to prevent injury to the motor. We put on a little jumping space, so that the lightning can jump that space and not damage the motor, because it may tear through some part of the insulated motor, and we therefore make a point for it to reach the ground easily."

Mr. Charles J. Woodbury, second vice-president of the Boston Manufacturers' Mutual Fire Insurance Company and engineer for twenty companies known as the Factory Mutual Insurance Company, gave his experience in regard to the danger incurred by receiving a shock of 500 volts. He said:

"When I was in Philadelphia, in 1884, looking up some matters pertaining to the conduit systems, I received a shock from one of the Brush arc lighting circuits there in the city without any injury, above, of course, a sharp pain at the time, and I remember the question of the effect or shock of the electrical lighting arc current when I was at the United States Electric Lighting Company's works in Newark; Mr. Edward Weston showed that he could take the shock from one of his dynamos operating, I believe, fifteen lights in a circuit, by touching his hands upon the binding-posts, and I found that I could also do it. That would be from three hundred and fifty to perhaps five hundred and twenty volts, but of course there are others that have taken very much higher

shocks, but I refer to that as something within my recollection, and where there was no injury or burning even."

William Gowan, an employee of the Crescent Beach electric railway, testified that he received a shock from a current of 500 volts without other injury then raising two small blisters on his fingers, while Chas. J. Van Depoele of the Thomson-Houston Company testified that he had received shocks from 500 volt currents many times without injury, and that he would take such a current in presence of the committee at any time when desired.

Professor Thomson said in regard to the falling of telephone and other wires on the central conductor of the overhead electric car system, that those wires ought to be supported better than they are. "They are flimsy; they are not properly supported," remarked the Professor. "Support them as you would the electric road wire, which has to stand the jar of the trolley, and they will not come down. But the matter of other wires coming in contact with the conductors has always been brought up whenever a new system of wires has been introduced, and every system which has been stronger than others, and the failure has been the failure of the lighter wires all through. The iron wires rust out and on the slightest provocation they drop down on the other wires; but danger from that can be easily obviated. Suppose you run out guard wires at short distances above the central wire, then if a wire drops down it will not sink to the car current line. Ground the heavy guard wire and have a line come down on it. If it touches the electric road wire it will burn the connecting link in a moment. There is no telephone wire in use which would not be burned out in an instant. If this safeguard cannot be provided you have still others, but simply grounding the upper wires — connecting it with the ground — suffices. Now, if the telephone wire sags from any cause, in almost all cases it will not probably touch the under wire at all, and in any case in which it does touch it will produce such a flow of current that the wire will simply break the connection, leaving you as before in extra good condition to carry your current to the cars. These are all precautions which can be adopted and are well known at the present time."

Josiah Q. Bennett, president of the Cambridge Electric Light Company, in giving his evidence as to danger from electric wires, says :

"We have never had a claim made against our company for any damage from any cause, nor has there been any injury to any employee from electric wires of any serious character, nothing from which any one has not in a short time recovered. I would like to state in this connection that our employees are insured by the Employers' Liability Association, for almost the same rates used in the most favored cases; that is for sixty cents a hundred dollars of pay roll per annum. They get the full indemnity, $5,000 apiece for every man. That shows that the Employers' Liability Association, who have made a most careful examination, were satisfied that the danger of death from currents of electric wires was very small indeed.

"We are running, and have been for a year, currents of 400 volts potential, for operating motors in Cambridge, and I have not heard of any injury or of the slightest trouble from that current. We are also running 500 volt currents, and we have not received any complaint about those. We are also running 2,500 volt currents, and in their operation it has been shown that the tendency is to throw off a person who comes in contact with the wires; he does not retain the wires long enough to receive any serious injury, and the only way in which we have known of a man's being hurt is from his being thrown from a pole and from concussion on falling to the ground, not by the current itself."

Gen. E. W. Hincks, chairman of the Committee of Roads and Bridges in the city of Cambridge, very tersely puts the matter of danger in these words:

"We in Cambridge have been examining that point as a practical question, for the purpose of securing the best method of relief for our people, who have long suffered from unsuitable transportation. Every man in this country knows that during the last four months (March, 1889) there has been such an impetus in the demand for electric motors for almost every purpose that many thousands of inexperienced men have of necessity been employed in electrical works; and during that period of four months I have yet to learn that there has been a single fatal accident resulting from the use of electrical currents among those employees, or resulting from the operation of cars themselves. The only case of fatality was that of the poor mule who has been immortalized, and in this instance there was, unfortunately, no *post mortem* examination.

He had the misfortune to die in the vicinity of a railroad wire. The papers record the case of a horse who was frightened to death by a locomotive ; it may be that this poor mule met his fate in the same way. We have not a single fatal accident recorded from the use of electric motors for the last four months ; but every member of this committee knows the destruction produced by another motor which has been operated, and the power of which has been deeply studied for the last eighty years. Within the last four weeks I have seen accounts in the paper of seven accidents in which from twenty to eighty-three lives were sacrificed by the use of steam motors. If restricted legislation is to be tried with regard to motors, it seems to me it should be brought to bear against the steam motor rather than against the safer motor of electricity.

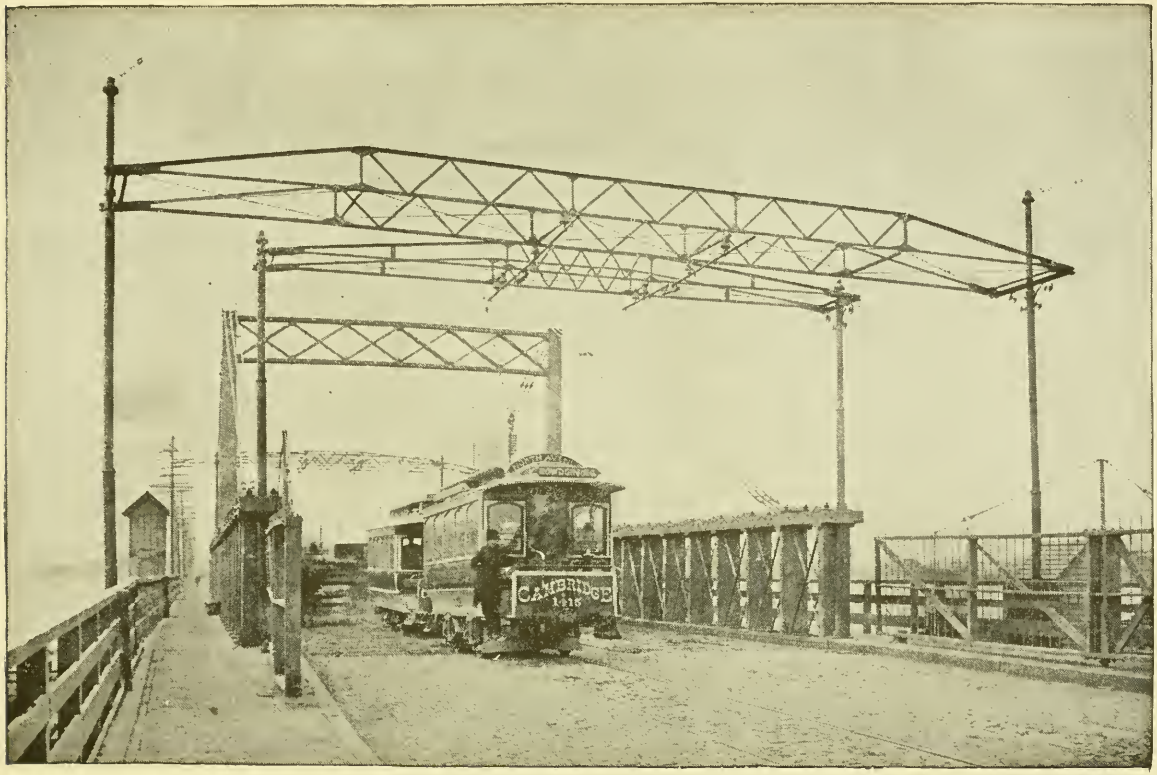
"In Cambridge we are very greatly interested in securing better methods of transportation than we have got, and we feel that it would be an injustice to deprive us of this. I believe the people of Cambridge have no preference for any particular electrical system. The field is broad, and the man who creates the most economical electrical motor, which can be operated with safety and efficiency, will find field enough for its use, without attempting to exclude any other by legislative restriction ; its very superiority will exclude others ; everything else will yield to it, because the electric motor has come to stay, and the best only will survive ; the survival of the fittest is the doctrine just now to put in force."

Mr. Frank Leonard Pope, editor of a prominent electrical journal of New York city and a practical electrical engineer, in a letter dated Feb. 26, 1888, says :

"The dangers to persons and property arising from the multiplication of the electric wires in streets, thoroughfares and public places, although to a certain extent justified by facts, have been unreasonably exaggerated. It is clear to every observant person that the use of electricity for lighting and motive power is rapidly becoming one of the most potent factors of modern civilization, and cannot but enormously increase the comforts and conveniences of life, but the facilities of manufacture and transportation. This development of electrical enterprises, so desirable in many respects, may be seriously hampered by unreasonable prejudice, and illiberal and unnecessary restrictions. It is my conviction that the policy of the State should lie, not in the direction of prohibition or arbitrary

restrictions upon the construction and use of electric conductors, but in that of rigid, and at the same time intelligent, supervision and regulation. With such supervision and regulation the dangers both to person and property may be reduced to a minimum. Under the management and oversight of well instructed and careful persons electricity is one of the least dangerous forms of force ; but in the hands of ignorant and careless persons, it may easily become one of the most dangerous.

"The foregoing remarks must be understood as applying to electric service generally. With reference to the particular question which relates solely to the possible dangers to life and property which may arise from the presence of suspended electric conductors for the purpose of operating electric street railways, I would say that there are now in operation in the United States some fifty of these roads of the length of five miles or less, nearly all the mileage of which is situated in the most prominent thoroughfares of cities and large towns. As editor of a journal devoted to the interests of practical electricity, and having had an extended experience in the actual practice of electric engineering, I have exceptional opportunities for information respecting this class of enterprises, and I affirm that not a single instance has ever come to my knowledge of any person having been killed or seriously injured, either in the United States or in any other country, by the electric current from a street railway conductor ; and I do not think that a single such instance can be pointed out by the opponents of such enterprises. The electrical pressure which has been settled upon, as it were, by common consent, for electric railway work, is in the neighborhood of 500 volts, a pressure which, although high enough to secure economical and efficient operation, is undoubtedly well within the limit of danger to human life. It is but little more than the pressure of 400 volts which has been used for years on many of the main lines of the Western Union Telegraph Company, and, so far as I am aware, without injurious results. A current of 500 volts, though capable of producing great pain and nervous shock if passed through a person, would not permanently injure or incapacitate such person. Instances have been recorded (upon how good authority I know not) in which horses have been killed by electric railway currents. This is quite possible, because the nervous system of the horse is well known to be exceedingly sensitive. Many instances



VIEW OF CAMBRIDGE STREET BRIDGE, SHOWING CAMBRIDGE ELECTRIC CARS OF THE WEST END.

have been reported of horses falling dead from fright caused by the sudden apparition of some unaccustomed object, such as a locomotive, and the same result might easily follow from the intense pain resulting from the contact of an electric wire charged with 500 volts. I do not, however, believe that a current of this pressure can in any proper sense be said to be dangerous to human life.

"As to the danger of fire arising from the accidental contact of other wires conveying the current into the interior of buildings, such danger unquestionably exists, but it is quite certain that it may be minimized, and, in my opinion, avoided altogether, by the use of proper precautions. It should not be possible for a telegraph or telephone wire to fall upon an electric railway conductor, except in rare instances; but, even should such accident occur, its effects may be avoided by the use of a simple protecting device which is largely used in the city of Philadelphia in the telephone service and by the Western Union Telegraph Company in all of its larger stations. This device is so constructed that, upon the appearance of an abnormal current upon the wire, it is automatically disconnected from the instrument and connected directly to the earth, at a point outside the building. This device has been found by the Western Union Telegraph Company to be almost an absolute protection. That this is the fact, is sufficiently proven by the circumstance that so few fire have occurred in telegraph offices, although the mileage of wire connected with them is probably a hundred times as great as that connected with the telephone or any other service.

"So far as it is proper for me to suggest any action, I should advise that it be in the direction of careful supervision by proper authority, having regard to the circumstances of the case. A pressure which might be safe under one set of conditions might be highly dangerous under another. Just as it might be perfectly safe to run a locomotive through the crowded streets of a city at the rate of three miles an hour, and equally safe to run it through an uninhabited country at the rate of sixty miles an hour. It would seem as if legislation in the direction of arbitrary prohibition or restriction would be undesirable, but State and Municipal regulation, carefully guarding the life and property of the citizen, and yet not unnecessarily obstructing the free circulation of electricity for industrial purposes, I regard as eminently practical and desirable."

His Excellency, William E. Russell, Governor of the Common-

wealth of Massachusetts, appeared at the hearing before the Committee on Street Railways, as counsel for the Cambridge Electric Light Company, and presented his views in the following words:

"I appear at this hearing as counsel for the Cambridge Electric Light Company, that is interested in the investigation now going on. First, because it operates the motors of the railroad company in Cambridge, and next, because an investigation of the safety of overhead wires of that company involves also the broader question of the safety and expediency of all overhead wires carrying electric currents of high potential; and, as whatever action this committee may take will necessarily affect my client, it desires to be heard with evidence on this subject. I shall confine my remarks to a few words on the necessity and safety of these wires, and what would be the result of restrictive legislation or of failure to grant such legislation as is required for the further development of the successful experiment now being tried in Cambridge.

"Cambridge has for many years suffered from inadequate means of transit, being injured from this cause more than any other suburban place. It has been inadequate because the transit is slow and insufficient under any possible arrangement of horse cars. The long time necessary to go from Cambridge to Boston in the crowded horse cars, has made all of our seventy thousand people anxious for some other means of transit. So, in spite of all the objectionable features, she has welcomed the elevated roads as a possible solution of the difficulty. Already she has granted a location to them in her streets, notwithstanding the great inconvenience of such a structure in the streets, and the certain injury it will be to private property. But luckily, as I think, before that location has been built on, there has come a better, surer, and safer remedy, and one far less objectionable or injurious to private property. In the consolidation of the horse car companies, it was hoped and expected that the West End Railroad, with its great resources, energy, and evident wish to serve the public faithfully, would find some method of quicker transit. This task it at once undertook, and has now accomplished in its overhead electric system. Already the people are getting better accommodations, more cars, that are better lit and better run, with a certainty of much quicker transit when the line is fully equipped, and not blocked by cars run by horses. I have never seen a change of anything like its magnitude which has received such general and

instant approval. The universal wish now is that it shall be extended over all its lines in Cambridge, because of its own advantages, and not less because it does away with the necessity for an elevated road, which would be far more objectionable to the public in the streets, and to all abutters along the streets. Much has been said about the relative value of overhead and underground wires. Mr. Bennett, president of the Cambridge company, who will be a witness before you, has made a personal investigation of the success of the underground system, by correspondence with every city in which it is in use. With one exception, the report is unfavorable to that system. I know that when the matter was under consideration before the aldermen of Cambridge, the West End Company expressed a strong wish that the conduit which was then being built in Boston, should prove a success, and if it was that it should be finally adopted in Cambridge. At that hearing, Mr. Bennett stated the result of his investigation, and predicted that the conduit could not be successful. The result of his prediction has been verified. After a most patient and thorough trial, and great expense, it is stating it mildly to say the conduit system is unsatisfactory. To compel its adoption by legislation hostile to overhead wires, means for us in Cambridge an abandonment of the electric system, and must mean a return to horse cars, with insufficient accommodations and slow transit. This committee will not take such action which would greatly inconvenience the public unless public safety certainly requires it. A single word, then, Mr. Chairman, as to the danger from overhead wires. I do not propose to enter the field that has been so fully covered by expert evidence. They have clearly shown you how little harm can come from such wires. I shall speak of it not technically but in a simpler way, believing there is a very erroneous popular belief as to the danger from electric wires.

"The Cambridge company has been established now some years. It has miles of wires in many streets, all of them overhead. It runs arc and incandescent lights, motors for industries, and motors for street cars. The currents over these wires vary from 500 volts (used by the cars) to 3,000 volts. Some are constant and some are alternating. During its whole existence, not one single claim for damage to any person or property has been made against the company. What stronger evidence could be produced of the safety of these wires? People may speculate as to possible dangers, but the

facts show that such dangers do not exist. One other fact. The company insures its employees against accidents. These employees are working all the time over and above its dynamos, and along its wires, and they are constantly liable to all the dangers that exist from strong electrical currents. The rates for such insurance are exceedingly low, as low, I suppose, as against accidents of any other nature, and no claims have been made upon these policies. Of course, the men get electric shocks, but they are not fatal or serious. Within a few days there have been two such cases, both of which will be in evidence before your committee, where men have received the full force of a 1,000-volt alternating current, and a 2,700-volt constant current.

"Under these circumstances, there seems to be no occasion for the Legislature to pass restrictive legislation. To compel wires to go underground with the conduit system, as yet undeveloped and unsatisfactory, means not only to prevent further development and extension of the use of electricity, but a serious, if not fatal blow, to its present use. Prof. Thomson has said that it would compel the abandonment of the electric road at Cambridge. It must be fatal to the electric light. Such a course, therefore, would be a great public injury. Mr. Chairman, the local authorities in cities and in towns have full power to remedy any inconvenience of overhead wires to the public, or any trouble that arises from conflicting wire, without the passage of stringent restrictive legislation. They are the ones most interested, most competent to decide what is needed, and are ever watchful of the public interest. No one objects to such proper regulations as they can give, either as to the locations or use of such wires. The company I represent has already petitioned the city of Cambridge for the appointment of an inspector for the performance of such duties. Regulation by local authorities exists now, and is proper and sufficient, and restrictive prohibitory legislation seems to me unnecessary, and it certainly will be fatal to electric interests, and so a public misfortune."

Mr. A. T. Mason, general manager of the Simplex Electrical Company of Boston, in giving his testimony as to the harmless character of a current sufficient to operate street cars, says:

"In answer to your inquiry, I beg to say, that I consider a 400 volt current is perfectly innocuous. I regard the taking of that current through my body as rather a pleasure than a peril."

Hon. Henry Baldwin gave his appreciation of the electrical system before the legislative committee (March, 1891,) in the following words:

"I have been highly interested and perhaps instructed, with reference to the matter of liability to accident, by what I have heard here. I have no interest in this matter of electricity except that of a common citizen. I am not interested in the West End Street Railway at all; I am simply interested as a citizen. The electric system of the West End road runs by my home on Harvard avenue, in Allston. * * * * I will simply say, in a word, that I like it very much. I should deem it a great misfortune if the overhead system and the electric cars did not run by my home and did not run on Harvard avenue. I think it has given a great impetus to the prosperity of the community in which I live. I am not particularly in favor of high prices for real estate; I do not speak of that as a great argument in favor of this system; but there are large numbers of people now who are seeking places where they may buy land on which to build houses in which to live, and invariably they seek those sites on the line of the electric railway. Now, this system, had I not seen it at Richmond, I should have felt, perhaps, would be unsightly, but, as you have all seen,—I cannot instruct this committee at all in regard to that—it is not unsightly, and I do not know but it is rather ornamental than otherwise. Whether it is ornamental or not, it compares very favorably with the telephone and telegraph posts. I am more than pleased with what I see of the results of this system with us. * * * I do not know what particular question is before this committee, but I am simply here to say, as a citizen, residing on the line of this overhead system, that I am more than pleased with it, and I should be very sorry to see it removed."

This evidence as to the danger from electricity used in street car propulsion might be extended almost indefinitely, but enough has been introduced here to serve our purpose in this respect, and from a source not likely to be questioned as to its reliability. As to the danger to pedestrians from the electric cars, it has been demonstrated that it is much less than from horse cars or from other vehicles on the streets, a fact which can be accounted for in part by the fear people entertain for the electric car which has been instilled in their minds by the exaggerated reports of their destructiveness.

The electric cars are praised in the highest terms by all who see or have occasion to use them, and as time wears on and the communities through which they pass become familiar with them, their popularity as street passenger conveyances will be greater than any mode of transportation ever before devised.

The officers of the West End Railway for the current year, Sept. 30, 1891, to Sept. 30, 1892, are as follows:

OFFICERS.

President — Henry M. Whitney.

Vice President — Prentiss Cummings.

Second Vice President — C. S. Sergeant.

General Manager — F. H. Monks.

Treasurer — J. H. Goodspeed.

Auditor — H. L. Wilson.

Purchasing Agent — H. F. Woods.

DIRECTORS.

G. T. W. Braman.
T. Jefferson Coolidge.
Eustace C. Fitz.
Walter Hunnewell.
Samuel Little.
Theophilus Parsons.
Nathaniel Thayer.
Isaac T. Burr.
Joseph S. Fay, Jr.
Henry D. Hyde.
E. D. Jordan.
Wm. Powell Mason.
Dexter N. Richards.
Walter S. Swan.
Henry M. Whitney.

(Corporation Clerk) Prentiss Cummings.

The various departments are under the superintendence of the gentlemen named below, many of whom have been identified with the street railways of Boston since their introduction early in the fifties:

Heads of Departments.

F. S. Pearson, Chief Engineer Steam and Electrical Departments.

L. J. Hirt, Mechanical Superintendent.

L. S. Doumalin, Electrical Superintendent.

Louis Pfingst, Master Mechanic.

Arthur Hodges, Chief Engineer (Road Department.)

A. L. Plimpton, Principal Assistant Engineer (Road Department.)

C. Q. Ring, Manager Claim Department.

E. A. Soule, Roadmaster.

J. M. H. Hildreth, Superintendent Routes and Time Tables.

H. W. Peters, Superintendent Stables.

R. H. Keim, Storekeeper.

Division Superintendents.

First Division, J. W. Moore.
Second " J. M. Gould.
Third " G. W. Hendry.
Fourth " E. J. McClench.
Fifth " G. R. Tripp.
Sixth " John H. Studley.
Seventh " R. Hapgood.
Eighth " C. W. Hawes.
Ninth " H. A. Pasho.

We have endeavored in the preceeding pages to outline the great work of the West End Street Railway Company, and to encourage by giving uncontrovertible facts a better appreciation of its magnitude and the vast benefit it has been and will be in the future to untold thousands. No corporation in this or any other country can

show such a record of public service, or a more sincere desire to achieve success for itself through any but the most honorable channels. It has erected here in Boston the grandest and most colossal electrical street railway system in the world, and scientific observers on both hemispheres are watching with wonder and admiration its rapid and successful development. Its enterprise is a credit to the city, to New England and to the nation, and every safeguard of law should be thrown around it compatible with true statesmanship and the great interests at stake.

THE END.

STREET RAILWAYS

IN THE

United States and Canada.

ADRIAN, MICH.— Adrian City Electric Belt Ry. Co. Rae system.

AKRON, O.— Akron St. R. R. Co. Elec. Edison system.

ALAMEDA, CAL.— Alameda, Oakland & Piedmont R. R. Co.

ALBANY, GA.— Artesian City R. R. Co.

ALBANY, N. Y.— Watervliet Turnpike & R. R. Co. Elec. T–H and Short systems.

Albany & E. Greenbush Horse Ry. Co.

The Albany Ry. Co. Elec. T–H system.

ALBANY, ORE.— Albany St. Ry. Co.

ALHAMBRA, CAL.— Alhambra & Pasadena St. Ry. Co.

ALLEGHANY, PA.— Nunnery Hill Incline Plane Ry. Co.

Troy Hill Inclined Plane & Bridge Co.

ALLENTOWN, PA.— Allentown & Bethlehem Rapid Transit Co. Elec. T–H system.

ALLIANCE, O.— Alliance St. Ry. Co.

ALTON, ILL.— Alton Improvement Association.

Alton & Upper Alton Horse R. R. & Carrying Co.

ALTOONA, PA.— City Pass. Ry. Co., of Altoona, Pa. Elec. T–H system.

City & Park Railroad Co. Elec. Edison system.

AMERICUS, GA.— Americus St. Ry. Co. Elec. T–H system.

AMES, IA.— Ames St. Ry. Co.

AMSTERDAM, N. Y.— Amsterdam & Rockton St. Ry. Co. Elec. Edison system.

ANACONDA, MONT.— Electric Ry., Light & Power Co. T–H system.

ANACORTES, WASH.— Fidalgo City & Anacortes Ry. Co. Elec. T–H system.

ANACOSTIA, D. C.— Anacostia & Potomac River Ry. Co.

ANDERSON, IND.— Anderson St. Ry. Co. Elec.

ANN ARBOR, MICH.— The Ann Arbor St. Ry. Co. Elec. Edison system.

ANNISTON, ALA.— Anniston City St. Ry. Co.

ANOKA, MINN.— Anoka St. Ry. Co.

ANSONIA, CONN.— Birmingham & Ansonia Horse R. R. Co.

Derby Horse Ry. Co.

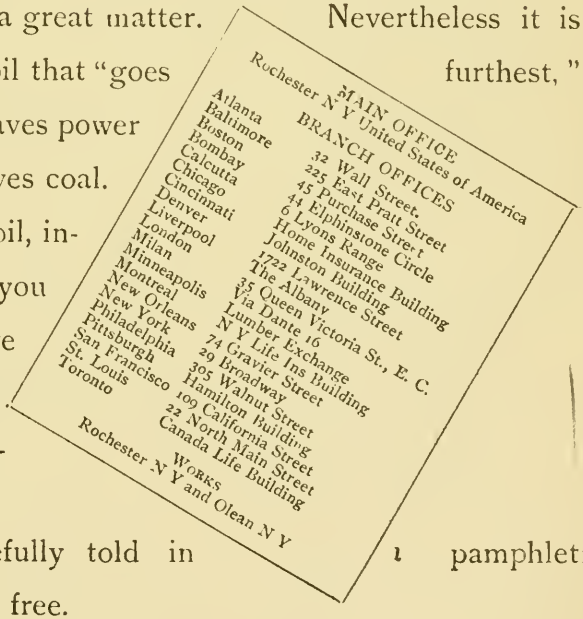
APPLETON, WIS.— Appleton Electric St. Ry. Van Depoele system.
Marinette St. Ry. Co.
ARANSAS PASS, TEX.— Aransas Pass St. Ry. Co.
ASBURY PARK, N. J.— Seashore Elec. Ry. Co. Daft system.
ASHEVILLE, N. C.— Asheville St. Ry. Co. Elec. Edison system.
ASHLAND, KY.— Ashland & Catlettsburg St. Ry. Co.
ASHLAND, WIS.— Ashland St. Ry. Co.
ASHTABULA, O.— Ashtabula City Ry. Co.
Ashtabula Rapid Transit Co. Elec. T–H & Short systems.
ASPEN, COLO.— Aspen City Ry. Co.
ATCHISON, KAN.— Atchison St. Ry. Co.
ATHENS, GA.— Athens Ry. Co.
ATHENS, TENN.— Athens Mineral Land & Imp't Co.
ATLANTA, GA.— Atlanta Consolidated St. Ry. Co.
Fulton County St. R. R. Co. Elec. T–H system.
ATLANTIC CITY, N. J.— Atlantic City Electric Ry. Edison system.

~ The oil that lubricates most. ~

That is what you want in machinery, engines, cylinders, everywhere.

Wrong opinions prevail. The principal facts in friction and lubrication are overlooked and unimportant ones are magnified. The current practice is wrong.

You seek economy of oil, a small matter. You forget what oil is for, a great matter. Nevertheless it is true, as a rule, the oil that "goes furthest," lubricates most—saves power from friction — saves coal. A pint of right oil, instead of that you are using may save a ton of coal; and a little on oil besides.



The facts carefully told in a pamphlet on "Lubrication"; free.

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ATTLEBORO, MASS. — Attleboro, N. Attleboro & Wrentham St. Ry. Elec.

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AUSTIN, TEX.— Austin City R. R. Co.

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Baltimore City Pass. Ry. Co.

Baltimore Traction Co.

Baltimore Union Pass. Ry. Co.
Baltimore & Hall Springs R. R.
Baltimore & Yorktown Turnpike Road Co.
Central Ry. Co.
Highlandtown & Point Breeze Ry. Co.
North Avenue Ry. Co. Elec. Baxter system.
North Baltimore Passenger Ry. Co.

BANGOR, ME.— Bangor St. Ry.

BATTLE CREEK, MICH.— Battle Creek St. Ry. Co. Elec. Short system.

BAY CITY, MICH.— Bay City St. Ry. Co. Elec.

BAY RIDGE, MD.— Bay Ridge Electric R. R. Edison system.

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Beatrice Rapid Transit & Power Co. Elec.

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Belleville, Ont., Can.— Belleville St. Ry. Co.

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Berkley, Va.—The Berkley St. Ry. Co.

Bessemer, Ala.— Bessemer & Birmingham R. R. Co.

Beverly, Mass.—Beverly & Danvers St. Ry. Co. Elec.

Biddeford, Me.— Biddeford & Saco R. R.

Binghamton, N. Y.— Binghamton & Port Dickinson R. R. Co.
Binghamton St. R. R. Co. Elec. Edison system.
Court St. & East End R. R.
Main, Court & Chenango St. R. R.
West Side Ry. Co.

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Birmingham & Forest City Dummy St. R. R.
Birmingham & Milner Springs St. Ry. Co.
Highland Ave. & Belt R. R. Co.

BIRMINGHAM, CONN.— Birmingham & Ansonia Horse R. R.
Derby Street Ry. Co. Elec. T-H system.

BLOOMFIELD, N. J.— Newark & Bloomfield R. R.

BLOOMINGTON, ILL.—The Bloomington City Ry. Co. Elec. United Elec. Traction Co's system.

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Braddock Electric Ry. Co. Short system.

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East Side R. R. Co. Elec. T–H & Edison systems.

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BRUNSWICK, GA.— Brunswick St. R. R. Co.

BUENA VISTA, VA.— The Buena Vista St. Ry. Co. Elec.

BUFFALO, ILL.— See Mechanicsburg, Ill.

BUFFALO, N. Y.— Buffalo Railway Co. Horse and elec. Edison system.

Buffalo & Tonawanda Electric Ry. Co.

BURLINGTON, IA.— Burlington St. R. R. Co.

Burlington Electric Ry. Co. Westinghouse system.

Union St. Ry. Co.

BURLINGTON, VT.— Winooski & Burlington St. Ry. Co.

BUTTE, MONT.— Butte Consolidated Ry. Co. Steam, cable and elec. Edison system.

CAIRO, ILL.— Cairo St. Ry. Co.

CALERA, ALA.— So. Calera Land & Imp't Co.

CALLIOPE, IA.— Calliope & Hawarden St. Ry. Co.

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Camden Horse R. R. Co. Horse and elec. United Electric Traction Co. system.

Pennsylvania R. R. Co. Elec.

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CANTON, O.— Canton St. Ry. Co. Elec. Edison system.

Lakeside St. R. R. Co.

CAPE MAY, N. J.— Cape May & Schellenger's Landing R. R. Co.

CARTHAGE, MO.— Carthage Horse Ry. Co.

CEDAR RAPIDS, IA.— Cedar Rapids & Marion Ry.

CENTERVILLE, IA.— Centerville St. Ry.

CENTRALIA, ILL.— Centralia & Central City St. Ry. Co.

CHARLESTON, S. C.— Charleston City Ry. Co.

Enterprise R. R. Co.

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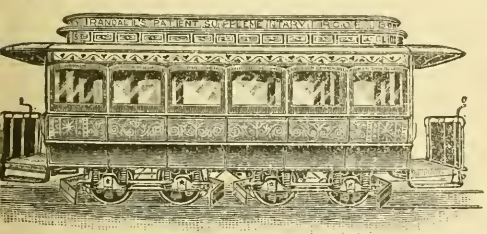

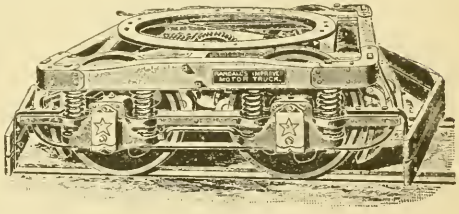

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Calumet Electric St. Ry. Co.
Chicago Pass. Ry. Co.
Cicero & Proviso St. Ry. Elec. Edison system.
North Chicago St. R. R. Co.
South Chicago City Ry. Co.
South End Electric Ry. Co.
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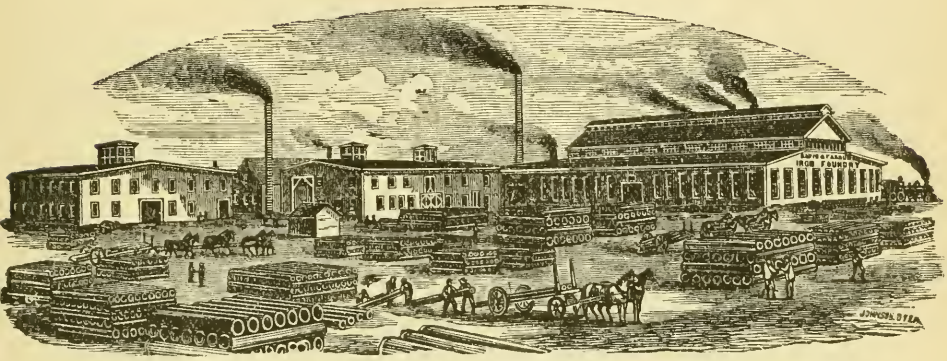

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FRANKFORT, N. Y.— Frankfort & Ilion St. Ry. Co.

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FREMONT, O.— Fremont St. Ry. Co.

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GAINESVILLE, GA.— Gainesville & Hall Co. St. R. R. Co.

GAINESVILLE, TEX.— Gainesville St. Ry. Co.

GALESBURG, ILL.— College City St. Ry. Co.

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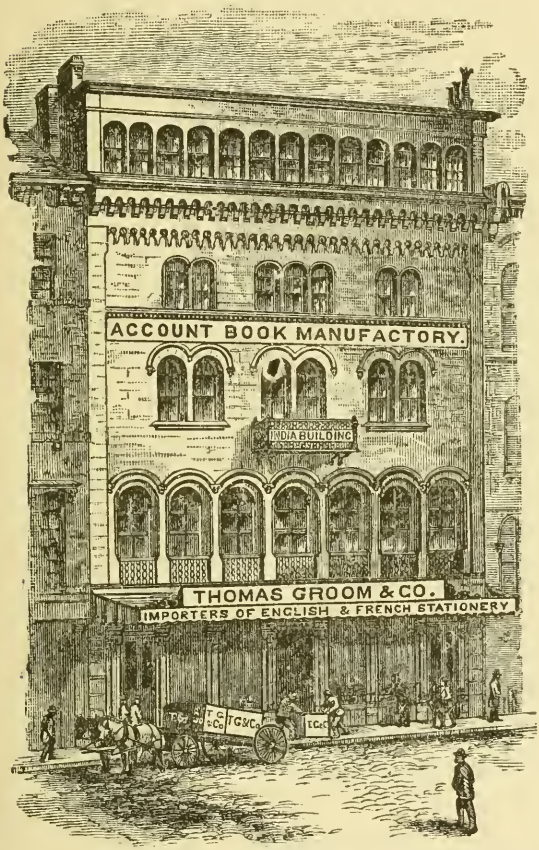

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GREENBUSH, N. Y.— North & East Greenbush St. Ry. Co.

GREEN CASTLE, IND.— Green Castle City St. Ry. Co.

GREENSBURG, PA.— Greensburg & Hempfield Electric St. Ry. Co. Westinghouse system.

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HARRISBURG, PA.— Harrisburg City Passenger Ry. Co. Elec. T–H system.

East Harrisburg Pass. Ry. Co. Elec. T–H system.

HARTFORD, CONN,— Hartford & Wethersfield Horse R. R. Co. Horse & elec. Edison system.

HARVEY, ILL.— Harvey Transit Co. Elec. Short System.

HASTINGS, NEB.— Hastings Improvement Co.
Citizens' St. Ry. Co.

HAVERHILL, MASS.— Haverhill & Groveland St. Ry. Co.

HELENA, ARK.— Citizens' St. Ry. Co.

HELENA, MONT.— Helena Electric Ry. Co. Westinghouse system.
Helena, Hot Springs & Smelter R. R. Co.

HENDERSON, KY.— Henderson St. Ry. Co.

HENDERSONVILLE, N. C.— Hendersonville St. Ry. Co.

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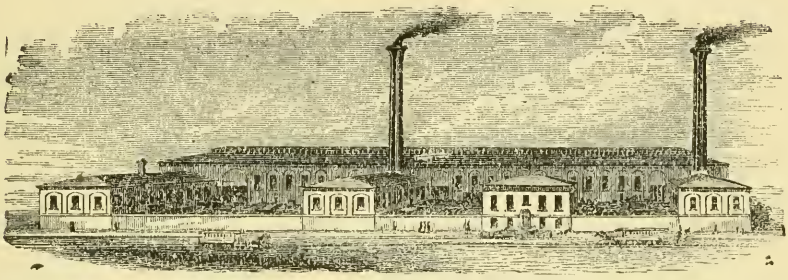


CHILLED CAST IRON CAR WHEELS.

FOR

EVERY KIND OF SERVICE,

Made of Best Charcoal Irons.

Chill, Deep, Uniform, Durable.

Wheels perfectly Round without being Ground.

STEEL TIRED WHEELS

FOR EVERY SERVICE WITH STRONG ANNEALED CAST IRON CENTRES.

CASTINGS of Soft or Chilling Irons.

HOT SPRINGS, ARK.— Hot Springs St. R. R.

HOT SPRINGS, S. DAK.— Hot Springs & Chautauqua R. R. Co. Elec. Short system.

HOUSTON, TEX.— Houston City St. Ry. Co. Horse and elec. Short system.

Bayou City St. R. R. Co.

HUDSON, N. Y.— Hudson Elec. Ry. Co.

HUNTINGTON, L. I., N. Y.— Huntington R. R. Co.

HUNTINGTON, W. VA.— Huntington Elec. Light & St. Ry. Co. Short system.

Huntington Belt Line Co.

HUNTSVILLE, ALA.— Huntsville Belt Line & Monte Sano Ry. Co.

HUTCHINSON, KAN.— Hutchinson St. Ry. Co.

INDEPENDENCE, MO.— Kansas City.

Independence, & Park Dummy Line.

INDIANAPOLIS, IND.— Citizens' St. R. R. Co. Horse & elec. T–H and Short systems.

IRONTON, O.— The Ironton & Petersburg St. Ry. Co.

ITHACA, N. Y.— Ithaca St. Ry. Co. Elec. Daft system.

JACKSON, MICH.— Jackson Street Ry. Co. Elec.

JACKSON, MISS.— Jackson City R. R.

JACKSON, TENN.— Jackson & Suburban St. R. R. Co.

JACKSONVILLE, FLA.— Main St. Ry. Co.
Jacksonville St. R. R. Co.

JACKSONVILLE, ILL.— Jacksonville Ry. Co.

JAMAICA, N. Y.— Jamaica & Brooklyn Road Co. Elec. Edison system.

JAMESTOWN. N. Y.— Jamestown St. Ry. Co. Elec. Short system.

JANESVILLE, WIS.— Janesville St. Ry. Co.

JEFFERSONVILLE, IND.— Ohio Falls St. Ry. Co.

JERSEY CITY, N. J.— Jersey City & Bergen R. R. Co. Horse & elec. T–H system.

Pavonia Horse R. R. Co.

JOHNSTOWN, N. J.— Johnstown, Gloversville & Kingsboro Horse R. R. Co.

JOHNSTOWN, PA.— Johnstown Pass. Ry. Co. Elec. Short system.

JOLIET, ILL.— Joliet St. Ry. Co. Elec. T–H system.

JOPLIN, MO.— Joplin Electric Ry. & Motor Co. T–H system.

KALAMAZOO, MICH.— Kalamazoo City & County St. Ry. Co.

KANAKEE. ILL.— Kanakee Electric Ry. Co.

KANSAS CITY, MO.— Kansas City Cable Ry. Co.

Consolidated City & Chelsea Park Ry. Co. Elec. T–H system.

East Fifth St. Ry. Co.

Grand Ave. Ry. Co. Elec.

Inter-State Consolidated Rapid Transit Ry. Co.

Kansas City & Independence Rapid Transit Ry. Co.

Kansas City, Masten & Westport R. R. Co.

Metropolitan St. Ry. Co. Cable, horse and elec. T–H system.

North East St. Ry. Co. Elec. T–H system.

North Kansas City St. Ry.

People's Cable Ry. Co.
South Side St. Ry. Co.
Union Ry. Co. Cable.
Vine St. Motor Line.
Waldo Park Ry.Co.

KEARNEY, NEB.— Kearney Electric Co. T-H & Edison systems.

KEOKUK, IA.— Keokuk Electric St. Ry. & Power Co. Edison system.

KEY WEST, FLA.— Key West St. Ry. Co.

KEYPORT, N. J.— Keyport & Matawan St. Ry. Co.

KINGSTON, ONT., Can.— Kingston St. Ry. Co.

KNOXVILLE, TENN.— Knoxville St. R. R. Co. Elec. T–H system.
Fountain Head Ry. Co.
West End St. Ry. Co.

LACONIA, N. H.— Laconia & Lake Village Horse R. R.

LA CROSSE, WIS.— La Crosse City Ry. Co.

LAFAYETTE, IND.— Lafayette St. Ry. Elec. Edison system.

LAMPASAS SPRINGS, TEX.— Lampasas Springs St. R. R. Co.

LANCASTER, O.— Lancaster St. R. R. Co.

LANCASTER, PA.— Lancaster & Millersville R. R. Co. Elec.
Lancaster City & West End St. Ry. Co. Elec. Edison & Daft systems.

LANSING, MICH.— Lansing City Ry. Co. Elec. Westinghouse system.

LARCHMONT, N. Y.— Larchmont Horse R. R. Co.

LAREDO, TEX.— International Bridge & Tramway Co.
The Laredo Improvement Co. Elec. Edison system.

LARNED, KAN.— Larned St. Ry. Co.

LA SALLE, ILL.— La Salle and Peru Horse & Dummy R. R. Co.
City Electric Ry. Co. Edison system.

LAWRENCE, KAN.— Lawrence Transportation Co.

LAWRENCE, MASS.— Merrimac Valley Horse R. R. Co.

LEAVENWORTH, KAN.— Leavenworth & Suburban R. R. Co.
Leavenworth Rapid Transit Co.

LEBANON, PA.— Lebanon & Annville St. Ry. Co.. Elec. Edison system.

LEOMINSTER, MASS.— Leominster St. Ry. Co.

LEWISTON, ME.— Lewiston & Auburn Horse R. R. Co.

LEXINGTON, KY.— Lexington City Ry. Co.
Passenger & Belt Ry. Co. Elec. Edison & T–H systems.

LEXINGTON, MO.— Lexington & Kansas City Land & Investment Co.

LIMA, O.— Lima St. Ry. Motor & Power Co. Elec. Van Depoele system.

LINCOLN, NEB.— Lincoln St. Ry. Co. Elec. T–H generators, Westinghouse & Short Motors.

Lincoln City Elec. Ry. Co.

So. Lincoln St. Ry. Co.

LITTLE ROCK, ARK.— Capital St. Ry. Co.

The City Electric Ry. Co.

LOCKPORT, N. Y.— Lockport St. R. R. Co.

LOGANSPORT, IND.— Logansport Ry. Co.

LONDON, CAN.— London St. Ry. Co.

LONG ISLAND CITY, N. Y.— Steinway & Hunters' Point. R. R. Co.

Long Island City & Newtown Ry. Co. Elec.

Riker Ave. & Sanford's Point R. R. Co.

LONGVIEW, TEX.— Longview & Junction St. Ry.

Los Angeles, Cal.— Pacific Ry. Co., of Chicago, Ill.
Depot Railway Co., of Los Angeles.
Los Angeles & Vernon St. Ry. Co.
Los Angeles Consolidated Electric Railway Co. Horse and electric.
Main St. & Agricultural Park R. R. Co.
Temple St. Cable Ry. Co.

Louisville, Ky.— Kentucky St. R. R. Co.
Central Pass. R. R. Co. Horse and elec. T–H and Short systems.
Crescent Hill R. R. Co.
Louisville City Ry. Co. Horse and elec. T–H system.

Lowell. Mass.— Lowell & Suburban Ry. Co. Horse and elec.

Lynchburg, Va.— Lynchburg St. Ry. Co. Elec. Eickemeyer overhead system.

LYNN, MASS.— Lynn Belt Line St. Ry. Co. Elec. T–H system.
Lynn & Boston R. R. Co. Horse and elec. T–H system.
LYONS, IA.— Clinton & Lyons Horse Ry. Co.
MACON, GA.— Macon City & Suburban St. R. R. Co. Elec. T–H system.
Central City St. Ry. Co. Elec.
Metropolitan St. Ry. Co. Elec. T–H system.
MADISON, IND.— Madison St. Ry. Co.
MADISON, WIS.— Madison City Ry. Co.
MALDEN, MASS.— East Middlesex St. Ry. Co.
MANCHESTER, N. H.— Manchester St. Ry. Co.
Massabesic Horse R. R. Co.
MANKATO, MINN.— Mankato St. Ry. Co.
MANSFIELD, O.—Citizens' Elec. Ry. Lt. & Power Co.
MARION, IND.— Marion St. Ry. Co. Elec. T–H system.

MARLBORO, MASS.— Marlboro St. R. R. Co. Elec. Edison system.

MARQUETTE, MICH.— Marquette City & Presque Isle Ry. Co. Elec. T–H system.

MARSHALLTOWN, IA.— Marshalltown Passenger Ry. Co.

MARYSVILLE, CAL.— Marysville & Yuba City St. R. R. Co.

MATTOON, ILL.— Mattoon St. Ry. Co.

MAYSVILLE, KY.— Maysville St. R. R. & Transfer Co. Elec.

MCKEESPORT, PA.— McKeesport & Reynoldton Pass. Ry. Co. Horse and elec.

MCPHERSON, KAN.— McPherson St. Ry. Co.

MECHANICSBURG, ILL.— Mechanicsburg & Buffalo Ry. Co.

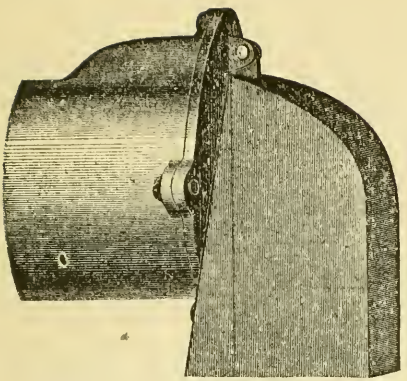
MEMPHIS, TENN.— Citizens' St. R. R. Co. Horse and elec. Edison system.

City & Suburban Ry. Co. Elec. T–H system.

East End Ry. Co.

Memphis & Fort Pickering St. Ry. Co.

Memphis & Prospect Park R. R.



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Pat'd Dec. 1, 1890.

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Manufacturer of

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Machinery Castings,

Columns, Boiler Fronts,
Sewer Work, etc.

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Patented Dec. 1, 1890.

Used for Railway Purposes between tracks, by use of Catch Basin with beam and gate attached.

Office, 257 Washington St., - BOSTON.

STATEMENT

OF

The Merchants National Bank of Boston

JANUARY 1st, 1892.

RESOURCES.			LIABILITIES.	
Loans on time		$5,311,516.22	Capital Stock	$3,000,000.00
U. S. 4 per cent. Bonds, at par		200,000.00	Surplus and Profits	1,557,771.57
Banking House		500,000.00	Circulating Notes	121,500.00
U. S. Treasurer	$6,075.00 / 42,000.00	48,075.00	Deposits	7,409,825.55
Expenses and Taxes		44,863.81		
Demand Loans	$2,878,200.86			
Due from Banks and Cash	3,106,441.23			
		5,984,642.09		
		$12,089,097.12		$12,089,097.13

Organized as a State Bank, 1831. Dividends paid as a State Bank $6,206,250 00
Organized as a National Bank, 1864. Dividends paid as a National Bank 6,463,446.15

Dividends paid since 1831 . . . . . $12,669,696.15

Directors.

T. JEFFERSON COOLIDGE, GEORGE A. GARDNER,
JOHN F. ANDERSON, HOWARD STOCKTON,
FRANKLIN HAVEN, JR., NATHANIEL THAYER,
ABBOTT LAWRENCE.

FRANKLIN HAVEN, Jr., President. **A. P. WEEKS, Cashier.**

MENOMINEE, MICH.— Menominee Elec. Ry. & Pow. Co. Edison system.

MERIDEN, CONN.— Meriden Horse R. R. Co.

MERIDIAN, MISS.— Meridian St. Ry. Co.
Meridian Dummy Line Ry. Co.

MERRILL, WIS.— Merrill Ry. & Lighting Co. Elec.

MICHIGAN CITY, IND.— Citizens' St. Ry. Co.

MIDDLETOWN, CONN.— Middletown Horse R. R. Co.

MIDDLETOWN, O.— Middletown & Madison St. R. R. Co.

MILFORD, MASS.— Milford & Hopedale St. Ry. Co. Elec. Milford. Storage Battery system.

MILLEDGEVILLE, GA.— Milledgeville & Asylum Dummy Line R. R. Co.

MILLERSVILLE, PA.— Lancaster & Millersville St. R. R. Co.

MILWAUKEE, WIS.— Marinette St. Ry. Co.
Milwaukee Electric Ry. Co. T–H system.
Milwaukee St. Ry. Co.
Milwaukee & Whitefish Bay R. R. Co.
West Side St. Ry. Co. Elec. Edison system.

MINNEAPOLIS, MINN.— Minneapolis St. Ry. Co. Elec. Edison & T–H systems.

MOBILE, ALA.— Mobile St. Ry. Co.

MOHAWK, N. Y.— Mohawk & Ilion Horse R. R. Co.
Herkimer & Mohawk St. Ry. Co.

MOLINE, ILL.— Moline & Rock Island St. Car. Co.
Moline Central St. Ry. Co. Elec. Edison & Westinghouse systems.
Union St. Ry. Co.

MONTGOMERY, ALA.— Montgomery Terminal & St. Ry. Co.

MONTREAL, CAN.— Montreal St. Ry. Co.

Mt. Clemens, Mich.— Mt. Clemens St. Ry. Co.

Mt. Vernon, N. Y.— Mount Vernon & East Chester Ry. Co.

Muncie, Ind.— Muncie St. Ry. Co.

Muscatine, Ia.— Muscatine City Ry. Co.

Muskegon, Mich.— Muskegon Ry. Co. Elec. Short system.

Nantucket Beach, Mass.— Nantucket Beach St. Ry. Co.

Nashua, N. H.— Nashua St. Ry. Co.

Nashville, Tenn.— United Electric Railway. Edison & Westinghouse systems.

Citizens' Rapid Transit Co. Elec. Edison system.

Nashville & West Nashville St. Ry. Co.

Overland Ry. Co.

NATCHEZ, MISS.— Natchez St. Ry. Co.

NATCHITOCHES, LA.— Natchitoches St. Ry. Co.

NATICK, MASS.— Natick & Cochituate St. Ry.

NEBRASKA CITY, NEB.— Nebraska City St. Ry. Co.

NEW ALBANY, IND.— New Albany Ry. Co.

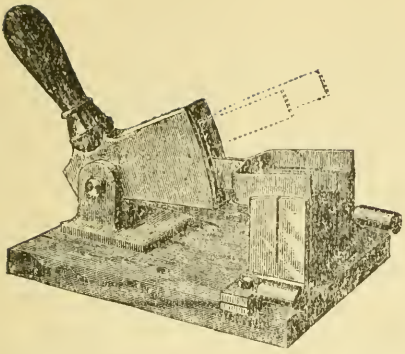
NEWARK, N. J. — Essex Pass. Ry. Co. Elec. T–H system.

Newark, S. Orange, Ferry St. & Hamilton Pl. R. R. Co.

Rapid Transit St. Ry. Co. Elec. Edison system.

NEWARK, O.— Newark City Ry. Co. Horse and elec. T–H system.

Newark & Granville Elec. St. Ry. Co. Edison system.



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The Insulating Tubes OF THE INTERIOR CONDUIT & INSULATION CO.

ARE ESPECIALLY DESIGNED TO CARRY THE FEEDER WIRES OF

ELECTRIC STREET RAILWAY SYSTEMS.

The principle of telescoping one tube into another not only secures extraordinary insulation, but obviates the necessity of making joints. Each duct becomes in fact continuous from manhole to manhole.

Equal care has been exercised to secure perfect insulation in the manholes themselves.

The almost universal endorsement and adoption of the Company's system for the interior wiring of buildings is of itself the best evidence of the insulating property it posesses. For catalogues, price list and general information, write to

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EDWARD H. JOHNSON, President.

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Factory, 527 to 531 West 34th St. and 526 to 528 West 35th St., New York.

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Central Electric Co., Chicago, Ill. Chas. Gabriel, Saginaw, Mich.
American Elect. Supply Co., Buffalo, N. Y. Walker & Kepler, Philadelphia, Pa
Southern Elect. Mfg. & Supply Co., New Orleans, La.
Putnam, Gay & Co., Rochester, N. Y. Glover Elect. Co., Cincinnati, O.
Southern Elect. Co., Baltimore, Md.
Eelct. Supply & Const. Co., Pittsburgh, Pa.

NEW BEDFORD, MASS.— Union St. Ry. Co. Horse and elec. T–H system.

NEW BRITAIN, CONN.— New Britain Tramway Co.

NEW BRUNSWICK, N. J.— New Brunswick City Ry. Co.

NEWBURG, N. Y.— Newburg St. Ry. Co.

NEWBURYPORT, MASS.— Newburyport & Amesbury St. R. R Co. Elec. T–H system.

Black Rocks & Salisbury Beach St. Ry. Co. Elec.

Plum Island St. Ry. Co.

NEW CASTLE, PA.— New Castle St. Ry. Co. Storage battery electric system.

New Castle Electric St. Ry. Co. T–H & Westinghouse systems.

New Haven, Conn.—Fair Haven & Westville R. R. Co.
New Haven & Centreville Horse R. R. Co.
New Haven & West Haven Horse R. R. Co.
State St. R. R. Co.
Whitney Ave. Ry. Co.
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Algiers & Gretna Ry. Co.
Crescent City R. R. Co.
New Orleans & Carrollton R. R. Co.
New Orleans City & Lake R. R. Co.
Orleans R. R. Co.
St. Charles St. R. R. Co.

SPECIFICATION.

Ball Bearings to all running parts, including the Head.

Strictly Highest grade machine.

Every part made of Best Welded Cast Steel.

WITH CUSHION TIRES, $135.00 EACH.

WITH PNEUMATIC TIRES, $150.00 EACH.

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NEWPORT, R. I.— Newport St. Ry. Co. Elec. T-H system.
NEW ROCHELLE, N. Y.— New Rochelle Ry. & Transit Co.
NEWTON, KAN.— Newton City Ry. Co.
NEWTON, MASS.— Newton St. Ry. Co. Elec. T-H system.
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Chambers St. & Grand St. Ferry R. R. Co.
Christopher & Tenth St. R. R. Co.

Dry Dock, East Broadway & Battery R. R. Co.
Eighth Ave. R. R. Co.
Forty-second St. & Grand Street Ferry R. R. Co.
Forty-second St., Manhattanville & St. Nicholas Avenue Ry. Co.
Harlem Bridge, Morrisania & Fordham Ry. Co.
Houston, West Street & Pavonia Ferry R. R. Co.
Jerome Park R. R.
New York & Harlem R. R. Co.
Ninth Ave. R. R. Co.
Second Ave. R. R. Co.

Sixth Ave. R. R. Co.
Third Ave. R. R. Co.
Twenty-third St. Ry. Co.
Twenty-eighth & Twenty-ninth Sts. R. R. Co.

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NIAGARA FALLS, CAN.— Niagara Falls, Wesley Park & Clifton Tramway Co.

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NORFOLK, VA.— Norfolk City R. R. Co.
The Suburban & City Ry. & Improvement Co.

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Norristown Pass. Ry. Co.
NORTH ADAMS, MASS.— Hoosac Valley St. Ry. Co. Elec. T–H system.
NORTHAMPTON, MASS.— Northampton St. Ry. Co.
NORTH WOBURN, MASS.— North Woburn St. Ry. Co.
NORWALK, CONN.— Norwalk Horse R. R. Co.
NORWICH, CONN.— Norwich St. Ry. Co.
OAKLAND, CAL.— Broadway, Berkeley & Piedmont R. R. Co.
Central Avenue Ry. Co. Elec. T–H system.
Consolidated Piedmont Cable Co.

Fourteenth St. R. R. Co.
Highland Park & Fruit Vale R. R.
Oakland & Berkeley Rapid Transit Co. Elec. Edison system.
Oakland Consolidated Elec. St. Ry. Co. Edison & T–H systems.
Oakland R. R. Co.
Oakland, Brooklyn & Fruit Vale R. R. Co.
Oakland Cable Ry. Co.

OGDEN CITY, UTAH.— Ogden City Ry. Co.

OGDENSBURG, N. Y.— Ogdensburg St. Ry. Co.

OLEAN, N. Y.— Olean St. Ry. Co.

OMAHA, NEB.— Omaha St. Ry. Co. Elec. Edison and T–H systems.

Omaha & Council Bluffs Ry. & Bridge Co. T–H & Edison systems.

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ONSET, MASS.— Onset Street Ry. Co,

ONTARIO, CAL.— Ontario & San Antonio Heights Ry. Co.

ORANGE, N. J.— Orange, Crosstown & Bloomfield St. Ry. Co.

ORANGEBURG, S. C.— Orangeburg St. Ry. Co.

ORLANDO, FLA.— Orlando St. Ry. Co.

OSHKOSH, WIS.— Oshkosh St. R. R. Co.

PALATKA, FLA.— Palatka & Heights St. Ry. Co.

PARIS, TEX.— Paris Ry. Co.

PARKERSBURG, W. VA.— Park City St. R. R. Co.

PASADENA, CAL.— City Ry. Co.

Alhambra & Pasadena St. Ry. Co.

Colorado St. Ry. Co.

Pasadena St. Ry. Co.

PATERSON, N. J.— Paterson Ry. Co. Elec. T–H & Edison systems.

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PEABODY, MASS.— Essex Electric St. Ry. Co.

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Pensacola Terminal Co.

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Pittsburg Traction Co. Cable & Elec. Short system.

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Second Avenue Pass. Ry. Co. Elec. T–H & Westinghouse systems.

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Suburban Rapid Transit Co. Elec. N. E. Co. system.

PITTSBURG, TENN.— South Pittsburg St. Ry. Dummy.

PITTSFIELD, MASS.— Pittsfield Electric St. Ry. Co. Westinghouse system.

PITTSTON, PA.— Pittston St. Car Co.

PLATTSMOUTH, NEB.— Plattsmouth St. R. R. Co. Elec. Edison system.

PLYMOUTH, MASS.— Plymouth & Kingston Ry. Co. Elec. T–H system.

POMONA, CAL.— San Antonio & Holt Ave. St. R. R. Co.

Orange Grove St. R. R. Co.

PORT CHESTER, N. Y.— Port Chester & Rye Beach St. Ry. Co. Elec.

PORT HURON, MICH.— Gratiot Elec. Ry. Co. Van Depoele system.

Port Huron Electric Ry. Co.

PORTLAND, ME.— Ocean St. R. R. Co.

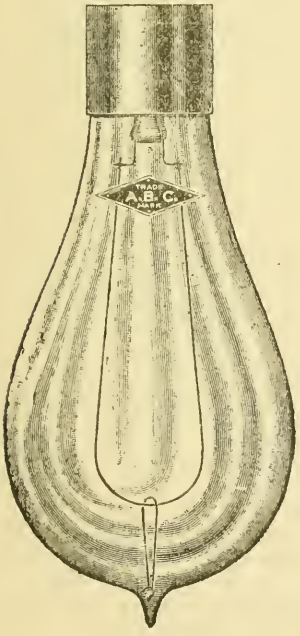
Portland R. R. Co. Elec.

WEST END STREET RAILWAY COMPANY,
436 Albany Street.
Electrical Department.

F. S. Pearson, Chief Engineer.
L. S. Dumoulin, Supt. of Electrical Dept.
L. J. Hirt, Supt. of Power Stations.

Messrs. Alexander, Barney & Chapin,
Cortlandt St., New York, N. Y.

Gentlemen:--Your favor to hand asking me for an opinion on the A. B. C. Lamps. I should think that the extent of our orders, and their constant repetition, is sufficient testimony as to how we regard them, to satisfy anybody.



Yours truly,

West End St. Ry. Co.,

(Signed) L. S. Dumoulin,
Supt. El. power.

The ONLY LAMP which will sustain the vibration incidental to car usage and the strain produced by burning in an inclined position.

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Metropolitan Ry. Co. Elec. Edison system.

Mt. Tabor St. Ry. Co.

Multnomah St. Ry. Co. Elec. Edison system.

Portland Cable Ry. Co.

Portland & Vancouver Ry. Co.

PORTSMOUTH, O.— Portsmouth St. R. R. Co.

PORTSMOUTH, VA.— Portsmouth St. Ry. Co.

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Schuykill Electric Railway Co. Short system.

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PROVIDENCE, R. I.— Union R. R. Co.

Providence Cable Tramway Co.

PROVO CITY, UTAH.— Provo City Ry. Co.

PUEBLO, COL.— Pueblo City Ry. Co. Elec. T–H system.

PUT-IN-BAY, O.— Put-In-Bay Water Works, Light & Ry. Co. Elec. T–H system.

QUEBEC, CAN.— Quebec St. Ry. Co.

St. John St. Ry. Co. L't'd.

QUINCY, ILL.— Quincy Horse Ry. & Carrying Co. Elec. T–H system.

QUINCY, MASS.—Quincy St. R. R.

Manet St. Ry. Co. Elec. Edison system.

Quincy & Boston St. Ry. Co. Elec. T–H system.

RACINE, WIS.— Belle City St. Ry. Co.

RALEIGH, N. C.— Raleigh St. Ry. Co.

RAPID CITY, S. DAK.— Rapid St. Ry. Co.

READING, PA.— Reading City Pass. Ry. Co.

East Reading R. R. Co. Elec. Edison system.

Neversink Mountain R. R.

Reading & South Western St. Ry. Co.

RED CLOUD, NEB.— Street Ry.

REDLANDS, CAL.— Redlands St. Ry. Co.

RED OAK, Ia.— Red Oak St. R. R. Co.

RICHMOND, IND.— Richmond City Elec. St. Ry. Co. T–H system.

RICHMOND, VA.— Richmond Ry. & Electric Co. Edison & Westinghouse systems.

Richmond & Manchester Ry. Co. Elec. Edison system.

Richmond Vnion Pass. Ry. Co. Elec. Edison system.

Manchester Ry. & Improvement Co.

North Side Land & Highland Park R. R. Co. Elec. Edison system.

RIVERSIDE, CAL.— Riverside & Arlington St. Ry.

ROANOKE, VA.—Roanoke St. Ry. Co. Elec. Westinghouse system.

ROCHESTER, N. Y.— Rochester Ry. Co. Elec. Short system.

Rochester Electric Ry. Co. T–H & Short systems.

ROCKFORD, ILL.— Rockford City Ry. Co. Elec. T-H system.
West End St. Ry. Co. Elec. Short system.
ROCK ISLAND, ILL.— Rock Island & Milan St. Ry. Co.
ROME, GA.— Rome St. R. R. Co.
North & South St. Ry. Co.
ROME, N. Y.— Rome City St. Ry. Co.
RONDOUT, N. Y.— Kingston City R. R. Co.
ROXBOROUGH, PA.— Manayunk & Roxborough Inclined Plane & Ry. Co.
RUTLAND, VT.— Rutland St. Ry. Co.
SACRAMENTO, CAL.— Sacramento City Ry. Co.
Highland Park Ry.
Central St. Ry. Co. Edison system.
SAGINAW, MICH.— City of Saginaw St. R. R. Co.
Saginaw Union St. Ry. Elec. Rae system.
SALEM, MASS.— Naumkeag St. Ry. Co. Elec.
Essex Electric St. Ry. Franklin Elec. Co. system.
SALEM, N. C.— Winston-Salem Ry. & Elec. Co.
SALEM, O.— Salem Elec. Ry. Co. T-H system.
SALEM, ORE.— Capital City Ry. Co. Elec. Edison system.
SALINA, KAN.— Salina Electric Ry. Co.
SALINA, N. Y.— Wooldawn & Butternut St. Ry. Co.
SALT LAKE CITY, UTAH.— Salt Lake City R. R. Co. Elec. Edison system.
Salt Lake Rapid Transit Co. Elec. Edison system.
West Side Rapid Transit Co.

San Antonio, Tex.— San Antonio St. Ry. Co. Elec. Edison & T-H system.

Alamo Electric St. Ry. Co. T-H system.

Prospect Hill St. R. R. Co. Elec.

Rapid Transit St. Ry. Co. Elec. T-H system.

West End St. Car Co. Elec. T-H system.

San Bernardino, Cal.— Southern California Motor Road Co.

San Diego, Cal.— San Diego St. Car Co.

San Diego Cable Ry. Co.

San Diego, Old Town & Pacific Beach R. R. Co

Sandusky, O.— Sandusky St. Ry. Co. Elec. Westinghouse system.

San Francisco, Cal.— California St. Cable R R. Co.

Central R. R. Co.

City R. R. Co.

Clay St. Hill R. R. Co.

Ferries & Cliff House Ry.

Geary St., Park & Ocean R. R. Co.

Market St. Cable Ry. Co.

North Beach & Mission Ry. Co.

Ocean Beach Ry. Co.

Omnibus Cable Co.

Park & Ocean R. R. Co.

Potrero & Bay View R. R. Co.

Powell St. Ry. Co.

Presidio & Ferries R. R. Co.
Sutter St. Ry. Co.

San Jose, Cal.— San Jose & Santa Clara R. R. Co. Elec. T–H system.
First St. R. R. Co. Elec T–H system.
First St. & San Pedro St. Depot R. R. Co.
North Side Horse R. R. Co.
San Jose & Alum Rock Park Motor Road.
Willow Glen R. R.

San Luis Obispo, Cal.— San Luis St. Ry. Co.

Santa Ana, Cal.— Santa Ana, Orange & Tustin St. Ry. Co.

Santa Barbara, Cal.— Santa Barbara St. R. R. Co. and Citizens' St. R. R. Co. of Santa Barbara.

Santa Cruz, Cal.— Pacific Av. R. R. Co.

Santa Rosa, Cal.— Santa Rosa St. R. R. Co.
South Side St. Ry. Co.

Saratoga, N. Y. — Saratoga Electric Ry. Co. T–H system.

Sarnia, Ont.— Sarnia St. Ry. Co.

Saugatuck, Conn.— Westport & Saugatuck Horse R. R. Co.

Sault Ste. Marie, Mich.— Sault Ste. Marie St. Ry. Co. Elec. Rae system.

Savannah, Ga.— City & Suburban R. R.
Coast Line R. R. Co.
Savannah St. & Rural Resort Ry. Elec. T–H system.

Schenectady, N. Y.— Schenectady St. Ry. Co.

SCRANTON, PA.— People's St. Ry. Co. Elec. Edison system.
Nayaug Cross Town Ry.
Scranton Suburban Ry. Co. Elec. T–H system.
Scranton Passenger Ry. Co. Elec. T–H system.
SEARCY, ARK.— Searcy & West Point R. R. Co.
SEATTLE, WASH.— Front St. Cable Ry. Co.
Green Lake Electric Ry. Co. T–H system.
Madison St. Cable Ry. Co.
North Seattle Cable Ry. Co.
Queen City Ry. Co. Elec. Terry system.
Rainier Ry. & Power Co. Elec. Westinghouse system.
Seattle City Ry. Co.
Seattle Electric Ry. & Power Co. Elec. T–H system.
South Seattle Cable Ry. Co.
West St. & North End Electric Ry. Co. T–H system.
SEDALIA, MO.— Sedalia St. Ry. Co. Elec. Edison system.
The Electric Ry., Light & Power Co., of Sedalia. Edison system.
SELMA, ALA.— Selma St. R. R. Co.
SENECA FALLS, N. Y.— Seneca Electric Ry. Co. T–H system.
SHAWNEE, O.— Shawnee & Iron Point Coal & Iron Co.
SHEBOYGAN, WIS.— Sheboygan St. R. R.
SHEFFIELD, ALA.— Sheffield St. Ry. Co.

THE BURTON ELECTRIC HEATERS—THE SYSTEM IN SUCCESSFUL OPERATION ON THE WEST END STREET RAILWAY.

People who travel in street cars, especially over the long suburban routes, will appreciate the comfort which the new system of electrical heating insures, and which is now being successfully introduced on the electric cars of the West End Street Railway. These heaters are supplied by the Electrical Merchandise Company of No. 11 Adams street, Chicago, Ill., and are known as the Burton Electric Heaters. On the long electrics they are unquestionably a much needed article, as they impart to the interior a comfortable temperature, which is lacking in frosty weather on these capacious vehicles, making the long trip into some of the suburbs as agreeable as on a steam passenger coach. The handsome double deckers which are gradually being put on the suburban lines of the West End Railway are supplied with the Burton heaters, and the comfort they afford is the subject of most favorable comment by all who patronize these palatial cars between Boston and Cambridge. The Electric Merchandise Company handles electric railway supplies exclusively, and the facilities are such as to enable the company to meet the largest orders with the utmost despatch. The cars of all the principle lines of electric railways are being equipped with the Burton heaters, a fact which will be most agreeable news to all who are obliged to patronize long routes in the various cities.

SHERMAN, TEX.— Sherman City R. R. Co.
College Park Rapid Transit Co. Elec. Edison system.
SHREVEPORT, LA.— Shreveport City R. R. Co.
Shreveport Ry. & Land Improvement Co. Elec. T–H system.
SIOUX CITY, IA.— Sioux City St. Ry. Co. Elec. Edison system.
Riverside Park Ry. Co. Elec. Westinghouse system.
Sioux City Cable Ry. Co.
Sioux City & Highland Park Ry. Co.
Sioux City Rapid Transit Co.
SIOUX FALLS, S. DAK.— City St. Ry. Co.
S. Dakota Rapid Transit Ry. Co. Elec. Edison system.
SOUTH BEND, IND.— South Bend & Mishawaka St. Ry. Co. Elec. T–H system.
SOUTH CHICAGO, ILL.— See Chicago.
SOUTHINGTON, CONN.— Southington & Plantsville Tramway Co. Elec. T–H system.
SPOKANE FALLS, WASH.— Spokane Falls & Montrose Steam Motor R. R.
City Park Transit Co. Elec. T–H system.
Ross Park St. Ry. Co. Elec. T–H system.
Spokane Cable Ry. Co.
Spokane St. Ry. Co. Elec. Edison system.
SPRINGFIELD, ILL.— Citizens' St. R. R. Co. Elec. Rae system.
Springfield City Ry. Co. Elec.
SPRINGFIELD, MASS.—Springfield St. Ry. Co. Elec. T–H system.
SPRINGFIELD, MO.— Metropolitan Electric Ry. Co. Westinghouse system.

Springfield Electric St. Ry. & Improvement Co.

SPRINGFIELD, O.—Citizens' St. R. R. Co.

STAMFORD, CONN.— Stamford St. Ry. Co.

STATEN ISLAND, N. Y.— Staten Island Belt Line R. R. Co.

South Beach Ry. Co. Elec.

STAUNTON, VA.— City St. Car Co.

ST. CATHARINES, ONT.— St. Catharine's, Merritton & Thorold St. Ry. Co. Elec. Van Depoele system.

ST. CLOUD, MINN.— St. Cloud City St. Car Co.

STEUBENVILLE, O.— Steubenville Ry. & Elec. Co. Edison system.

STILLWATER, MINN.— Stillwater St. Ry. Co. Elec. Edison system.

STILLWATER, N. Y.— Stillwater & Mechanicville St. Ry. Co.

ST. JOHN, N. B.— St. John St. Ry. Co. Elec.

ST. JOSEPH, MICH.— St. Joseph & Benton Harbor St. Ry. Co.

ST. JOSEPH, MO.— People's St. Ry. Electric Light & Power Co.

Circle Cable Ry. Co.

Union Ry. Co. Elec.

Wyatt Park Ry. Co. Elec. Syrague system.

ST. LOUIS, MO.— Baden & St. Louis R. R.

Benton–Bellefountaine Ry. Co.

Cass Avenue & Fair Ground Ry. Co.

Citizens' Ry. Co.

Forest Park & Laclede Ave. & Fourth St. Ry. Co. Elec. T–H system.

Fourth St. & Arsenal Ry. Co.

Jefferson Ave. Ry. Co.

Lindell Ry. Co. Elec. Edison & Short systems.

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Northern Central Ry. Co.
People's R. R. Co.
Southern Ry. Co. Elec. T–H system.
St. Louis R. R. Co.
St. Louis & East St. Louis Electric Ry. Co.
St. Louis & Suburban Ry. Co. Elec T–H system.
Union Depot R. R. Co. Elec. T–H system.
Union R. R. Co.

STONEHAM, MASS.— East Middlesex St. R. R. Co.

ST. PAUL, MINN.— St Paul City Ry. Co. Elec.

STREATOR, ILL.— Streator Ry. Co. Elec Rae system.

STRONDSBURG, PA.— Strondsburg Passenger Ry. Co.

ST. THOMAS, CAN.— St. Thomas St. R. R. Co.

SUNBURY, PA.— Sunbury & Northumberland St. Ry. Co. Elec. United El. Tr. Co. system.

SUPERIOR, WIS.— Douglas County St. Ry. Co. Elec.

SYRACUSE, N. Y.— Syracuse & Omondaga R. R. Co.
Central City Ry. Co.
Fifth Ward R. R. Co.
Fourth Ward Ry. Co.
Genesee & Water St. R. R. Co.
People's R. R. Co.
Seventh Ward Ry. Co.

The Syracuse Consolidated St. Ry. Co. Elec.
Syracuse & Geddes Ry. Co.
Third Ward Ry. Co. Elec. T–H system.
Woodlawn & Butternut St. Ry. Co.

TACOMA, WASH.— Tacoma Ry. & Motor Co. Elec. Edison system.
Tacoma & Puyallup R. R. Co.
Point Defiance St. Ry. Co.
Tacoma & Fern Hill St. Ry. Co.
Tacomo & Steilacoom Ry. Co. Elec. T–H system.

TAMPA, FLA.— Tampa St. Ry. Co.

TAUNTON, MASS.— Taunton St. Ry. Co.

TERRE HAUTE, IND.— Terre Haute St. Ry. Co. Elec. Westinghouse system.
Vigo County St. Ry. Co.

TEXARKANA, ARK.— Texarkana St. Ry. Co. Elec.

TIFFIN, O.— Tiffin St. Ry. Co.

TOLEDO, O.— Toledo Consolidated St. Ry. Co. Elec.
Central Street R. R. Co.
Metropolitan St. R. R. Co.
Toledo Electric St. Ry. Co. T–H system.

TOPEKA KAN.— Topeka City Ry. Co.
Topeka Belt Ry. Co.
East Side St. Ry. Co.
Topeka Rapid Transit. Ry. Co. Elec. T–H system.
West Side Circle Ry. Co.

TORONTO, CAN.— Toronto St. Ry. Co.
Metropolitan St. Ry. Co.
TRENTON, N. J.— Trenton Horse R. R. Co.
City Ry. Co.
TRINIDAD, COL.— Trinidad St. Ry. Co.
TROY, N. Y.— Troy & Albia Horse R. R. Co. Elec. Edison system.
Troy & Lansingburg R. R. Co. Elec. T–H system.
TUSKALOOSA, ALA.— Tuskaloosa St. Ry. Co.
Tuskaloosa Belt Ry. Co.
TYLER, TEX.— Tyler St. Ry. Co.
UNION SPRINGS, ALA.— Union Springs St. Car Co.
URBANA, ILL.—Urbana & Champaign St. Ry. Co. Elec.
UTICA, N. Y.— Utica, Clinton & Binghamton St. R. R.
Deerfield & Utica.
Oneida St. R. R. Co.
Utica & Mohawk R. R. Co. Elec. Edison system.
Utica Belt Line St. R. R. Co. Elec. T–H system.
VANCOUVER, B. C.— Electric Ry. & Light Co. Ld. T–H system.
Columbia Land & Improvement Co.
VICKSBURG, MISS.— Vicksburg St. Ry. Co.
Hill City R. R. Co.
VICTORIA, B. C.— National Electric Tramway & Lighting Co. T–H system.
VICTORIA, TEX.— Victoria St. Ry. & Improvement Co.

VINCENNES, IND.—Citizens' St. Ry. Co.

WACO, TEX.— Citizens' Ry. Co. Elec.

Santa Fe St. & Juarez Ave. St. Ry. Co.

Waco Electric Ry. & Light Co. T–H system.

WALLA WALLA, WASH.— Walla Walla St. Ry. & Investment Co.

WARRENSBURG, MO.— Electric Springs Ry. Co.

WASHINGTON, D. C.— Capital, No. O. St. & So. Washington R. R.

Columbia R. R. Co.

Eckington & Soldiers' Home Ry. Co. Elec. T–H & E. D. Co. systems.

Georgetown and Tenalleytown Ry. Co. Elec. T–H and Short Systems.

Glen Echo R. R. Co. Elec. Westinghouse system.

Metropolitan R. R. Co.

Washington & Georgetown R. R. Co.

WASHINGTON, PA.— Washington Electric St. Ry. Co. Westinghouse system.

WATERBURY, CONN.— Waterbury Horse R. R. Co.

WATERFORD, N. Y.— Waterford & Cohoes R. R. Co.

WATERLOO, IA.— Waterloo St. Ry. & Bus Co.

WATERLOO, ONT.— Berlin & Waterloo St. Ry. Co.

WATERLOO, N. Y.— See Seneca Falls, N. Y.

WATERTOWN, DAK.— Watertown & Lake Kampeska Ry. Co.

WATERTOWN, N. Y.— Watertown St. Ry. Co. Elec.

WATERVILLE, ME.— Waterville & Fairfield Horse R. R. Co.

WAXAHACHIE, TEX.— Waxahachie St. Ry. Co.

Lake Park St. Ry. Co.

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WEBB CITY, MO,— The Twin Cities Ry. Co.

WEST BAY CITY, MICH,— West Bay City Ry. Co. Elec. Edison system.

WEST SUPERIOR, WIS.— Douglas Co. St. Ry. Co. Elec. T–H system.

WESTPORT, CONN.— Westport & Saugatuck Horse R. R. Co.

WHEELING, W. VA.— Citizens' Ry. Co. Elec. T–H & Van Depoele systems.

Wheeling & Elm Grove R. R.

Wheeling Ry. Co. Elec. T–H system.

WHITMAN, MASS.— Whitman St Ry. Co. Elec. T–H system.

WICHITA, KAN.— Wichita Electric Ry. Co. Elec. T–H system

WILKESBARRE, PA.— Wilkesbarre & Kingston Pass. R. R.

Coalville Passenger R. R. Co.

Wilkesbarre & Suburban St. Ry. Co. Elec. Edison system.

Wilkesbarre & West Side Ry. Co. Edison system.

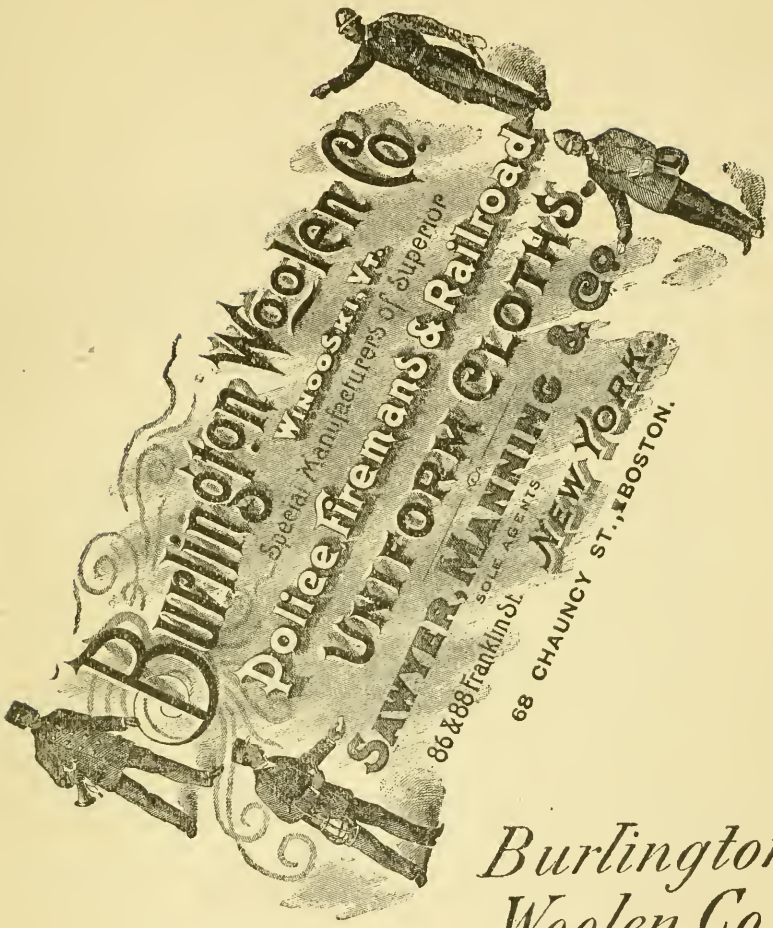
Wilkesbarre & Wyoming Valley Traction Co.

WILLIAMSPORT, PA.— Willamsport Pass. Ry. Co.

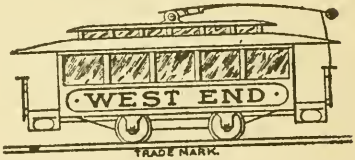
WILMINGTON, DEL.— Front & Union St. Pass. Ry. Co.

Wilmington City Ry. Co. Elec. Edison system.

WILMINGTON, N. C.— The Wilmington St. Ry. Co.



Burlington Woolen Co.



Case _____

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Style _____

Yds. _____

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WINDSOR, ONT.— Windsor R. R.

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Windsor Electric St. Ry. Co. Van Depoele system.

WINFIELD, KAN.— Union St. Ry. Co.

WINNIPEG, MANITOBA, CAN.— The Winnipeg St. Ry. Co. Elec. Edison system.

WINONA, MINN.— Winona City Ry. Co.

WINSTON, N. C.— Winston-Salem Ry. & Elec. Co. Edison system.

WOBURN, MASS.— East Middlesex St. Ry. Co.

WOODLAWN, CAL.— Woodlawn St. Ry. Co.

WOONSOCKET, R. I.— Woonsocket St. Ry. Co.

WORCESTER, MASS.— Worcester Consolidated St. Ry. Co.

Worcester, Leicester & Spencer St. Ry. Co. Elec. T-H system.

WYMORE, NEB.— Wymore & Blue Springs Ry. Co.

YONKERS, N. Y.— Yonkers St. Ry. Co.

YORK, PA.— York St. Ry. Co.

YORK, NEB.— York St. Ry. Co.

YOUNGSTOWN, O.— Youngstown St. R. R. Co. Elec. Edison system.

YPSILANTI, MICH.— Ann Arbor & Ypsilanti St. Ry. Co.

ZANESVILLE, O.— Zanesville & McIntire St. Ry. Co.

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